

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for VI SEMESTER DIPLOMA IN AUTOMOBILE ENGINEERING / MECH. ENGG.(AUTO)

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Automotive Electrical & Electronic Systems	1633602	03	03	10	20	70	100	28	40	03
3.	Transport Management	1633603	03	03	10	20	70	100	28	40	03
4.	Vehicle Maintenance	1633604	03	03	10	20	70	100	28	40	03
5.	Elective –(Any One)	1625605/ 1633605	03	03	10	20	70	100	28	40	03
Elective - (i) Alternate Energy Sources And Management (1625605A)				(ii) Automobile Air Conditioning (1633605B)				(iii) CAD -CAM And Automation (1625605D)			
Total :- 15							350	500			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal(A)	External(B)			
6.	Automotive Electrical & Electronic Systems Lab	1633606	02	03	15	35	50	20	01
7.	Vehicle Maintenance Lab	1633607	04	03	15	35	50	20	02
Total :- 06							100		

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits	
8.	Transport Management - TW	1633608	02	07	18	25	10	01	
9.	Elective – (Any One)	1625609/ 1633609	02	07	18	25	10	01	
	Elective - (i) Alternate Energy Sources And Management (1625609A) - TW		(ii) Automobile Air Conditioning(1633609B) - TW			(iii) CAD -CAM And Automation (1625609D) - TW			
10.	Professional Practices- VI - TW	1625610	02	07	18	25	10	01	
11.	Industrial Project - TW	1633611	04	15	35	50	20	02	
12.	Special Purpose Vehicles - TW	1633612	02	07	18	25	10	01	
Total :- 12							150		
Total Periods per week Each of duration One Hour 33						Total Marks = 750		24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
	—	—	—	CT	:	10	
—	—	—	CT	:	20		

CONTENTS: THEORY

Name of the Topic	Hrs/week	Marks
Unit -1 Overview Of Business:- 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	02	---
Unit -2 Management Process:- 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	10

Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentation <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock 	07	12
Unit - 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel– Training & Development <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow’s Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to – <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act 	08	14

Unit – 5	Financial Management:- 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to – <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT 	08	14
Unit – 6	Materials Management 6.1. Inventory Management (No Numericals) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	14
Unit – 7	Project Management (No Numericals) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 ‘S’, & 6 Sigma 	08	06
	Total	48	70

Text/ Reference Books :-

Titles of the Book	Name of Authors	Name of the Publisher
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	Everest Publication , Pune
The fundamental of design management	Kathryn Best	

Unit - 4	Ignition Systems 4.1 Need of ignition system. 4.2 Triggering of Primary circuit – Inductive, Hall Effect and Optical method. Mutual Induction. 4.3 Classification of ignition systems on basis of – a) triggering system b) source-battery & magneto c) spark timing- dual spark timing (vacuum and centrifugal advance), electronic spark timing 4.3 Magneto ignition system- construction and working of CDI system. 4.4 Components of ignition system:- Ignition coil types, Distributor, spark plug, cords, and condenser. 4.5 Advance & retard timing mechanism-construction and working. 4.6 Electronic (or solid state) ignition system with distributor- circuit diagram and working. 4.7 Distributor less/ computer controlled coil ignition system operation. 4.8 Sensors and Ignition Control Module for triggering and timing of spark.	08	12
Unit - 5	<u>Advanced lighting accessories -fundamentals</u> 5.1 Operation of automatic headlight dimming. 5.2 Operation of automatic on/off headlight with time delay. 5.3 Use and working of fiber optics & its diagnosis 5.4 Operation of keyless entry 5.5 Operation of common anti-theft system 5.6 Purpose & operation of automatic door lock system	05	06
Unit - 6	Diagnosis of electronic components & Systems 6.1 Sensor testing:- Oxygen sensor, Engine coolant sensor, Intake air temp. sensor, Throttle position sensor, Manifold absolute pressure sensor. 6.2 Electronic fuel Injector testing:- only sound test, Ohmmeter test. 6.3 Onboard diagnosis (OBD):- 6.3.1 Purpose of (onboard diagnostic second generation) OBD II, flash codes of Malfunction indicator light. 6.3.2 OBD II terminology:- Drive cycle, Trip, Warm up cycle (Definitions only) 6.3.3 SAE J2012 standards Diagnostic Trouble Code(DTC) :-5 digits only 6.4 Troubles of electronic gauges like. 6.4.1 Gauge reads low constantly. 6.4.2 Gauge reads high constantly. 6.4.3 Inaccurate Gauge reading.	05	06
	Total	48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Automotive Electricity, Electronics & Computer Controls	Barry Hollenbeck	Delmar Publishers
Automotive Technology: A System Approach	Jack Erjavec, Robert Scharff	Delmar Publisher Inc
Automotive Electrical Equipment	P. L. Kohli	Tata McGraw-Hill
Automotive electronic systems	Trevor Mellard	ELBS
Automobile electrical & electronic systems	Tom Denton	
Diagnosis and troubleshooting of automotive electrical,electronics & computer engineering	James Haldeman	

TRANSPORT MANAGEMENT
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633603	Theory			Full Marks			Credits		
	No. of Periods Per Week						:		100
	L	T	P/S	ESE		:		70	
	03	—	—	TA		:		10	
	—	—	—	CT		:		20	

CONTENTS: THEORY

Name of Topics	Hrs/week	Marks
<p>Unit -1 Introduction to transport management</p> <p><i>1.1 Motor Vehicle Act:</i> Short titles used in MVA, Definitions, Terms regarding vehicle.</p> <p>1.2 Licensing of Drivers of Motor Vehicle: Necessity, Age limit, Responsibility of owners, Restriction on holding a driving license, General, Preliminary test and driving test.</p> <p>1.3 Conductor's license: Necessity, Eligibility, Documents required and rules for conductors.</p> <p>1.4 Registration of Vehicles: Necessity, Where to be made, How to be made, Temporary registration, Production of vehicle at the time of registration, Form and manner of display of registration mark, Size of letters and numerals of registration mark, Transfer of Ownership of Motor Vehicle.</p> <p>1.5 Control of Transport: Transport authorities, Difference between STA & RTA, Necessity of Permit, All types of Permit, Transfer of permit, Temporary permit, Tourist permit, National permit. Speed limits.</p> <p>1.6 Construction of Motor Vehicle: Overall dimensions, General provision regarding construction and maintenance of motor vehicle. Power of central government to make rules.</p> <p>1.7 Taxation: Objectives, Basis of taxation, Methods of levying tax, Tax exemption.</p> <p>1.8 Insurance: Motor Vehicle Insurance, No-fault liability, Procedure for accident claim.</p>	14	20

<p>Unit -2</p>	<p>Transport Management</p> <p>Part A</p> <p>2.1 Terms used in transportation: Road transport service, Transport vehicle, Public service vehicle, Goods vehicle, Public place, Depot, Route, Trip, Time table, Vehicle schedule, Fare.</p> <p>2.2 Comparison of Modes of transport.</p> <p>2.3 Requirements of goods and passenger transport on the basis of— Volume, type, weight of material; class of passenger.</p> <p>2.4 Basic elements in Transport Management:</p> <p>2.4.1 Market potential: Type of goods/ passengers, Period of use, Probable competition.</p> <p>2.4.2 Selection of vehicle: Type of load, Class of passenger, Type of service.</p> <p>2.4.2 Organization setup: Govt., Semi Govt., Private.</p> <p>2.4.4 Legal compliance: Documents required as per MVA, Registration.</p> <p>2.4.5 Policies of transport organization: Policies towards passenger, employees, like Long distance service, Express service, Night service and others.</p> <p>Part B</p> <p>2.4.6 Layout of organization: Location, elements considered in location, Passenger amenities, infrastructural facilities.</p> <p>2.4.7 Scheduling: Basic factors in bus, crew(staff) and maintenance scheduling, calculation of number of buses.</p> <p>2.4.8 Freight calculation: Time base, Distance base, Contract, per passenger, cubic feet tone method. Structure of fare, fixed cost- Maintenance cost, depreciation cost, insurance, interest on capital, variable cost, Hiring of trucks, Toll, staff wages, Miscellaneous cost.</p> <p>2.4.9 Record keeping : Log book, Trip operational sheet, Vehicle ledger, Truck history card, Monthly operational sheet, Goods consignment note, various types of bookings, Use of Computer.</p>	<p>06</p>	<p>08</p>
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Unit - 3	Estimation and Valuation of Vehicle: 3.1 Role of surveyor. 3.2 Procedure of survey and valuation of vehicle. 3.3 Accident survey report. 3.4 Importance of warranty system and protection of law: How to deal with defects, benefits of warranty system. Protection of law. 3.5 Buying a new vehicle: Factors to be considered - Ex-showroom price and on road price, use of vehicle, when and where to buy, Closing the deal, Running in. inspecting the vehicle, Points to check: test drive, Controls, Bonnet, Suspension, Switches, Seat, Noise, Ventilation, Safety, Boot, Interior Storage. 3.6 Buying a used vehicle: When & where to buy: Dealers, used car firms, Private sellers, Garages, Auctions. Factors to be considered-- Depreciation, Model and year, Oil leak, Oil Pressure, Exhaust , Battery, Odometer, Bonnet, Crash damage, Rust, Suspension damage, Tyres, Switches & accessories, Lights, Chrome, Wiring , Steering, Hydraulic System, Structural corrosion, Floor, Test drive. 3.7 Preparations for selling : When to sell, How to sell, Auctions, Garages, Private sale, Preparing the car, Documentation, Selling price, Safeguards.	08	12
Unit - 4	Driving skills: 4.1 Instructions in driving of motor vehicle : Driving theory, traffic education, light vehicle driving practice, Vehicle mechanism & repair, Public relations for drivers, Fire hazards, vehicle maintenance, first aid. 4.2 Traffic signs: Mandatory signs, Cautionary signs, Informatory signs. Traffic signals. Causes of accident and remedies. 4.3 Measures to avoid accidents 4.4 Defensive driving : 4.5 Rain and flood, fog and mist, snow and ice, 4.6 Fitness to drive : Driving and age, stress due to traffic jam, night driving.	08	12
Unit - 5	Motor Industry 5.1 The Automobile Industry In India (Collection of Data of various companies) 5.2 Importance of Automobile Engineer. 5.3 Working of Various State Transport Organizations. (MSRTC, BEST)	08	12
Unit - 6	Functions & Role in Automobile Industry: Various Research Organizations like- Central Institute of Road Transport. Automotive Research Association of India. Vehicle Research, Development & Establishment. Central Road Research Institute. Petroleum Conservation & Research Association	04	06
	Total	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Passenger Amenities in STU	Dr. P. Sudarsanam.	CIRT, Pune
Fare structure in STU	Dr. P. Sudarsanam.	CIRT, Pune
Bus station Management	Dr. P. Sudarsanam.	CIRT, Pune.
Bus & Crew scheduling	Dr. P. Sudarsanam	CIRT, Pune.
Industrial Organization & Management	O.P. Khanna.	Dhanpat Rai & sons
Compedium of Transport Terms	Dr. P.G. Patankar. Director.	CIRT, Pune
Vahan Mitra	Bharat Kalaskar	Sanjivini Prakashan, Pune
--	Book Of The Car	Drive Publications Limited Automobile Association
Airline Marketing and Management	Stephan Shaw	
Practical Transport management	Andrew Hastie	

Unit - 4	Chassis & Body Maintenance Part A: 4.1 Checking and repairing of Clutch for clutch plate thickness, run-out, rivet depth, warpage of pressure plate. 4.2 Adjustment of clutch. 4.3 Troubles, Causes and remedies of clutch. 4.4 Checking gearbox for run out of main shaft and lay shaft, for wear of synchronizer and worn bearings, checking oil seals. 4.5 Troubles, Causes and remedies of gearbox 4.6 Checking and adjusting differential for ring gear run-out, backlash in ring gear, tooth contact between ring gear and pinion, bearing preload. 4.7 Troubles, Causes and remedies of propeller shaft, differential and rear axle. 4.8 Inspection and repair of master cylinder, wheel cylinder, brake drum, brake disc, brake linings and brake pads.	10	14
	4.9 Adjustment of hydraulic brakes – shoe clearance, brake pedal free travel, pedal to wall clearance, parking brake adjustment. 4.10 Bleeding of hydraulic brakes 4.11 Troubles, Causes and remedies in brake system. Part B: 4.12 Troubles, Causes and remedies of suspension system. Lubrication of leaf springs 4.13 Procedure of wheel alignment (after chassis height adjustment) by wheel alignment gauges and procedure of wheel balancing. Troubles, Causes and remedies of steering system. 4.14 Care of wheels and tires, retreading of tires and vulcanizing. Tire rotation. 4.15 Frame repairs (cracks, loose rivets, skewness in frames) and alignments. 4.16 Body repairs- denting, denting tools and equipments 4.17 Repainting procedure, patch work. 4.18 Painting defects. 4.19 Adjustment of doors and locks	09	12
	Total	48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Automotive Service	Tim Gills	Delmar Publisher Inc.
Automobile Mechanics	Crouse / Anglin.	TATA McGraw – HILL
Automobile Engineering Vol. III Auto Marketing and Workshop Techniques	Anil Chikara	Satya Prakashan, New Delhi
Automobile Engineering Vol. IV Body repair techniques	Anil Chikara	Satya Prakashan, New Delhi
Automobile Engineering Vol. V Paint techniques	Anil Chikara	Satya Prakashan, New Delhi
Automobile Engineering Vol. I	Dr. Kirpal Singh	Standard Publishers.
Motor Automotive Technology	Anthony Schwaller	Delmar Publisher Inc.
Automotive Engine Performance	Ken Layne	Prentice Hall Career Technology
Heavy Duty Truck System	Ian Norman, Robert Scharff, John Corinchoke	Delmar Publisher Inc.
Santro & Accent Basic training Book	--	Hyundai Motors India Ltd.
Service Manuals of all Euro –II vehicles.	--	Maruti motors India Ltd.
Automotive Mechanics	S.Srinivasan	Tata McGraw Hill.
Maintenance and repair of road vehicles	Roy Brooks,Jack Herst John Whip	

**ELECTIVE-(ANY ONE)- (i) ALTERNATE ENERGY SOURCES AND
MANAGEMENT (MECHANICAL ENGINEERING GROUP)**

Subject Code 1625605A	Theory			Credits		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	ESE	:	70
	03	—	—	TA	:	10
—	—	—	CT	:	20	

CONTENTS: THEORY

	Name of Topics	Hrs/week	Marks
Unit -1	Introduction to Energy Sources 1.1 Introduction. 1.2 Major sources of energy: Renewable and Non-renewable. 1.3 Primary and secondary energy sources. 1.4 Energy Scenario: - Prospects of alternate energy sources. - Need of Alternate energy sources.	06	04
Unit -2	Solar Energy 2.1 Principle of conversion of solar energy into heat and electricity 2.2 Solar Radiation: Solar Radiations at earth's surface Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle 2.3 Applications of Solar energy: - - Construction and working of typical flat plate collector and solar concentrating collectors and their applications, advantages and limitations - Space heating and cooling. - Photovoltaic electric conversion. - Solar distillation, Solar cooking and furnace. - Solar pumping and Green House. - Agriculture and Industrial process heat. (no derivations and numericals)	08	10
Unit - 3	Wind Energy 3.1 Basic Principle of wind energy conversion. 3.2 Power in wind, Available wind power formulation, Power coefficient, Maximum power 3.3 Main considerations in selecting a site for wind mills. 3.4 Advantages and limitations of wind energy conversion. 3.5 Classification of wind mills 3.6 Construction and working of horizontal and vertical axis wind mills, their comparison 3.7 Main applications of wind energy for power generation and pumping.	06	08
Unit - 4	Energy from Biomass 4.1 Common species recommended for biomass. 4.2 Methods for obtaining energy from biomass 4.3 Thermal classification of biomass a) Gasified, b) Fixed bed and fluidized 4.4 Application of gasifier 4.5 Biodiesel production and application 4.6 Agriculture waste as a biomass 4.7 Biomass digester 4.8 Comparison of Biomass with conventional fuels	08	12

Unit - 5	Energy Conservation A. Energy conservation and Management:- 5.1 Global and Indian energy market 5.2 Energy scenario in various sectors and Indian economy 5.3 Need and importance of energy conservation and management 5.4 Concept of Payback period, Return on investment (ROI), 5.5 Life cycle cost, Sankey diagrams, specific energy consumption.	04	08
Unit - 6	Energy Conservation Techniques 6.1 Distribution of energy consumption 6.2 Principles of energy conservation. 6.3 Energy audit 6.4 Types of audit 6.5 Methods of energy conservation 6.6 Cogeneration and its application 6.7 Combined cycle system 6.8 Concept of energy management 6.9 Study of different energy management techniques like <ul style="list-style-type: none"> - Analysis of input - Reuse and recycling of waste - Energy education - Conservative technique and energy audit 	08	14
Unit - 7	Economic approach of Energy Conservation 7.1 Costing of utilities like steam, compressed air, electricity and water. 7.2 Ways of improving boiler efficiency 7.3 Thermal insulation, Critical thickness of insulation. 7.4 Waste heat recovery systems, their applications, criteria for installing unit.	08	14
	Total	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Non conventional energy Resources	Dr B.H.Khan	Tata McGraw Hill
Non conventional energy sources	G. D. Rai	Khanna publication
Solar energy	S. P. Sukhatme	Tata McGraw Hill
Solar energy	H. P. Garg	Tata McGraw Hill
Power plant engineering	Arrora Domkundwar	Dhanpat Rai & co.
India- The energy sector	P.H. Henderson	Oxford University Press
Industrial energy conservation	D. A. Ray	Pergaman Press
Energy management handbook	W. C. Turner	Wiley Press
Non-conventional energy source	K. M. Mittal	--
Energy resource management	Krupal Singh Jogi	Sarup and sons
Renewable & novel energy sources	S.L Sah	
Renewable enrgy in non- technical language	Ann Chambers	

2.Cassettes/CD/websites:

1. CDs developed by National Power Training Institute, (Under the ministry of Power, Government of India)
Opposite VNIT, South Ambazari road, Nagpur
2. Website of Bureau of Energy and Efficiency.(www.bee-india.nic.in)
3. Website for Akshay Urja News Bulletin. (www.mnes.nic.in)

ELECTIVE-(ANY ONE)- (ii) AUTOMOBILE AIR CONDITIONING
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633605B	Theory			Credits		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	ESE	:	70
	03	—	—	TA	:	10
	—	—	CT	:	20	

CONTENTS: THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	<p>Introduction</p> <p>1.1 Environmental & safety aspects in heating, ventilation & air conditioning systems</p> <p>1.2 Human comfort control - comfort zone, air movement, wind chill factor, odour problems & effects of humidity.</p> <p>1.3 Heat transfer fundamentals- forced & natural convection, radiation, evaporation & conduction.</p> <p>1.4 Requirements of heating, ventilation & air conditioning in cars, multi utility vehicles, vans, safari, heavy passenger vehicles, coaches, cargo vehicle cabin, vehicle carrying perishable commodities & cryogenic substances.</p> <p>1.5 Controlled & uncontrolled ventilation - working, application & comparison.</p>	06	10
Unit -2	<p>Case & Duct System</p> <p>2.1 Construction & working of Air intake section, core section & distribution section.</p> <p>2.2 Construction & working of Downstream, upstream, split & hybrid.</p> <p>2.3 Construction & working of rear heating & cooling system.</p>	06	10
Unit -3	<p>Air Conditioning System</p> <p>Part A</p> <p>3.1 General layout of Air conditioning system.</p> <p>3.2 Construction & working of following refrigeration sub systems – thermostatic expansion valve, fixed orifice tube & rotary vane air cycle system.</p> <p>3.3 Construction & working of evaporator, condenser, accumulator.</p> <p>3.4 Receiver driers & accumulator- Types, construction & working</p> <p>3.5 Construction & working of reciprocating, scroll & rotary vane compressors. Drive systems for compressors.</p> <p>Part B</p> <p><i>3.1 Construction & working of electromagnetic clutch</i></p> <p>3.2 Metering devices- comparison of thermostatic expansion valve & fixed orifice tube. Types working & comparison of thermostatic expansion valves i.e. H valve, block type, internally equalized & externally equalized.</p> <p>3.3 Functions of thermostatic expansion valve i.e. Throttling action, modulating action & controlling action. Construction & working of remote bulb.</p>	06	10

Unit - 4	System Control Devices & Electrical Circuits 4.1 System controls - Construction & working of typical vacuum system & electronic temperature control system. 4.2 Construction & working of vacuum operated devices i.e. vacuum reserve tank, vacuum restrictor, vacuum motor, check valve & check relays. 4.3 Switches - Construction & working of high- side temperature switch, low-side temperature switch, high- pressure switch, low- pressure switch, pressure regulator, ambient switch & superheat switch. 4.4 Sensors- Construction & working of sun load sensor, outside temperature sensor & in car temperature sensors. 4.5 Construction & working of Aspirator. 4.6 Construction & working of blower clutch control, heater control, and time delay relay for heater control. 4.7 Mode doors and temperature doors. 4.8 Electrical circuits- Typical climate control system & Electronic climate control system, their electrical circuits & working.	11	14
Unit - 5	Repairs & maintenance of Air Conditioning system 5.1 Visual & acoustic check, side glass, leak test, temperature test, Procedure of charging & discharging. Moisture removal procedure. 5.2 Service equipments & tools – Vacuum pump, Manifold & gauge i.e. Low side & high side, gauge calibration, recovery unit & recycling unit, Halide (freon) & Fluorescent leak detector, nitrogen leak test 5.3 Compressor service - Symptoms, faults, cause & remedy. 5.4 Electromagnetic clutch service - Symptoms, faults, cause & remedy. 5.5 Performance testing procedure of thermostatic expansion valve & fixed orifice tube. 5.6 Refrigerant lubricants- Properties & types 5.7 Refrigerant- types, Packaging, storage, restrictions, color code & purity test Hoses & connectors – construction of system hoses, charging hose with shutoff valve & connectors. Retrofitting from CFC- R12 to HFC- 134 A – need, procedure & Precautions	09	12
Unit - 6	Comfort Heating System 6.1 Function, construction, working, maintenance, general faults and their remedies of Comfort Heating System.	04	04
	Total	48	70

Text / Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Automobile Air Conditioning	Boyce H. Dwiggin	Thomson Learning
Service Manual	--	Subros Company
Service Manual	--	Sanden Company
Service Manual	--	Baher Company
Automotive Air conditioning & Climate	Stevan Daley	
Automobile Engineering	K.K Jain	

CD.s:

- C. D. on various Topics of Automobile Engineering By SAE Publisher.

ELECTIVE-(ANY ONE)- (iii) CAD-CAM AND AUTOMATION
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625605D	Theory						Credits 03
	No. of Periods Per Week						
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
	—	—	—	CT	:	10	

CONTENTS: THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Introduction to CAD/CAM Computers in industrial manufacturing. Product Cycle, CAD/CAM CAD/CAM hardware:- basic structure, CPU, Memory, I/O devices, Storage devices and system configuration	06	08
Unit -2	Geometric Modelling Requirement of geometric modelling, Types of geometric models. Geometric construction method-sweep, solid modelling- Primitives & Boolean operations, free formed surfaces (Classification of surface only) (No numerical treatment)	10	14
Unit -3	Introduction to computer numerical Control Introduction - NC, CNC, DNC, Advantages of CNC, The coordinate system in CNC, Motion control system - point to point, straight line, Continuous path (Contouring). Application of CNC.	05	08
Unit -4	Part programming Fundamentals, manual part programming, NC –Words, Programming format, part programming, use of subroutines and do loops, computer aided part programming (APT).	12	16
Unit -5	Industrial Robotics Introduction, physical configuration, basic robot motions, technical features such as - work volume, precision and speed of movement, weight carrying capacity, drive system, End effectors, robot sensors. Application – Material transfer, machine loading, welding, spray coating, processing operation, assembly, inspection.	09	14
Unit -6	Automation Basic elements of automated system, advanced automation functions, levels of automation. Flexible manufacturing system :-Introduction, FMS equipment, FMS application, Introduction to CIM	06	10
Total		48	70

Text / Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
CAD/CAM Principles and Applications	P. N. Rao	Tata McGraw-Hill
CAD/CAM/CIM	RadhaKrishna P. & Subramanyam	Wiley EasternLtd
CNC Machine	B.S.Pabla and M.Adithan	New age International(P)Ltd
Computer Aided design and manufacturing	Groover M.P. & Zimmers Jr	Prentice hall of India
Algorithms for VLSI Physical design automation	Naveed A Sherwaani	
CAD/CAM/CIM	P. Radhakrishnan	

AUTOMOTIVE ELECTRICAL & ELECTRONIC SYSTEMS LAB
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633606	Practical			Full Marks			Credits	
	No. of Periods Per Week							:
	L	T	P/S	ESE				01
	—	—	02	Internal				
	—	—	—	External				
			:					
			50					
			15					
			35					

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual Skills:

- Understand various test procedures for battery as specified by manufacturer.
- Understand the precautions while handling a battery.
- Identify the alternator components, starter motor components and understand test procedure of some of the components.
- Understand principle of stroboscope operation and concept of ignition timing adjustment.
- Understand the test and service procedure for spark plug, distributor and spark plug cords.
- Identify and locate sensors and to understand diagnostic procedures (on-board and stand alone diagnosis).

Motor Skills:

Take specific gravity reading using hydrometer, to correct it using temperature correction factor.

- Perform alternator tests as specified by manufacturer.
- Perform alternator component tests as specified by manufacturer.
- Measure parameters such as current, voltage drop using multimeter.

List of Practical:

1. Specific gravity of electrolyte, High rate discharge test of battery. Load test of battery.
1. Alternator-component identification and output test, Regulated Voltage Output Test charging circuit resistance test. Electrical testing of rotor and stator of alternator.
2. Starter Motor –component identification, starter current draw test and voltage drop test. 4. Adjustment of ignition timing of a multi cylinder engine with strobe (neon light) Inspection of spark plug cords, Servicing of spark plugs and distributor
5. Location and identification of sensors. Stand alone diagnosis.
6. Assignment - On Board Diagnosis.

Demonstration: Trainer kits as well as charts of electronic circuits may be prepared for Demo.

VEHICLE MAINTENANCE LAB
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633607	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	02
	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Skills to be developed

Intellectual Skills:

- Select tool and equipment for vehicle maintenance.
- Diagnose faults and suggest remedies.
- Understand tuning, backlash and detonation.

Motor Skills:

- Put vehicle on the ramp
- Use diagnostic tester
- Use service manuals for maintenance of vehicle.

List of Practical:

1. Remove multi-cylinder engine from a vehicle, dismantle, clean, inspect and repair following components.
 - cylinder head for warpage and cracks, refacing by grinding or cutting, straightening cylinder heads
 - cylinder block for measurement of ovality and taperedness , cylinder boring , honing process, changing of liners.Piston and piston rings for wear, appearance,
 - piston head for signs of deposits and detonation, oversize piston, ring groove clearance, removing and refitting rings.
2. Tuning of carburettor, tuning and maintenance of diesel fuel injection system.
3. Servicing lubrication system – change oil filter, check oil pump, diagnose causes for excessive oil consumption, external oil leakage, and low oil pressure in an automobile engine.
4. Overhauling of clutch and gear box- dismantling, inspection of clutch and gearbox parts – pressure plate, clutch plate, gear shaft bearing, synchromesh unit, shifting ring forks etc. repairing, replacement of components and reassembling of the clutch and gear box, adjustment of shifting mechanism. Adjust the clutch paddle.
5. Dismantle the propeller shaft and differential, Check wear in universal joints, straightness in propeller shaft, remove bushes and bearings and reassemble it. Check the differential gears for wear, run out, backlash, tooth contact. Adjust the final drive and obtain even tooth contact.
6. Adjustment of mechanical and hydraulic brakes and renewal of brake liners, repairing of master cylinder, wheel cylinder, brake chamber, brake bleeding, skinning scored brake drum.
7. To remove and refit the drag link and steering gearbox. Adjust joints and track rod ends. Do the Adjustment of steering gear to take up backlash.
8. Evacuation, charging and trouble shooting of Air conditioner.

TRANSPORT MANAGEMENT -TW
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633608	Term Work						Credits
	No. of Periods Per Week						
	L	T	P/S	Internal	:	07	01
	—	—	02	External	:	18	

CONTENTS: TERM WORK

List of Assignments/Term Work :-		
S.No	The following term work / assignments may be completed by a group 5 or 6 students. (1 Hr/ Week)	
1	1. Study, fill up, highlight the important points & prepare report on following forms under M V rules -- a. Medical certificate b. Learner's license. c Driving license. d. Addition of license. e. Renewal license f. Registration of vehicle. g. Transfer of vehicle.	
2	Prepare a report on buying of a new vehicle.	
3	Prepare a report on buying /selling an old vehicle.	
4	Prepare a report showing different road signs and signals.	
Note: It is recommended that the eligible student as per M.V. Act should seek license up to LMV.		
M. V. Acts:		
	Title	Publication
1	Motor Vehicle Act, 1988	Home Department (M .S.)
2	Central M. V. Rules 1989	Home Department (M .S.)

**ELECTIVE- (ANY ONE)- (i) ALTERNATE ENERGY SOURCES AND
MANAGEMENT-TW (MECHANICAL ENGINEERING GROUP)**

Subject Code 1625609A	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

CONTENTS: TERM WORK

List of Assignments/Term Work :-	
S.No	
1	<ul style="list-style-type: none"> • To collect information about global and Indian energy market.
2	<ul style="list-style-type: none"> • To perform an experiment on solar flat plate collector used for water heating.
3	<ul style="list-style-type: none"> • To study construction and working of photo voltaic cell.
4	<ul style="list-style-type: none"> • To study construction, working and maintenance of solar cooker.
5	<ul style="list-style-type: none"> • Visit to plant of solar heating system for hotel/hostel/railway station etc.
6	<ul style="list-style-type: none"> • To study construction and working of horizontal axis wind mill or to visit a nearest wind farm.
7	<ul style="list-style-type: none"> • To visit a biomass/ biogas plant of municipal waste or else where.
8	<ul style="list-style-type: none"> • Perform energy audit for workshop/Office/Home/SSI unit.
9	<ul style="list-style-type: none"> • Study of various waste heat recovery devices

ELECTIVE-(ANY ONE)- (ii) AUTOMOBILE AIR CONDITIONING -TW
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633609B	Term Work						Credits 01
	No. of Periods Per Week						
	L	T	P/S	Internal			
	—	—	02	External			
				:		25	
				:		07	
				:		18	

CONTENTS: TERM WORK

S.No	List of Term Work / Assignment :-
1	Demonstration of all parts of all subsystems & assembly & disassembly of three different types of compressors.
2	Identification & use of tools, gauges & equipment for servicing.
3	Demonstration of charging & evacuation of refrigerant from system.
4	Demonstration of leakage testing using soap solution & other techniques.
5	Diagnosis of electrical systems faults.
6	Diagnosis of control systems faults.
7	Perform lubrication of A C system & servicing of heating system.
8	Retrofitting from CFC- R12 to HFC- 134 A
9	Diagnosis of various running faults in car HVA C

ELECTIVE-(ANY ONE)- (iii) CAD-CAM AND AUTOMATION -TW
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625609D	Term Work			Full Marks			Credits 01
	No. of Periods Per Week						
	L	T	P/S	Internal			
	—	—	02	External			

CONTENTS: TERM WORK

List of Term Work / Assignment :

1. Two assignments on CAD for 2D drafting (Using AutoCAD)
2. Two assignments on CAD for 3D Modelling. (Using any 3-D Modelling software like CATIA, ProE, Sdidworks etc.)
3. Manufacturing one turning and one Milling component on CNC.
4. At least four assignments on part programming using subroutines do loops for turning and milling component.
5. Report writing on visit to industry having CNC machine.
6. Report writing on visit to industry having robot Application.
7. Report writing on visit to Industry having Automation in manufacturing.

PROFESSIONAL PRACTICES VI -TW
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625610	Term Work						Credits
	No. of Periods Per Week						Full Marks
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

CONTENTS: TERM WORK

Name of Topics		Hrs/week
Unit -1	<p>Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. TWO industrial visits may be arranged in the following areas / industries to observe - Material Handling System, quality control charts / production record / layout flow systems / Facilities / Hydraulic & pneumatic systems / Working of Boilers and steam engineering applications.</p> <ul style="list-style-type: none"> vi) Auto / Electronic equipment manufacturing industry. vii) Modern service station or garage (understanding of latest scanning & testing equipments, auto air-conditioning) viii) Earth Moving Equipment Maintenance Shop. ix) Transport organization (records of transport , transport management 	20
Unit -2	<p>Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any of the following areas (4 lectures of 2 hrs duration each): a) Electrical accessories b) Types of Batteries c) Charging systems d) Electronic ignition system e) Advanced auto mobile lighting accessories f) Auto sensors & actuators g) Motor vehicle rules h) Transport management i) Estimation & valuation of a vehicle j) Buying a new / used vehicle k) Driving skills l) Motor industry m) Maintenance management & record keeping n) Engine / chassis / body maintenance o) Air conditioning & heating systems p) Earth moving machines q) Tractors r) Excavators s) Fork lift trucks t) Road- roller u) Automated Guided Vehicles (AGV) v) Career opportunities in RTO, Service stations, Marketing, Surveyor, Insurance, R&D, call centers ,CAD, NDT, Railways, Defense, Aeronautics, Marine, Software development, Information Technology w) Continuing education / Open universities programmes for diploma holders.</p>	12
Unit - 3	<p>Information Search : Search information on any TWO of the following suggested topics and write a report (Group size – 3-5 students, Report – upto 10 pages). Collection of information related to :</p> <ul style="list-style-type: none"> a) Buying of a new / old vehicle (cost, make, model etc.). b) Road signs, signals & traffic regulation. c) Motor vehicle taxes/ insurance. d) Elements of transport. e) Automotive batteries – Construction, features & specifications. f) Automotive electrical / electronic accessories. g) Starting & charging system. h) Maintenance management & record keeping. i) Chassis & body maintenance. j) A Special purpose vehicle. k) Maintenance of Automobile air-conditioning systems. 	18

Unit - 4	<p><u>Group Discussion:</u> The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topics of (ANY TWO) group discussions may be selected by the faculty members. Some of the suggested topics are -</p> <ul style="list-style-type: none"> v) Solar Vehicles / Electric Vehicles. vi) Vehicles – Comparison. vii) Two stroke versus Four stroke automobile engines viii) Tribological aspects in automobiles ix) Energy Conservation In Institutes x) Creativity and Innovativeness. xi) Attributes of Product Design 	08
	<p><u>Student Activities :</u> The students in a group of 3 to 4 will perform any one of the following activities (other similar activities to be considered), and write a report as part of term work. Activity (Any Two):</p> <ul style="list-style-type: none"> v) Collecting internal communication forms. vi) Collecting Failure data for automobile / machines / equipments. vii) Study of Hydraulic Circuit of any one system/machine tool like – dumpers, Earth moving equipment, Auto service station. 	12
	Total	70

INDUSTRIAL PROJECT -TW
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633611	Term Work						Credits
	No. of Periods Per Week						
	L	T	P/S	Internal	:	15	02
	—	—	04	External	:	35	

CONTENTS: TERM WORK

<i>Skills to be developed</i>	
Unit -1	<p>Intellectual Skills</p> <ol style="list-style-type: none"> 1. Design the related machine components & mechanism. 2. Convert innovative or creative idea into reality. 3. Understand & interpret drawings & mechanisms 4. Select the viable, feasible & optimum alternative from different alternatives.
Unit -2	<p>Motors skills</p> <ol style="list-style-type: none"> 1. Use of skills learnt in workshop practical. 2. Assemble parts or components to form machine or mechanisms. 3. Classify & analyze the information collected. Implement the solution of problem effectively.
<p>Notes: 1) Project group size: Maximum 4 students. 2) Project report will be of minimum 40 pages unless otherwise specified. 3) Project diary should be maintained by each student.</p>	
<p>Part A-Project</p> <p>A batch of maximum 4 students will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Student is expected to apply the knowledge & skills acquired. Batch may select any one problem/project work from following categories.</p> <ol style="list-style-type: none"> 1. Fabrication of small machine / devices/ test rigs/ material handling devices/ jig & fixtures/ demonstration models, etc. Report involving aspects of drawing, process sheets, costing, Installation, commissioning & testing should be prepared and submitted. 2. Design & fabrication of mechanisms, machines, Devices, etc. Report involving aspects of designing & fabricating should be prepared & submitted. 3. Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots etc. 4. Industry sponsored projects- project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co- guide along with guide from institution. 5. Literature survey based projects:Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments in mechanical or mechatronix field, and should not be a part of diploma curriculum. Report should be of min 60 pages. 6. Investigative projects- Project related with investigations of causes for change in performance or structure of machine or component under different constraints through experimentation and data analysis. 7. Maintenance based projects: The institute may have some machine/ equipment/ system which are lying idle due to lack of maintenance. Students may select the specific machines/equipment/system. Overhaul it, repair it and bring it to working condition. The systematic procedure for maintenance to be followed and the report of the activity be submitted 	

8. Industrial engineering based project: Project based on work study , method study, methods improvement, leading to productivity improvement, data collection, data analysis and data interpretation be undertaken .
9. Low cost automation projects: Project based on hydraulic/pneumatic circuits resulting into low cost automated equipment useful in the identified areas.
10. Innovative/ Creative projects – Projects related with design, develop & implementation of new concept for some identified useful activity using PLC, robotics, non-conventional energy sources, CIM , mechatronics, etc.
11. Environmental management systems projects: Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.
12. Market research/ survey based projects: Projected related with identification of extent of demand, sales forecasting, Comparative study of marketing strategies, Comparative study of channels of distribution, Impact of variables on sales volume, etc. The project involves extensive survey & market research activities information to be collected through various mechanisms/tools & report be prepared.
13. Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.
14. Project can be selected other than the area specified above. Project should provide viable and feasible solution to the problem identified. Report should be of min 50 pages.

Part B- Seminar

Every student will prepare & deliver the seminar. Evaluation of seminar will be carried out by panel of at least three teaching staff from mechanical/ production /automobile department.

15. Selection of topic for the seminar should be finalized in consultation with teacher guide allotted for the batch to which student belongs.
 16. Seminar report should be of min.10 & max. 20 pages & it should be certified by guide teacher and head of the department
 17. for presentation of seminar, following guide lines are expected to be followed:-
 - Time for presentation of seminar: 7 to 10 minutes /student.
 - Time for question/answer : 2 to 3 minutes /student
- c) Evaluation of seminar should be as follows:-
 Presentation: 15 marks
 Use of A. V. aids: 05 marks
 Question /answer: 05 marks Total: 25marks
- d) use of audio visual aids or power point presentation is desirable.
4. Topic of the seminar should not be from diploma curriculum
 5. Seminar can be on project selected by batch.

Text/ Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Project management & team work	Karl Smith	Tata- Mc Graw Hill
Project management	Clifford gray & Erik Lasson	Tata- Mc Graw Hill
Engineering Project management	Nigel J Smith	
Plant Engineers	Dennis Snow	

Magazines:

1. Invention intelligence magazine
2. Popular mechanics Journals/ Magazines

SPECIAL PURPOSE VEHICLES -TW
(AUTOMOBILE ENGINEERING GROUP)

Subject Code 1633612	Term Work			Credits		
	No. of Periods Per Week			Full Marks	:	25
	L	T	P/S	Internal	:	07
	—	—	02	External	:	18

CONTENTS: TERM WORK

Name of Topics		Hrs/week	Marks
Unit -1	<p>Earth Moving Machines – Introduction</p> <p>1.1 General layout, Application & Classification of earth moving machines. Comparison of tyred & crawler tractor.</p> <p>1.2 General Specifications of a typical earth moving machine.</p> <p>1.3 Comparison between general automobile & earth moving machine on following parameters:</p> <ul style="list-style-type: none"> • Traveling Speed • Working conditions • Power output & power variations • Controls • Torque & torque variations. • Steering • Suspension • Fuel & fuel consumption • Hydraulics • Power take offs • Clutch • Brakes • Driving license • RTO registration <p>1.4 Implications of earth moving machines on economy & infrastructure development:</p> <ul style="list-style-type: none"> ○ Next five year plan ○ Role of earth moving machine in road laying, bridge construction, building construction, tunnel, mining & in disaster management. 	10	14
Unit -2	<p>Tractor Dozer</p> <p>2.1 Tractor dozer- types, layout , power train & bucket swing Applications i.e. ripping, blasting Vs ripping)</p> <p>2.2 Rippers – types i.e. hinge & parallelogram, their application & comparison.</p> <p>1.6 Ripper tip selection.</p> <p>1.7 Dozing, & Underwater application.</p> <p>2.5 Dozer blade – types i.e. straight dozer, angle dozer, S’ blade, ‘U’ blade, ‘C’ blade, ‘A’ blade, and their applications.</p> <p>2.6 Track shoe construction & working.</p> <p>2.7 Under carriage maintenance.</p> <p>2.8 Safety precautions for Dozer operations.</p>	07	10
Unit - 3	<p>line (Rope Operated Excavator)</p> <p>3.1 Applications of dragline i.e. excavating channels, ditches, trenches, underwater soil, stripping overburden, shallow grading, general excavation, loading into hoppers, loading hauling units, sloping & grading.(simple sketches only)</p> <p>3.3 Clamshell - application, capacity, bucket, construction & size</p> <p>3.4 Hoe and Cranes - their working & Application.</p>	06	08

Unit -4	Loaders & Excavators: 4.1 Crawler loader – working & attachments i.e. standard bucket, bulk handling bucket, fork lift attachment, crane attachment Stability & safety of crawler loader operations. 4.2 Wheeled loader –types i.e. back hoe & front hoe, working, capacity & output. 4.3 Hydraulic Excavator: Application, block diagram, types of buckets & their applications e.g. 3 in 1 bucket, ejector bucket, square hole bucket, ditch digging bucket, clay bucket and hydraulic grab. 4.4 Scraper: Block diagram, types – Towed & self-propeller, 4.5 Motor Grader – Block diagram, constructions, application, stability & safety, capacity & outputs.	09	14
Unit -5	Tractor: 5.1 Comparison of tractor with an automobile 5.2 Indian tractor industry 5.3 General Layout of a tractor 5.4 Power train & transmission layout of a tractor 5.5 Tractor Power take off its working & construction 5.6 Tractor tyres construction & selection 5.7 Counterweight & its importance 5.8 Types of implements in tractors, its uses & its effect on performance of a tractor 5.9 Power tiller- Comparison with tractors, Various attachments & its applications	09	14
Unit -6	Forklift Truck , tipper & road roller 6.1 Forklift Truck- Types, layout, lifting mechanism, counterweight & steering mechanism. Safety in operation. 6.2 Tipper – Types, construction & working tipping mechanism & maintenance. Safety in operation of tipper. 6.3 Road roller- Types, layout , operation & maintenance.	07	10
	Total	48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Art of earth moving	Jagman Singh	
Tractors and automobile.	Radichev	
Tractors and their power units	Burge	
Earth moving plant	Trucker	
C. D.s: on various Topics of Automobile Engineering By SAE Publisher.		

S.No	List of Assignments/Term Work :-
1	<ul style="list-style-type: none"> • Visit to service center of Tractor or Dozer or Excavator or Fork lift or Road roller. Write report on various mechanisms used, service procedure adopted, cost of equipment and other financial aspects.
2	<ul style="list-style-type: none"> • Visit to a mine/ construction site to observe various operations of Earth Moving Machines. Write a report on the visit.
3	<ul style="list-style-type: none"> • Assignment on specifications and features like hydraulic circuit, control systems of any one earth moving machine,
4	<ul style="list-style-type: none"> • Assignment on specifications and capacities of any one dozer. Draw the sketches of various dozer blades stating their applications.
5	<ul style="list-style-type: none"> • Assignment on applications of any one Rope operated excavator/ fork lift.
6	<ul style="list-style-type: none"> • Assignment on working of crawler loader and its attachments/ road roller types and operations.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN AGRICULTURAL ENGINEERING

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Mechanics of Structure	1611602	04	03	10	20	70	100	28	40	04
3.	Farm Tractor & Non-Conventional Energy	1611603	04	03	10	20	70	100	28	40	03
4.	Post Harvest Technology	1611604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1611605	03	03	10	20	70	100	28	40	03
Elective - (i) Water Resources Management (1611605A)		(ii) Non-Conventional Energy (1611605B)			(iii) Computer Aided Design & Drawing (1611605C)			(iv) Pollution and Environmental Engg. (1611605D)			
Total:- 17						350		500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits	
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject		
					Internal (A)	External (B)				
6.	Farm Tractor & Non-Conventional Energy Lab	1611606	06	03	15	35	50	20	02	
Total:- 06						50				

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits	
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject		
7.	Agricultural Economics & Farm Management -TW	1611607	04	15	35	50	20	02	
8.	Post Harvest Technology -TW	1611608	06	15	35	50	20	02	
9.	Project Work & Its Presentation in Seminar-TW	1611609	Two Week Continuously	30	70	100	40	02	
Total:- 10						200			
Total Periods per week Each of duration One Hours = 33						Total Marks = 750		24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS ; THEORY

	Name of the Topics	Hrs/week	Marks
Unit -1	<p>Overview Of Business</p> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> • Service • Manufacturing • Trade <p>1.2. Industrial sectors Introduction to</p> <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry <p>1.3 Globalization</p> <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	<p>Management Process</p> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	<p>Organizational Management</p> <p>3.1 Organization :-</p> <ul style="list-style-type: none"> • Definition • Steps in organization <p>3.2 Types of organization</p> <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project <p>3.3 Department ation</p> <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control <p>3.4 Forms of ownership</p> <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock 	07	

	<ul style="list-style-type: none"> • Co-operative Society • Govt. Sector 		
Unit - 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel- Training & Development <ul style="list-style-type: none"> • Types of training • Induction • Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow's Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to - <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act 	08	
Unit - 5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets • Production Budget (including Variance Report) • Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to - <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit - 6	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	

Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-		
Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

MECHANICS OF STRUCTURE

Subject Code 1611602	Theory			No of Period in one session : 50			Credits 04
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
				CT	:	20	

RATIONALE:

This subject forms an important part of Mechanical Engineering as well as other engineering branches like Agricultural Engineering and deals with the basic concept of the behavior of material used in machine parts and in practice in different structures. The student will be able to take up design jobs and understand the various properties of materials and behavior under different types of load. In fact, the subject may be considered as the key of the engineering subjects dealing with materials.

Objectives:

The student will be able to

1. Understand the various problems of materials used in machines.
2. Understand and analyze various forces acting on the components of a machine and the resistance offered by these components.
3. Judge the suitability of a particular material in the design.

Contents : Theory		Hrs/week	Marks
Unit -1	<p><u>Principal Stress and Strain</u> 01.01 Normal and tangential stress on oblique planes, resultant stress. 01.02 Principal planes and principal stresses & strain (analytical and graphical solution) simple problems. 01.03 Theory of elastic failure. 01.04 Simple problems.</p>	[05]	[08]
Unit -2	<p><u>Centre of Gravity & Moment of Inertia</u> 02.01 Centre of gravity, centroid and moment of Inertia as T.I. and angle & channel section. 02.02 Definition of moment of Inertia and radius of gyration. Basic theorem of parallel and perpendicular axes. 02.03 Moment of inertia of Rectangular, circular, section about centroidal axis. 02.04 Simple problems</p>	[05]	[08]
Unit -3	<p><u>Bending Stress in Beam</u> 03.01 Theory of simple bending, position of neutral axis. Moment of resistance, Distribution of bending stress across the section. Bending stress in symmetrical and unsymmetrical section, section modulus, flexural strength of a section. 03.02 Shearing stress at a section in a loaded Beam. Distribution of shear stress over rectangular, Triangular, circular, I and T Sections.</p>	[07]	[08]
Unit -4	<p><u>Combined Direct and Bending Stresses</u> 04.01 Concept of Direct and Eccentric Load. 04.02 Symmetrical Column (Rectangular and Circular) with eccentric loading about one axis. Stress distribution at base, Maximum & minimum stress at base. 04.03 The middle third Rule. 04.04 Column & Chimney subjected to horizontal wind pressure. 04.05 Simple problems</p>	[05]	[08]
Unit -5	<p><u>Slope & Deflection of Beam</u> 05.01 Relation between slope, deflection & radius of curvature. 05.02 Slope and deflection calculation for cantilever and simply supported beams subjected to concentrated and uniformly distributed load by double integration and moment area method. Mohr's Theorem. 05.03 Macaulay's method and its application to find deflection at a particular section for beams subjected to point (concentrated) load as well as uniformly distributed load. 05.04 Simple problems.</p>	[07]	[08]

Unit -6	<u>Columns & Struts.</u> 06.01 Concept of columns mode of failure, classification and end conditions. 06.02 Buckling load, crushing load, slenderness Ratio, factors affecting strength of columns. 06.03 Euler's Theory of long column. Determination of buckling and safe loads. Assumptions and limitations of Euler's Theory. Rankine's formula for column. Indian standard code of column (No derivation) 06.04 Simple problems	[05]	[06]
Unit -7	<u>Torsion of Shaft</u> 07.01 Theory of pure torsion. Moment of resistance Torsional equation. Assumption in the theory of pure torsion, Strength of solid and hollow shaft. Polar modulus. 07.02 power transmitted by shaft, stresses in Bolt and key of shaft coupling, shear and torsional resilience. 07.03 Simple problems	[06]	[08]
Unit -8	<u>Spring</u> 08.01 Closed coil helical springs, determination of deflection, angle of twist and stiffness under axial loading and Twisting. 08.02 Carriage spring, determination of central deflection, Number of leaves and Radius of curvature of semi-elliptical and elliptical section of spring. Simple	[05]	[08]
Unit -9	<u>Thin Cylinders and Spheres.</u> 09.01 Failure of a cylindrical shell due to an internal pressure, circumferential and longitudinal stress. 09.02 Change in dimensions, change in volume due to internal pressure of thin cylinder & Thin spherical shell. Simple Problems.	[05]	[08]
Total		50	70

BOOKS RECOMMENDED

Sl No.	Title	Author	Publisher
1	Strength of Material	by Surender Singh	—
2	Strength of Material	by Ramarutham	—
3	Strength of Material	by R.S. Khurmi	—
4	Strength of Material	by R.K. Rajput	—
5	Strength of Material	by D.S. Bedi.	—
6	Mechanics of Strength of Material	by Malhotra & Gupta.	—

FARM TRACTORS AND NON CONVENTIONAL ENERGY

Subject Code 1611603	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

RATIONALE:

A diploma in Agricultural Engineering has to perform his role in farmer's field for modern & scientific agriculture with present farm. Tractors and other non conventional energy source thus for performing these operations. The know how is must.

Objectives:

The present course is designed to develop the ability to perform the farm Tractors & their different systems. The limited conventional energy source will not serve the purpose in time course is designed for non conventional energy source and its utilization. Following are the contents to fulfill the objectives.

Contents : Theory		Hrs/week	Marks
Unit -1	<u>Tractors</u> 01.01 Introduction 01.02 Classification of Tractors and its adoptability 01.03 Selection of tractors, Tractors specifications and specialty 01.04 Tractor loading system	[05]	[08]
Unit -2	<u>Tractors Clutches</u> 02.01 Types of clutches, construction and their working. 02.02 Clutch trouble and its remedies.	[04]	[06]
Unit -3	<u>Tractors Transmission system</u> 03.01 Types of transmission systems and their working. 03.02 Differential, construction and working 03.03 Final Drive 03.04 Power take- off, belt pulley, angle power drive, universal coupling. 03.05 Hydraulic operated internally and externally machinery utilization.	[05]	[08]
Unit -4	<u>Steering systems</u> 04.01 Conventional type and power steering systems. 04.02 Maintenance of steering	[04]	[06]
Unit -5	<u>Brake Systems</u> 05.01 Mechanical, Hydraulic, Air and power brake	[04]	[06]
Unit -6	<u>Hitching systems</u> 06.01 Principles of vertical and horizontal hitching. 06.02 Hitching adjustment 06.03 Draw Bar and Draw Bar horse power calculations	[04]	[08]
Unit -7	<u>Traction and Traction Aids</u> 07.01 Traction, Tractive effort, slip 07.02 Dead load ballast, Liquid ballast 07.03 Chain and Griddles 07.04 I and L type strake 07.05 Rolling Resistance and Traction efficiency	[04]	[08]

Unit -8	<u>Automotive Technology (Theory)</u> 08.01 Past, present & future trends in Automotive Technology – Diesel & Gasoline. 08.01.1 Engines, classification of different engines & adaptability. 08.01.2 IC Engines, Combustion chamber design, Types & application. 08.01.3 Automotive exhaust emission – constituents (Diesel & Gasoline). 08.01.4 Emission norms under MV ACE, Euro Norms & Bharat Stage Norms. 08.01.5 Diagnostics & Test equipments – Engine Analysis, Emission Analyzer, ECU Scan tool, compression tester. 08.02 Diesel & Gasoline Technology. 08.02.1 Introduction, Diesel fuel layout & Components, Gasoline fuel layout & components. 08.02.2 Diesel fuel components – function, working principle, testing, calibration, timing, construction, components & trouble shooting, add on modules. 08.02.3 Gasoline fuel components – function, working principles, testing, calibration, construction, components & trouble shooting. 08.02.4 Diagnostics & Test equipments – Diesel fuel injection pump test bench. Injector tester (Diesel), Nozzle cleaner, Petrol injector cleaner cum tester. Test specification. 08.03. Energy Systems. 08.03.1 Introduction, coverage, trends. 08.03.2 Starter – function, construction, working principle, components, types, output, testing & trouble shooting. 08.03.3 Alternator – function, construction, working principle, components, types, output, testing & trouble shooting. 08.03.4 Energy storage (batteries) – function, construction, working principal, types, JIS/DIN code Specifications, charging	[10]	[10]
Unit -9	<u>Non-conventional energy source.</u> 09.01 Utilization of wind, solar and other non-conventional energy source in agricultural different processes.	[10]	[10]
Total		50	70

REFERENCE BOOKS:-

SI No.	Title
1	Solar Energy Utilization by G.D. Rai, Khanna Publishers
2	Solar Energy by S.P. Sukhtme Tata McGraw Hill
3	Farm Gas Engine and Tractors by Johns Fred R. Tata McGraw Hill.
4	Tractors and Their power Units by Ligidial & J.E. Coketem. John Willy & Sons.
5	Tractor Engine Maintenance and Repair by H.C. Jain & C.R. Rai, Standard Publisher Distributors New Delhi.
6	Automotive Handbook by BOSCH.

POST HARVEST TECHNOLOGY

Subject Code 1611604	Theory			No of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

RATIONALE:

An Agricultural Engineering Diploma holder has to involve in processing works after the harvest of the farm product to the final shape; acceptable to the consumer with the help of different processing machines. In the light of modern and scientific agricultural methods of cultivation, modern and mechanized machine operations are essential. Thus, to get the know how of related processing machines, its working and handling is must for quality product. This course is designed to fulfill the objective of maintaining the qualitative and quantitative requirement with the time.

OBJECTIVE:

To bring the farm product in acceptable and nutritive form with the help of post harvest technology economically and efficiently.

SI No.	Topic	Lectures/Periods
01.	Introduction	04
02.	Drying.	05
03.	Cleaning and grading	04
04.	Seed treatment	03
05.	Material Handling	03
06.	Bagging	03
07.	Storage	03
08.	Milling and threshing	03
09.	Rice milling	03
10.	Cane Crushing	03
11.	Fruit preservation	03
12.	Dairy Engineering Process Equipments	05
		Total- 42

Contents : Theory		Hrs/week	Marks
Unit -1	<p><u>Introduction</u></p> <p>01.01 Introduction and importance of seed processing principles of Agricultural processing</p> <p>01.02 Sequences of operations, flow diagram service offered by processor to farmers, wheat, maize, paddy and soybean processing.</p> <p>01.03 Different steps involved in seed processing</p>	[04]	[04]
Unit -2	<p><u>Drying</u></p> <p>02.01 Importance of seed and grain moisture and drying.</p> <p>02.02 Estimation of moisture by direct and indirect method.</p> <p>02.03 Equilibrium moisture contents.</p> <p>02.04 Principles of drying, drying process.</p> <p>02.05 Constant ratio period and falling rate period.</p> <p>02.06 Drying kinds, thin and thick bed drying.</p> <p>02.07.1 Temperature and air flow requirement.</p> <p>02.07.2 Natural air and heated air drying.</p> <p>02.08 Solar drying. Direct and indirect dryer, their efficiency and economy.</p>	[05]	[04]
Unit -3	<p><u>Cleaning and grading</u></p> <p>03.01 Importance and grade factor.</p> <p>03.02 Elementary study of related machines, their operations and maintenance of air screen Machine.</p> <p>03.03 Seed and grain cleaning and grading equipments.</p> <p>03.04 Scalper, Grader and cleaner.</p> <p>03.05 Width and roundness, shape and weight based separator, horizontal separator, disk separator, gravity separator, rotary cleaner their principles of operations and working.</p>	[04]	[06]

Unit -4	<u>Seed Treatment</u> 04.01 Seed treatment and its important and kinds of seed treatment. 04.02 Methods, advantages of treatment. 04.03 Elementary study of seed treating equipments and powdered, slurry seed treater.	[03]	[06]
Unit -5	<u>Material Handling Equipments</u> 05.01 Screw conveyers, belt conveyers. 05.02 Bucket elevator. 05.03 Pneumatic conveyers. 05.04 Construction of different types of conveyers and maintenance.	[03]	[04]
Unit -6	<u>Bagging</u> 06.01 Manual bagging. 06.02 Semi automatic bagging machine. 06.03 Automatic bagging machine.	[03]	[04]
Unit -7	<u>Storage</u> 07.01 Traditional storage system. 07.02 Storage of seeds and grains. 07.03 Grain respiration and factor effecting it. 07.04 Changes in stored product during store from germination and seed viability. 07.05 Design of storage system and equipments, ISI code of practice. 07.06 Storage of fresh fruits vegetables and diary and other farm products	[03]	[06]
Unit -8	<u>Milling and Threshing</u> 08.01 Principles of operation of Dal mills. 08.02 Requirements for optimum milling. 08.03 Milling of animal feeds. 08.04 Treatment for animal feed. 08.05 Milling equipments. Burr grinder and hammer mill. 08.06 Kath Kolhu and power ghani. 08.07 Oil extracting equipment, expeller – horizontal type. 08.08 Chaff cutter and ensilage cutter. 08.09 Threshing equipment, its principles, clearance, adjustment and control.	[03]	[08]
Unit -9	<u>Rice milling, Chura mill & makhana processing</u> 09.01 Elementary study and operation of modern rice milling with line flow diagram, quality control. 09.02 Chura mill and makhana processing unit.	[03]	[08]
Unit -10	<u>Cane crushing and juice extraction.</u> 10.01 Cane crushers, manual, animal and power operated. 10.02 Soybean processing. 10.03 Juice extraction principles and juice extractor, manual and power operated.	[03]	[04]
Unit -11	<u>Fruit Preservation</u> 11.01 Importance of fruit preservation. 11.02 Quality of preservation. 11.03 Fruit processing, preparation of squash, jam, jelly marmled, pickles and other products.	[03]	[08]

Unit -12	<u>Dairy Engineering</u>	[05]	[08]
	12.01.1	Different dairy processes of milk receiving equipments.	
	12.01.2	Milking machine – principles and operations.	
	12.02.1	Pasteurization – its definition and types.	
	12.02.2	Its merits and demerits.	
	12.02.3	Different pasteurization milk flow line diagram.	
	12.03.1	Homogenization – definition and types.	
	12.03.2	Operation of homogenizer.	
	12.04.1	Cream separation principles.	
	12.04.2	Hand operated, power operated cream separator – its working & maintenance.	
	12.05.1	Butter churns principles.	
	12.05.2	Type of butter churns – its construction, working and maintenance.	
	12.05.3	Ice cream preparation -- types and ingredients mild dryer.	
12.06.1	Principles and types of milk dryer.		
12.06.2	Cleaning and sterilizing equipments.		
12.06.3	Adulteration test in milk and milk products.		
12.06.4	Mixing in Vitamin A in milk.		
Total		42	70

Sl No.	Title	Author	Publisher
1	Agricultural process engineering	by S.M. Handerson & R.L. Perry,	John Willey & Sons
2	Principles of agricultural Engineering Vol II	by A.M. Michel & T.P. Ojha	Jain Brothers
3	Dugdh Vigyan	by Bhati and Lavaniya	-
4	Diary Process Engineering	by J.S. Warner	-

ELECTIVE-(ANY ONE) - (i) WATER RESOURCE DEVELOPMENT & MANAGEMENT

Subject Code 1611605A	Theory			No of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

RATIONALE –

A Diploma in Agricultural Engineering has an opportunity to make himself specialized in water resource development field for up to date & complete know-how regarding the most burning problem of Indian Agriculture.

Objective :

To make perfect and acquaint with the up to date technological advancement the present effective curriculum is made to fulfill the objectives.

Sl.No.	Topics	Period
01.	Soil water plant relationship	07
02.	Irrigation	06
03.	Irrigation methods	08
04.	Water resources Development	07
05.	Wells and tube wells	07
06.	Irrigation pumps	<u>07</u>
Total-		42

Contents : Theory		Hrs/week	Marks
Unit -1	<p><u>Irrigation</u></p> <p>01.01. Irrigation, definition & types</p> <p>01.02. Importance of Irrigation in raising crops</p> <p>01.03. Benefits of Irrigation</p> <p>01.04. Water requirements of crops</p> <p>01.05. Quality of irrigation water</p>	[07]	[10]
Unit -2	<p><u>Soil water plant relation</u></p> <p>02.01. Types of agricultural soils</p> <p>02.02. Classes and availability of soil water consumptive use of water</p> <p>02.03. Duty irrigation water, delta and base period</p> <p>02.04. Relation between duty and delta</p> <p>02.05.1. Classification of comm. And area</p> <p>02.05.2. Gross command area.</p> <p>02.05.3. Culturable commanded area.</p> <p>02.05.4. Culturable cultivated area</p> <p>02.05.5. Cultivable & in cultivatable area.</p> <p>02.05.6. Intensity of irrigation</p> <p>02.06.1. Major crops of India (at list of Bihar)</p> <p>02.06.2. Water requirements of major crops</p> <p>02.06.3. Consumptive use of water.</p> <p>02.06.4. Harmful effect of excessive use of water</p>	[06]	[12]

Unit -3	<u>Irrigation methods</u> 03.01.01. Method of irrigation 03.01.02. Surface, sub surface, sprinkler irrigation 03.02.01. Flooding furrow method and contour farming. 03.02.2 Details of sub-surface irrigation. 03.02.3 Details of sprinkler irrigation. 03.02.4 Limitation of the method. 03.03.1 Types of sprinkler systems. 03.03.2 Perforated pipe system. 03.03.3 Based on portability. a. Semi portable. b. Semi permanent system. c. Solid set system. d. Permanent system. 03.03.4 Components of sprinkler system. 03.03.5 Classification of rotating head sprinkler system and their characteristics and adoptability. 03.04.1 Details of the system and its components.	[08]	[12]
Unit -4	<u>Water Resources Development</u> 04.01 Water resources and their development. 04.02 Different resources of water surface and sub-surface. 04.03 Hydrologic cycles. 04.04.1 Resources of water. 04.04.2 Ground water in filtration in rain water. 04.04.3 Porosity. 04.04.4 Water bearing stratum. 04.04.5 Ground water flow, Darcy Law and permeability. 04.04.6 Different source of tapping the ground water such as springs, infiltration gallery, porous pipe gallery, wells, tube wells, collectors well a brief introduction of each	[07]	[12]
Unit -5	<u>Wells and Tube wells</u> 05.01 Irrigation wells. 05.02 Different types of wells. Introduction of different types and classification. 05.03 Method of construction of tube well. 05.03.1 Boring method. 05.03.2 Hand boring and water jet boring method. 05.03.3 Percussion method or cable tool method. 05.03.4 Hydraulic rotary method. 05.03.5 Rivers rotary method. 05.04.1 Well assembly. 05.04.2 Development of well. 05.04.3 Sequence of operation. 05.04.4 Discharge equation of wells from unconfined strata. 05.04.5 Discharge equation of wells from confined strata. 05.05.1 Cavity wells. Introduction and method of construction. 05.05.2 Causes of failure of cavity wells and their probable remedy.	[07]	[12]

Unit -6	<u>Irrigation Pumps</u>	[07]	[12]
	06.01 Irrigation Pump.		
	06.02 Low head lift pump.		
	06.03 Medium head lift pump.		
	06.04 High head water lift.		
	06.05 Wind power and water power lift pump.		
	06.05.1 Wind mill.		
	06.05.2 Positive displacement pump.		
	06.06.1 Animal powered reciprocating type pump.		
	06.06.2 Variable displacement pump.		
	(i) Specific speed.		
	(ii) Pump characteristics.		
	(iii) Terminology.		
	(iv) Effect of speed and impellor diameter on pump.		
	06.07 Centrifugal and its classification.		
	06.08 Priming.		
	06.09.1 Centrifugal pump horizontal type.		
	06.09.2 Vertical type, end closed coupled or unibuilt.		
	06.10 Medium lift submersible centrifugal pump with hydraulic drive.		
	06.10.1 Installation of horizontal centrifugal pump.		
06.10.2 Electrical connection of pumps.			
06.10.3 Maintenance operation and trouble shooting of centrifugal pump.			
06.11.1 Vertical turbine pump and its construction.			
06.11.2 Pump drives, direct drives, belt drive, right angled gear drive.			
06.11.3 Installation of vertical turbine pumps.			
06.11.4 Operation maintenance and trouble shooting of the vertical turbine pumps.			
06.12.1 Submersible pumps and its construction and operation.			
06.12.2 Installation and maintenance of submersible pumps.			
	Total	42	70

Text Books

1. Irrigation Engineering and Water Power by B. C Punamia, Standard Publishers Distributors, New Delhi.
2. Irrigation by A.M Michel, Vikas Publishers.
3. Tube well and pumps by A.M Michel, Water Technology Centre IARI, New Delhi.
4. Irrigation Engineering by S.K Garg.

ELECTIVE-(ANY ONE) - (ii) NON CONVENTIONAL ENERGY

Subject Code 1611605B	Theory			No of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

RATIONALE:

Energy is an important input in all sectors of any country's economy. The standard of living of a given country can be directly related to per capita energy consumption. The population of the world has increased rapidly and standard of living of human being has increased hence Energy crisis occurs. If present trend continues, the world in the year 2000 A.D will be more crowded than that of today. The conventional source of energy are depleting and may be exhausted by the end of the century or beginning of the next century. Nuclear energy requires skilled technicians and poses the safety as regards to radioactive waste disposal. Solar energy and other non-conventional energy sources are the sources, those are to be utilize in future.

Objectives:

The objective of the course content is to provide knowledge of different types of conventional & non – conventional sources of energy.

The Student will be able to

- * Understand the importance of non – conventional energy in domestic Agriculture as well as industrial sector.
- * Understand the conversion of these energy in to useful work.
- * Understand the conservation of energy in different field by using improved equipments.

Contents : Theory		Hrs/week	Marks
Unit -1	<p><u>An introduction to Non Conventional Energy Sources.</u></p> <p>01.01 Classification of Energy Sources (Conventional & Non Conventional)</p> <p>01.02 Availability, Comparison and limitations</p> <p>01.03 World Energy futures</p> <p>01.04 Renewable energy Sources – Solar energy, wind energy, Biomass energy, Tidal Geothermal energy, OTEC, MHD Power, Mini & Micro Hydro Plant. Its prospects in India</p>	[07]	[08]
Unit -2	<p><u>Solar Energy</u></p> <p>01.01 Solar constant</p> <p>01.02 Solar Radiation concept</p> <p>01.03 Solar Radiation Geometry</p> <p>01.04 Solar Radiation measurements</p>	[04]	[08]
Unit -3	<p><u>Solar Energy Collectors.</u></p> <p>03.01 Principles of the conversion of solar radiation in to Heat.</p> <p>03.02 Flat-Plate Collectors & its efficiency.</p> <p>03.03 Concentrating Collector (Focusing Type)</p> <p>03.04 Advantages and Disadvantages of concentrating collector over flat- plate collectors.</p>	[04]	[08]
Unit -4	<p><u>Solar Energy Storage</u></p> <p>04.01 Introduction to solar energy storage system.</p> <p>04.02 Solar pond- its principle of operation & extraction of thermal energy.</p> <p>04.03 Application of solar ponds.</p>	[04]	[08]

Unit -5	<u>Application of Solar Energy</u> 05.01 Introduction 05.02 Solar photo – voltaic system 05.03 Solar Cell & its principle 05.04 Solar cell Modules 05.05 Solar cell connecting arrangements 05.06 Application of solar Photovoltaic system (Agricultural & Industrial) 05.07 Advantages and Disadvantages of Photovoltaic solar Energy conversion. 05.08 Solar distillation, Solar pumping, Solar furnace, Solar cooking, solar green house & its types.	[04]	[08]
Unit -6	<u>Wind Energy.</u> 06.01 Wind map of India & potentials of wind power in India 06.02 Wind speed, wind power, wind vanes. 06.03 Site selection considerations. 06.04 Basic components of WECS (Wind Energy Conversion System) 06.05 Classification of WECS system. 06.06 Advantages & Disadvantages of WECS 06.07 Types of wind – machine (Wind Energy Collectors) 06.08 Application of wind energy	[04]	[10]
Unit -7	<u>Energy from Biomass</u> 07.01 Introduction 07.02 Biogas conversion Technologies (Thermo chemical Conversion & Fermentation) 07.03 Biogas Generation 07.04 Factors affecting Bio-digestion or Generation of gas. 07.05 Classification of Biogas plants. 07.06 Types of Biogas plants. 07.07 Commonly used Biogas plants in India. 07.08 Community Bio gas plants 07.09 Materials used for Bio gas Generation. 07.10 Selection of sites for a Bio gas plants. 07.11 Problems related to Bio gas plants.	[07]	[10]
Unit -8	<u>Energy Conservation</u> 08.01 An economic Concept of Energy. 08.02 Principles and need of conservation of energy. 08.03 Energy demand Management. 08.04 Energy Accounting & Auditing	[08]	[10]
Total		42	70

BOOKS RECOMMENDED:-

Sl No.	Title	Author	Publisher
1	Non – Conventional Energy Sources	by G.D. Rai	Khanna Publisher.
2	पारम्परिक उर्जा स्रोत	द्वारा ए० एन० माथूर और एन० एल० राठौर	हिर्मोशू प्रकाशक।
3	Ref Book – Solar Engineering & Thermal Process	by John A duffie & William	A Backman, Willey Inter
4	Solar Energy	by G.D.Rai	Khanna Publisher
5	Manual of Wind Mill – Institute of Engg. And Rural Technology, Allahabad		
6	Gobar Gas Plant	by Khadivillage	commission
7	Bio gas technology (A practical hand book)	by K.C. Khandewall	
8	Advances in Biogas Technology	by O.P. Chwela.	
9	Solar energy utilization	by B.P. Sukhtma T.M.H.	
10	Different Publication of Tata Energy Research Institute N. Delhi		

ELECTIVE-(ANY ONE) - (iii) COMPUTER AIDED DESIGN & DRAWING

Subject Code 1611605C	Theory			No of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
				CT	:	20	

RATIONALE & OBJECTIVES: -

Today, all the workplace and living environment are being computerized. Every nook and corner computer the requirement of the computer knows how is must. In order to prepare Diploma Engineers to work in those environments, it is essential that they are exposed to various aspects of graphics package such as understanding the concept of CAD and its drafting application particularly in Engineering Diploma courses. Operating a computer with good working knowledge in computer aided design and its application form the broad competency profile of Diploma holders. This exposure will definitely enable the student to enter the world with confidence, live in these environments in harmonious way and contribute to the productivity.

Sl.No.	TOPIC	PERIODS
01.	Introduction to Designing and draughting Package	03
02.	Understanding AUTOCAD and its commands	03
03.	Basic Drawing Techniques	04
04.	Accuracy and Speed	02
05.	Advanced Drawing Commands	02
06.	Isometric Drawings	02
07.	Pseudo – 3D Drawings	03
08.	Text and Units	02
09.	Editing Techniques	02
10.	Working with Layers	02
11.	Block and Xrefs.	02
12.	Dimensioning	02
13.	3D- Drawing	03
14.	Wire frame Construction	03
15.	3D Faces	02
16.	Working with Paper Space	02
17.	Plan and Elevation of Buildings- Single Story & Multistory	03
Total		42

Contents : Theory		Hrs/week	Marks
Unit -1	<p><u>INTRODUCTION TO DESIGN AND DRAUGHTING PACKAGE</u></p> <p>Traditional Draughting Techniques. Auto Cad Draughting techniques. Starting and finishing AUTOCAD. Startup Dialogue Box. The Drawing Units The Electronic Paper Size Drawing Screen Menu and Toolbars</p>	[03]	[04]
Unit -2	<p><u>UNDERSTANDING AUTOCAD AND ITS COMMANDS</u></p> <p>Starting command, Toolbar icon, flyout Toolbar, Menu command- Pull down, Keyboard, Command Prompt – Working through line, circle, Area, erase, zoom, break etc. Editing commands- Fillet, donut, Offset, Extending, Trimming, Move, Text, Dim, Hatch, Drag, Copy, Paste, Trim, etc.</p>	[03]	[04]

Unit -3	<u>BASIC DRAWING TECHNIQUES</u> Drawing a Line. Drawing a Circle. Moving an Object. Using Grid and Snap. Drafting setting – Snap & Grid. Snapping to objects- the Toolbar. Running Objects – the Toolbar. Running Object Snap Tools.	[04]	[04]
Unit -4	<u>ACCURACY AND SPEED</u> Opening and existing drawing. Using Co-ordinate input Using the Zoom Toolbar. Aerial View. The Purge Command. Grips – the little blue boxes. System Variables.	[02]	[04]
Unit -5	<u>ADVANCED DRAWING COMMAND</u> Ray- Construction Line or Xline. Polylines – Polyline shapes. Rectangles 3D Polylines and Rectangles Donuts, Splines, Ellipses, Arcs, How to Draw a Door Arc. Multilines- editing, creating multiline styles, Modify Multiline Properties. Polygons.	[02]	[04]
Unit -6	<u>ISOMETRIC DRAWING</u> Not really 2D Drawing. Thickness – the Z dimension. Using Hide- the Drawing/Editing Commands. Elevation & Thickness, Thickness limitations.	[02]	[04]
Unit -7	<u>PSEUDO -3D DRAWING</u> Not really 2D Drawing. Thickness – the Z dimension. Using Hide- the Drawing/Editing Commands. Elevation & Thickness, Thickness limitations	[03]	[04]
Unit -8	<u>TEXT AND UNITS</u> Single Line Text, Paragraph Text. Multiline Text Editor, the Spell Checker. Editing Text- Text size and Plotting/ Printing. Controlling the Drawing Units.	[02]	[04]
Unit -9	<u>EDITING TECHNIQUES</u> Offset, Rotate, Stretch, Lengthen, Trim, Extend, Chamfer	[02]	[04]
Unit -10	<u>WORKING WITH LAYERS</u> Layers – setting up a new layer. Assigning a colour to a layer. Making a layer current, visible or invisible. Line types- load a line type, By Layer, By Object. Moving Objects to different Layers. Scaling Line types- Lt Scale.	[02]	[04]
Unit -11	<u>BLOCKS AND XREFS.</u> Blocks and Layers – Making, Inserting, Using in any Drawing. External References – Xrefs. Application and Values of Xrefs.	[02]	[04]
Unit -12	<u>DIMENSIONING</u> The Dimension. The Dimensioning Toolbar. Linear Dimensioning- Object, Snap & Dimensioning Aligned Dimensioning. Radius & Diameter.	[02]	[04]

Unit -13	<u>3D DRAWING.</u> The 3D Drawing – The coordinate Plane, WCS Icon. The UCSICON command – Orientation of the UCS. The X-Y Plane and Origin. The UCS- moving up to Z axis, Naming a UCS, Rotating the UCS around X axis & Y axis, Looking at a UCS from behind – using View ports. Editing Objects on a UCS – using 3 Points to define a UCS, The UCS command.	[03]	[05]
Unit -14	<u>WIREFRAME CONSTRUCTION</u> Laying the base- using layers. Placing Text on a Plane- using Vports.	[03]	[04]
Unit -15	<u>3D FACES</u> 3D Faces – placing 3D faces on the wire frame. Visible 3D Face Edges, Invisible Edges. Drawing a Window, making edges visible/invisible.	[02]	[04]
Unit -16	<u>WORKING WITH PAPER SPACE</u> Use of Paper space- default layout, the default layout page anatomy. Scaling the drawing – method 1, method 2. Working with paper space view ports – deleting & creating, freezing individual viewports.	[02]	[04]
Unit -17	<u>PLAN AND ELEVATION OF BUILDINGS – SINGLE STORY AND MULTISTORY.</u>	[03]	[05]
Total		42	70

BOOKS RECOMMENDED

Sl No.	Title	Author	Publisher
1	AUTOCAD	by George Omura & B. Robert Callori.	BPB Publication.
2	AUTOCAD	by Whelan,	Dreamtech Publication.
3	Principle of CAD/CAM	by Rooney & Philip	Sybex Publication.

ELECTIVE-(ANY ONE) - (iv) POLLUTION AND ENVIRONMENTAL ENGINEERING

Subject Code 1611605D	Theory			No of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

RATIONALE: With the increasing population the cost of our natural resources are being polluted day by day our existence depends upon the natural (resources) with time the general awareness is necessary.

Objectives: With the view to control the pollution to reduce the pollution of natural resources the present course contents is structure for fulfillment of objective used on scientific technological concepts:

Sl.No.	Topics	Periods
01	Pollution	02
02	Air pollution	10
03	Water pollution	03
04	Radio active pollution	03
05	Land pollution	03
06	Noise pollution	03
07	Water supply and treatment	08
08	Safe sewage disposal & treatment	10
Total		42

Contents : Theory		Hrs/week	Marks
Unit -1	<u>Pollution</u> 01.01 Introduction of pollution & Definition. 01.02 Types of pollution	[02]	[04]
Unit -2	<u>Air Pollution</u> 02.01 Introduction and Definition of pollution. 02.02 Type of Air pollution, sources of Air pollution, measurement of Air pollutes. 02.03 Effect of pollution on man, animals, plants and properly global effect. 02.04 Mycological factors effecting air pollution criteria of Air pollution method of abaliment and control of pollution. 02.05 Air pollution control, zoning dilution in plant modification of process and rand material. Removal of plummets and disposal particular matter setting chamber cyclones. Scrubbers bog falter, electrostatic precipitators. 02.06 Removal of gassers pollutions adsorption, absorption and incorruption. 02.07 Smoke sources, effecting measurement and control Air pollution standard historical cases and pleads, elements of air conditioning.	[10]	[12]
Unit -3	<u>Water pollution</u> 03.01 Introduction, Definition, Properties of healthy water. 03.02 Types of water impurities, source of water pollutant its effect of water pollution. 03.03 Water pollution control	[03]	[10]
Unit -4	<u>Radio Active pollution:</u> 04.01 Introduction, Radio Active pollution. 04.02 Radio active radiation, man-made radiation & its effects	[03]	[07]
Unit -5	<u>Land pollution</u> 05.01 Introduction, Definition. 05.02 Soil erosion, soil conservation	[03]	[06]
Unit -6	<u>Noise pollution:</u> 06.01 Introduction, Definition. 06.02 Noise pollution control.	[03]	[07]

Unit -7	Water supply and treatment 07.01.1 Importance of water quality and its purpose of treatment. 07.01.2 Basic principle of water and waste water treatment unit General aspects of treatment typical flow diagrams. 07.02.1 Purpose and different units of treatment, types of screen sedimentation, the array of sedimentation plan and coagulated. 07.02.2 Coagulation principles and coagulants, filtration theory slow, Rapid and presser filters, filter trouble. 07.02.3 By chlorination, detention method effect of chlorination, super chlorination and dechlorination, pre and past chlorination. 07.02.4 Water softening & removal process of temporary and permanent hardness.	[08]	[12]
Unit -8	Safe sewage disposal & treatment 08.01.1 Sewage, disposal, general aspect of sewage handling pollutional effect. 08.02.2 Methods of disposal, detention method conditions favorable for dilution methods effects on stream. 08.02.3 Self purification stream oxygen balance lend suitability of land treatment sewage forming sewage sickness periods. 08.03.1 Sewage treatment and its objectives. 08.03.2 Preliminary treatment. 08.03.3 Primary treatment. 08.03.4 Secondary treatment. 08.03.5 Final treatment for reuse typical flow diagrams sewage treatment plant layout.	[10]	[12]
Total		42	70

BOOKS:

Sl No.	Title	Author	Publisher
1	Air pollution	by Pirkernen.	-
2	Air pollution	by Theings.	-
3	Air pollution	by Ocaford.	-
4	Air pollution hand book	by Hokden & Audaly	-
5	Fundamental of Air pollution	by Stermelat.	-
6	Water supply by Rub	-	Rub-Academic Press
7	Sanitary supply	by S.K. Garg	-
8	Waste water treatment	-	-
9	Water supply and sanitary Engg.	By G.S. Praise die.	-

FARM TRACTORS AND NON CONVENTIONAL ENERGY LAB

Subject Code 1611606	Practical			No of Period in one session : 84			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

RATIONALE:

An agricultural Engineering Diploma holder has to operate the different machines and machinery by different power sources. The tractor is the most suitable power source for multipurpose operation of field or farm machinery. To perform the job with Quality and with good efficiency. The theoretical as well as practical know-how is must with time meeting the limited source of conventional energy its alternate energy non conventional energy source with latest technology and its know how is also very essential for these students.

Contents : Practical

Minimum ten experiments are to be completed by the students:-		Hrs/week	Marks
Unit -1	Familiarization of different controls on tractors and indicators and its operation.	[02]	
Unit -2	Tractors driving practice, first without implements and after that with secondary tillage reversing in turnings.	[10]	
Unit -3	Tractor driving practice with primary tillage implements.	[10]	
Unit -4	Notching of trailer and trolley reversing in turning.	[06]	
Unit -5	Trouble shooting remedies, adjustments, maintenance and repair of tractor systems clutch, gear box, brake, electrical system, steering system, hydraulic system.	[02]	
Unit -6	Servicing the tractor in the job.	[02]	
Unit -7	Identification of all the engine and tractor parts.	[02]	
Unit -8	Identification of all the tools and instruments needs for service and repair work.	[02]	
Unit -9	Estimation of per hour running cost of tractor without and with load.	[02]	
Unit -10	Servicing of the hydraulic system of the tractor.	[02]	
Unit -11	Study of the fabrication, quality controls, installation of a wind mill pumping unit after the suitability of its site selection.	[02]	
Unit -12	Study of the fabrication, quality control, installation of a solar street light system.	[02]	
Unit -13	Study of KVIC Bio gas plant system from fabrication, installation and working &	[02]	
Unit -14	Dismantling, assembling of 5 HP diesel engine pump set.	[02]	
Unit -15	Study of KVIC Bio gas plant system from fabrication, installation and working & maintenance.	[02]	
Unit -16	Study of tractor travel reduction traction, efficiency, coefficient of traction, rolling resistance, pull drawbar, efficiency and traction aids and their use in tractor in different condition.	[02]	
Unit -17	Operation of seed drill by the tractor.	[02]	
Unit -18	<u>Automotive Technology.</u> 18.1 Dismantling & assembling if fuel injection pump. 18.2 Dismantling & assembling of injections. 18.3 Testing of fuel injection pump on the test bench. 18.4 Clean test & reset injector opening presence of diesel fuel injector. 18.5 Identification of all the components of FIP & injector. 18.6 Dismantling & assembling of Alternator. 18.7 Dismantling & assembling of starter motor. 18.8 Identification of all the parts of Alternator and starter motor. 18.9 Testing of Alternator & starter motor on the Auto Electrical test bench. 18.10 Testing of all A E components. 18.11 Adaptability & testing of Battery & alternator on a tractor. 18.12 Setting of special timing of fuel injection pump fitted in a tractor. 18.13 Measure the pollutants in exhaust emission of a tractor under idling condition. 18.14 Check the engine for serviceability using a compression tester. 18.15 Cleaning & testing of petrol injector on a petrol injector cleaner & tester.	[30]	
Total		84	

AGRICULTURAL ECONOMICS & FARM MANAGEMENT-TW

Subject Code 1611607	Term Work			No of Period in one session : 50			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Rationale

The aim of the subject is to educate the students about the economic management of Agricultural operation and their appropriate use.

Objective

The course is designed with following objectives

- To develop skill about setting up their own new small business as enterprises for economic games.
 - To develop skill about to manage the enterprises and makes his/her business profitable by his/her Intelligence.
- At least four exercises are to be completed.

Contents : Term Work		Hrs/week	Marks
Unit -1	Study of small scale Industries-its growth and significance.	[08]	
Unit -2	Study of planning and preparation of project report.	[08]	
Unit -3	Study about costs and returns on a 10 hectare mix farm-its illustration	[08]	
Unit -4	Study of about 20 hectare dairy farm-its illustration through suitable example.	[08]	
Unit -5	Study of grain farming programme on a 4 hectare farm-its illustration though suitable example.	[08]	
Unit -6	Study about costs and returns (a 20 years planning span) on mango plantation-its illustration through suitable example.	[10]	
Total		50	

Text Books:-

Sl. No.	Name of Book	Writer's Name	Publisher's Name
01.	Farm Management-An Introduction to Economic Analysis	S.P Dhondyal	Achal Prakashan Mandir, Parmat, Kanpur
02.	Industrial Management and Entrepreneurship Development	S.Bhatnagar & C. Jain	New Bharat Prakashan Merrut- 250001
03.	Fundamentals of farm business Management	S.S Johl & T.R. Kapur	Kalyain Publishers New Delhi.

POST HARVEST TECHNOLOGY-TW

Subject Code 1611608	Term Work			No of Period in one session : 84			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	06	External	:	35	

RATIONALE:

Farm products are generally not in acceptable for the consumer until they are processed up to the acceptable form. They are available in season only but their availability have to maintain through out the year in different preserved farms as well choiced farm. For these various techniques, machines are involved. An agricultural Engineering diploma student has to be become more perfect through practical sessional aspect so that he can be able to perform the job more confidently.

Objectives:

The present curriculum is framed in such a way so that student becomes expert in this profession. The following contents are covered for fulfill meant of objectives.

At least ten exercises are to be done.

Contents : Term Work		Hrs/week	Marks
Unit-1	Study and operation of Air screen cleaner and other cleaning Equipments.	[03]	
Unit-2	Study and operation of Heated Air dryers.	[03]	
Unit-3	Study and operation of screw conveyors, bucket elevators and belt conveyors.	[03]	
Unit-4	Study and operation of slurry seed Treaters and power mixtures.	[03]	
Unit-5	Study of dal milling Equipment.	[03]	
Unit-6	Study of modern rice mill.	[03]	
Unit-7	Study of storage. (Cold storage)	[02]	
Unit-8	Study of dairy plant.	[03]	
Unit-9	Study of processing and storage plant.	[03]	
Unit-10	Manufacture of butter and ghee.	[08]	
Unit-11	Manufacture of ice cream.	[06]	
Unit-12	Determination of specific gravity of milk.	[06]	
Unit-13	Determination of fat percentage of milk.	[06]	
Unit-14	Manufacture of orange squash and tomato ketchup.	[10]	
Unit-15	Manufacture of Jam, Jelley & pickle, technique of presentation	[10]	
Unit-16	Study of makhana processing.	[04]	
Unit-17	Study of chura processing mill.	[04]	
Unit-18	Study of tea processing.	[04]	
Total		84	

BOOKS RECOMMENDED.

- 1 Agricultural process engineering by S.M. Handerson & R.L. Perry, John Willey & Sons.
2. Principles of agricultural Engineesring Vol II by A.M. Michel & T.P. Ojha, Jain Brothers
3. Dugdh Vigyan by Bhati and Lavaniya
4. Diary Process Engineering by J.S. Warner

PROJECT WORK AND ITS PRESENTATION IN SEMINAR - TW

Subject Code 1611609	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	30	
	—	—	Two Weeks Continuously	External	:	70	

RATIONALE:

Projects are intended to provide students of Agricultural Engg. Diploma with and ability to tackle new problem with inquisitiveness. The project work is included in the course to develop skill to plan, organize, survey, investigation, collect relevant data, analysis of data and take appropriate decision in the students.

OBJECTIVES: The course is designed with following objectives.

- Plan
- Organise
- Survey
- Investigation
- Collect relevant data
- Analysis of problem and data
- Taking decision
- Preparation of project or technical report
- Present the report before seminar.

S.I No Topics

01. Project planning and preparation of report.
02. Project work
03. Presentation of project work before a seminar

Contents : Term Work		Hrs/week	Marks
Unit-1	Project planning and preparation of report 01.1 Selection of project. 01.1.1 Objective of project report. 01.1.2 Need of preliminary project report 01.2 Scheduling the Activities involved in project selection. 01.3 Model format of project report 01.4 Preparation of action plan for implementation. 01.5 Preparation of project Report.		
Unit-2	Project Work At least two project work should be completed by the students. 02.1 Innovative technology based landscape and gardening project in a big infrastructure company. 02.2 Innovative technology need analysis based community development project. 02.3 New technology based design and construction of machinery project on post harvest technology. 02.4 New technology based design and construction of machinery project on farm and land development. 02.5 Innovative technology based irrigation project (Dam project, canal project/ tube well project etc). 02.6 Preparation of design plan based on the soil and water conservation measures project with economic analysis. 02.7 Farm power and non-conventional energy based innovative projects. 02.8 Topic based on innovative technique, assigned project as given by respective guide/guides.		
Unit-3	Presentation of project work before seminar		
Total			70

BOOKS RECOMMENDED

1. Entrepreneurship by M.K. Jain; Deepak Prakashan, Delhi, Chennai, Kanpur, Bhopal.
2. Hand book on project appraisal and follow up by D.P. Sarda.
3. Farm Management by S.P. Dhondyal; Achal Prakashan Mandir, Kanpur.

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Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP
(Effective from Session 2016-17 Batch)
THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Architectural Design & Drawing -II	1637601	04	03	10	20	70	100	28	40	03
2.	RCC & Steel Structure Design	1637602	04	03	10	20	70	100	28	40	03
3.	Professional Practice & Byelaws	1637603	03	03	10	20	70	100	28	40	03
4.	Acoustics & Illumination	1637604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1637605	03	03	10	20	70	100	28	40	03
(i) Landscape Design (1637605A)				(ii) Architectural Conservation (1637605B)				(iii) Building Maintenance (1637605C)			
Total:- 17							350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits	
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject		
					Internal (A)	External (B)				
6.	Architectural Design & Drawing Lab	1637606	06	04	15	35	50	20	03	
7.	Model Making Lab.-III	1637607	06	04	15	35	50	20	02	
Total:- 12							100			

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits	
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject		
8.	Architectural Design & Drawing -TW	1637608	04	15	35	50	20	02	
9.	Project Work & Presentation in Seminar -TW	1637609	-	30	70	100	40	02	
Total:- 04							150		
Total Periods per week Each of duration one Hours = 33							Total Marks = 750	24	

ARCHITECTURAL DESIGN & DRAWING - II

Subject Code 1637601	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale & Objective:

Ability to assist the Architect in preparation of building plan Elevation and Section, Independently able to handle project of Residential, Commercial and Institutional level.

Contents :Theory

Name of the Topic :-		Hrs/week	Marks
Unit-1	1. Preparation of Simple Residential building design (according to By-laws) of G+2. Apartment block [2 Sheets]	20	20
Unit-2	2. Building byelaws, FAR, Setbacks, Height Restriction, Key plan and site plan of a project. Development of a site plan of a School etc.[2 Sheets]	20	20
Unit-3.	3. Building byelaws, FAR, Setbacks, Height Restriction, Key plan and site plan of a project. Development of a site plan of a Hospitals and Commercial Building[2 Sheets]	20	30
Total-		60	70

R.C.C. & STEEL STRUCTURE DESIGN

Subject Code 1637602	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
				CT	:	20	

Rational:- Knowledge of RCC and Steel structure in Building.

Objective:- able to understand RCC & Steel structure.

Contents :Theory

Name of the Topic		Hrs/week	Marks
UNIT-1	<p><u>INTRODUCTION OF LOAD AND STRESS IN RCC STRUCTURE</u></p> <p>Dead load, Live load and Wind Load Stress for Structure</p> <p>Methods of Design of RCC section by limit –state methods, Stress –Strain ,Relation for RCC , Steel and Concrete</p>	05	05
UNIT-2	<p><u>INTRODUCTION TO BUILDING MOMENT AND SHEER STORE:-</u></p>		
01.01	Design R.C.C. Column, Beam, and Slabs, Shear fore, building moment	08	09
01.02	One Way and Two Way slab. (IS Code method)	08	09
01.03	Basic Idea of Pre cost Concrete. Advantage of Pre cost concrete.	08	09
01.04	Design of R.C.C. stairs. Design of dog leg stairs, Reinforcement detail,	08	
01.05	Brief idea of earthquake resistant buildings. Shear wall concept. (Design Based on IS 456 :2000 code book)	03	03
01.06	Basic idea of Steel structure Design – Material property of steel. Ductility, Behavior of steel in cyclic loading. Different types of steel structural system. Steel sections, Hollow tubular steel section. Rivet and welding. Types of connection. Ref. of code- IS 800 (1984)	20	35
Total		60	70

PROFESSIONAL PRACTICE & BYE-LAWS

Subject Code 1637603	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	10	
				:	20		

Rational: Knowledge of Bye Laws set by development Authority.

Objective: To be acquaintance with office norms.

Contents :Theory

Name of the Topic		Hrs/week	Marks
UNIT-1	<u>TENDER AND QUOTATION:</u>	20	20
	01.01 Definition, invitation of tender classification of tender. Tender document. Earnest money, Security money. Retention amount, Mobilization fund. Opening of tender. Rejection of lowest tender, rejection of all tender. Identical tender. Quotation – definition.		
UNIT-2	<u>CONTRACT:</u>	20	20
	02.01 Definition of tem contract. Contract document. Types of contract.		
	02.02 Condition of Contract: Concept. Condition of contract retention money. Time limit and its importance. Compensation for delay. Extension of time limit. Defect liability period, liquidated damages, extra items. Escalation of cost, sub-letting and arbitration. Termination of contract. Certificate and payments- interim certificate, certificate of virtual completion, penultimate certificate and final certificate.		
	02.03 Duties and liabilities of Professionals: Duties and liabilities of Architectural Assistant. Relationship of employee with employer. Office environment and work ethics. Office and its management, structure of an architects office.		
UNIT-3	<u>NEED OF BUILDING BYE-LAWS FACTOR INVOLVING PLANNING OF BYE-LAWS:</u>	20	30
	03.01 Light and Ventilation – requirement of a building. Healthy open space requirement. Setbacks. Floor area, carpet area, built up area, super built up area.		
	03.02 Mass – Height restrictions of a building. Light plane.		
	03.03 Open Space - Plot coverage, need for open space.		
	03.04 Skyline – Skyline of a city.		
	03.05 Aesthetics – Aesthetics of street, Landscaping of site, Urban design construction.		
	03.06 Set-Backs – Front set back, Rear set back, Side set back. Bye laws of Regional Development Authority. - Height Restriction Far and Study of National Building Code.		
Total		60	70

ACOUSTICS & ILLUMINATION

Subject Code 1637604	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rational:- To understand the acoustical nature of building and lighting aspect.

Objective:- able to design the building where acoustic treatment is required and lighting aspect of building

Contents :Theory

Name of the Topic			Hrs/week	Marks
UNIT-1	01.01	Introduction to Architectural acoustics-characteristics and measurement of sound, frequency, intensity, timbre, auditory range, effects of sound on human, loudness.	10	11
	01.02	Accoustics and acoustical environment, behavior of sound in an enclosed space, Accoustic defects such as echo and reverberation, reverberation time calculation.	05	06
	01.03	Absorption of sound ,Absorbent materials, Type of absorbent material-accoustics plaster, hairfall,acoustics tiles,different types of Boards and plywoods,carpets mats etc.	05	06
	01.04	Design of an Auditorium,cinema hall and music studios considering – size, shape,sitting arrangement,acoustical,correction design and modification studio.	05	06
	01.05	Planning and design against outdoor noise and indoor noise.Planning and Design of residential office,Hospital,educational and industrial Building considering noise and recommendation to reduce them	05	06
	01.06	Noise and its effects,noise mapping,types of noise,transmission of noise,transmission loss,acceptance noise level,sound insulation,structure and airborne noise and their absorption.	05	06
	01.07	Definition of light,light power,light flux,light intensity,law of illumination,application of law of illumination	05	06
	01.08	Artificial sources of light ,lamps and their characteristics,Incandescent lamp,Fuorescent lamp,Neon lamp and LED lamp	05	06
	01.09	Application of Lighting and illumination in Architecture	02	02

01.10	Sources of Electricity,Electricity generation,Basic Electrical Distribution System,Substation Transformer,Overhead line,Three Phase Supply,Electrical Distribution in campus	05	06
01.11	Domestic Wiring System,Material,Classification,Merits and Demerits,Electrical Accessories, Symbols and representation in Architectural Layout Drawings,Single line wiring Diagram,Safety Aspects,Protection of building against lightening,NBC recommendations,Earthing,Short circuit and overloading	05	06
01.12	Preparation of electrical layout of simple residential and public building-office/Shop	03	03
Total		60	70

ELECTIVE- (Any One) -(i) LANDSCAPE DESIGNS

Subject Code 1637605A	Theory			No of Period in one session : 60			Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rational:- To get additional knowledge to gain skill

Objective:- additional skill of landscape conservation and Building Maintenance.

Contents :Theory

Name of the Topic		Hrs/week	Marks
UNIT-1	<p>Natural Elements of Landscape Rock, Water, Vegetation, Plant Types, plant types, characteristics and colours</p> <p>Man made Elements of Landscape Garden furniture, lighting fixtures, Signage function, paving materials, artificial rocks and Plants, Climate and their role in landscape design, Modern garden –Rock garden, terrace garden, Chinese garden –indoor garden</p>	10	11
UNIT-2	01.01 Plants (Trees, Shrubs ground covers flowering species.	20	26
	01.02 Water – Use of water in landscape design – Mughal garden. Use of water as cooling element, fountain, water cascade, water channel. Musical fountain, light, water and music.		
	01.03 Forms and Stones- Stone Sculpture, Stone paving, benches.		
	01.04 Artificial Stones – Stone cladding		
	01.05 Principle of Landscape design with respect to architecture functions. (Use of trees as sunshade device) Greenery for aesthetics.	10	11
	01.06 Relationship of Landscape and climate. Micro climate		
	01.07 Practical exercises:-		
	(i) Landscape design of an out door area with use an existing or group of buildings- 2 sheets.	10	11
	(ii) Landscapes of architecture design project students are working currently- 25 heads.	10	11
Total		60	70

ELECTIVE - (Any One) -(ii) ARCHITECTURAL CONSERVATION

Subject Code 1637605B	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	10	
					:	20	

Rational: To get additional knowledge to gain skill

Objective: additional skill of architectural conservation and Building Maintenance.

Contents :Theory

Name of the Topic		Hrs/week	Marks
UNIT-1	Heritage and Culture – (Criteria for a building to become a heritage building)ASI – Archaeological Survey of India	15	17
UNIT-2	World heritage sites- UNESCO, Natural and Cultural Heritage, World heritage sites in India.	10	12
UNIT-3	Basic Conservation Techniques – Preservation of heritage building, conservative surgery.	10	12
UNIT-4	Adaptively Re-Use of heritage buildings – Havelis converted to heritage hotel. Rajashtan case study.	15	17
UNIT-5	Case Study –Nalanda University ,Taj Mahal	10	12
Total		60	70

ELECTIVE- (Any One) -(iii) BUILDING MAINTENANCE

Subject Code 1637605C	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rational:- To get additional knowledge to gain skill

Objective:- additional skill of Building Maintenance.

Contents :Theory

Name of the Topic		Hrs/week	Marks
UNIT-1	Principles of Building Maintenance of its economic Constructors.	10	11
UNIT-2	Identifying the Sources of problems in interiors and exteriors of building.	10	11
UNIT-3	Causes of dampness and remedies for removing dampness.	10	11
UNIT-4	Defects and repair in roofs./ Water proofing, leakage, dampness	10	11
UNIT-5	Common defects and their repair in buildings.	05	07
UNIT-6	Surfaced finishes defects and repairs.	05	08
UNIT-7	Maintenance of water supply and drainage systems.	10	11
Total		60	70

ARCHITECTURAL DESIGN & DRAWING LAB-II

Subject Code 1637606	Practical						Credits
	No. of Periods Per Week			Full Marks			:
				ESE			:
	L	T	P/S	Internal			:
	—	—	06	External			:
						50	03
						50	
						15	
						35	

Contents : Practical

List of Practical		Hrs/week	Marks
Unit-1	Planning of Higher Secondary School. Development of Elevation and Section of Building	30	25
Unit-2	Key plan and site plan. (Two Projects related to design)	30	25
total-		60	50

MODEL MAKING LAB - III

Subject Code 1637607	Practical			No of Period in one session : 60			Credits 02	
	No. of Periods Per Week			Full Marks		:		50
	L	T	P/S	ESE		:		50
	—	—	06	Internal		:		15
				External		:	35	

Rational:- to make 3-D Model

Objective:- gain skill in model making

Contents: Practical

List of Practical - Any Two		Hrs/week	Marks
Unit-1	- Model of a simple G+2 building using Mount Board.	20	15
Unit-2	- Model of a commercial G+4 building using Mount board, thermocol etc. Development of Site on a model.	20	15
Unit-3	- Model of a commercial Hospital /Institution building	20	20
Total		60	50

ARCHITECTURAL DESIGN & DRAWING -TW

Subject Code 1637608	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	50	02
	L	T	P/S	Internal	:	15	
—	—	04	External	:	35		

Contents :Term Work

List of Term Work		hrs/week	Marks
Unit-1	Planning of Higher Secondary School. Development of Elevation and Section of Building	30	25
Unit-2	Key plan and site plan. (Two Projects related to design)	30	25
Total-		60	50

PROJECT WORK & PRESENTATION IN SEMINAR -TW

Subject Code 1637609	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	Internal	:	30	
	—	—	—	External	:	70	

**Rati
onal**

: to gain speaking skill and presentation drawing.

Objective: to get idea of presentation drawing.

. Contents :Term Work

Project :-	Hrs/week	Marks
Complete project of a Building, Showing plan, Elevation, Section using power point. Site plan and key plan. Use of bye-laws of Regional Development authority. Presentation drawing	4 weeks	100

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN COSTUME DESIGN & GARMENT TECHNOLOGY
(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	EXAMINATION – SCHEME							Credits
				Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Apparel Merchandising	1642602	03	03	10	20	70	100	28	40	03
3.	Finishing of Fabric & Garments	1642603	03	03	10	20	70	100	28	40	03
4.	Computer Aided Garment Design	1642604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1642605A/ 1642605B	03	03	10	20	70	100	28	40	03
Elective- (i) Fashion Communication (1642605A)					(ii) Knitting Technology(1642605B)						
Total:- 15							350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	EXAMINATION – SCHEME				Credits
					Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	
					Internal (A)	External (B)			
6.	Finishing of Fabric & Garments Lab.	1642606	06	03	15	35	50	20	01
7.	Recycling of Waste Fabrics Lab	1642607	06	03	15	35	50	20	02
Total:- 12							100		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	EXAMINATION – SCHEME				Credits	
				Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject		
8.	Garment Representation Methods -TW	1642608	06	15	35	50	20	03	
09.	Project Work & Its Presentation in Seminar-TW	1642609	4 weeks continuous	30	70	100	40	03	
Total:- 06							150		
Total Periods per week Each of duration One Hours = 33							Total Marks = 750	24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory			No of Period in one session : 48			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Unit	CONTENT : Theory	Hrs/week	Marks
Unit -1	Overview of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W. Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit – 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentatin <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Propriotership 	07	

	<ul style="list-style-type: none"> • Partnership • Joint stock • Co-operative Society • Govt. Sector 		
Unit – 4	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel– Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow’s Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to –</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act 	08	
Unit – 5	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to –</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit – 6	<p>Materials Management</p> <p>6.1. Inventory Management (No Numerical)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	

Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality, concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-		
Name of Authors	Titles of the Book	Name of the Publishes
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E. Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

APPAREL MERCHANDISING

Subject Code 1642602	Theory			No. of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

RATIONALE: After completing this course students may be employed in marketing of garments operations as well. So, they need to possess the competency of retail marketing and documentation. This course has been designed so that students may develop the skills to undertake retail marketing, export business and merchandising of apparels. The competency that can be developed through this subject is equally important for wage employment as well as self-employment.

Objectives: Students will be able to:

- i. Select the type of retail merchandisers according to need.
- ii. Select new products based on information from market research agencies.
- iii. Market the garments taking the help of the merchandising services.
- iv. Assist in export of garments using the knowledge of export process and payment procedures.
- v. Prepare the necessary documentations to help exporter.
- vi. Identify suitable markets using the information of export policies of the country and import policies of other countries.

UNIT	CONTENTS : Theory	Hrs/ Week	Marks
Unit-1	<p>Merchandising and Merchandising Services</p> <p>1.1 Types of retail merchandise: peddlers, general merchandise stores, chain departmental stores (through franchise process), mail order sellers, boutiques</p> <p>1.2 Importance of advertisement in apparel industry.</p> <p>1.3 Types of advertisement – newspaper, magazines, leaf-let, brochures, catalogues, folders, charts, posters, diary, calendars, road hoardings, vehicle hoardings, banner, radio, T.V., Internet.</p> <p>1.4 Merchandising Services: Current market information, Buyer clinics, Central merchandising, Group purchases, Order placement and follow – up, Private label program, Sales promotion services, Colour brochures and mailers, Operations and research services (Market research, Information exchange), Personal Services, Recruitment Service, Overseas Services.</p>	11	22
Unit-2	<p>Apparel Market Research Agencies</p> <p>2.1 Market Research Agencies: Trade associations and trade shows; Retail buyers groups, Fashion shows, Fashion bulletins, Retail conventions.</p>	03	08
Unit-3	<p>Export Process and Payment Procedures</p> <p>3.1 Export process: Identifying the market (Desk Research), market approach– generating inquiries, SWOT analysis, quotations and negotiation.</p> <p>3.2 Payment Options and procedures: Letter of Credit, Cash against document or D/P (document against payment), D/A (Document on acceptance), Advance Payment, Exchange Control Regulations.</p>	06	12
Unit-4	<p>Documentation for Export</p> <p>4.1 Commercial Documents: Performa invoice, Commercial invoice, Packing list, Shipping instructions, Intimation for inspection, Certificate of inspection or quality control, Insurance declaration, Certificate of insurance, Shipping order, Mate’s Receipt, Bill of lading / combined transport document, Application for Certificate of Origin, Certificate of Origin, Bill of exchange, Advice of shipment, Letter of the bank for the collection / Negotiation of document.</p> <p>4.2 Regulatory Documents: Gate–pass one/ Gate pass two, AR- 4 / 44 Forms, Shipping Bill / Bill of Export, Export application / dock challan / port trust copy of shipping bill, Receipt for payment of port charges, Vehicle ticket, Reserve Control declaration /GRPP Forms, Freight payment certificate, Insurance premium payment certificate.</p> <p>4.3 Certifications: Inspection and Statutory requirement.</p>	12	14

	4.4 International trade agreements: WTO and Bilateral Agreements. 4.5 Export Pricing.		
Unit-5	Export Policies 5.1 Government Policies for export: Sales Tax, Octroi - Claimant refund of octroi where already paid, 'N' Form procedure, Export promotion form procedure, Central Excise. 5.2 Export Incentives: Duty drawback, International Price, Market development Assistance, Income tax, Advance license, Special Import license, 100 EOU / FTZEPZ, Export Promotion Capital goods Scheme. 5.3 Role of AEPC in boosting export: Channelizing Exports, Channels of Distribution.	10	14
	Total	42	70

List of Recommended Books

Sr. No.	Title	Author	Publication
1	Fashion from Concept to Consumer	Frings Gini Stephens	PHI Learning, New Delhi latest edition
2	Fashion and Retail Merchandising	Stone Elaine, Samples J.A.	McGraw-Hill, New Delhi, latest edition
3	Inside the Fashion Business	Dickerson Kitty G.	PHI Learning, latest edition New Delhi
4	Inside the Fashion Business	Jarnow & Jeanette	Macmillan, New Delhi, latest edition
5	Fashion Merchandising	Stone Elaine	McGraw-Hill, New Delhi, latest edition
6	Garment Exports - Winning Strategies	Koshy Darlie O.	PHI Learning, New Delhi latest edition
7	Export-Import Theory, Practices, and Procedures	Belay Seyoum	Routledge

FINISHING OF FABRIC AND GARMENTS

Subject Code 1642603	Theory			No. of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale: To impart knowledge of different finishing methods and techniques used for fabric and garment finishing which can be further applied to enhance the appearance and aesthetic value.

Objectives: The student will be able to:

1. Understand various mechanical and chemical finishes on fabrics and garments.
2. Identify and apply different wash down effects on denims and non-denims
3. Understand working of finishing machinery for fabrics and garments.

UNIT	CONTENTS :Theory	Hrs/ Week	Marks
Unit-1	Introduction to Mechanical Finishing 1.1 Introduction to finishing 1.2 Objects of finishing treatments 1.3 Classification of finishes 1.4 Objective and working principle of calendaring m/c 1.5 Mechanical finishing: decatizing, sanforising, compacting, heat setting, crabbing and sueding.	06	10
Unit-2	Chemical finishing and their application methods 2.1 Concept of exhaustion application, pad application, percent expression, wet pick up, spraying technique 2.2 Softeners: mechanism, types of softeners, properties of cationic non-ionic and silicone softeners 2.3 Resin finishing: Mechanism formulation of pad liquor for resin finishing, concept of pre cure and post cure method, wash n wear and durable press finishing. 2.4 Objective and end uses of flame retardant finish, antimicrobial finish, water repellent finish, scroopy finish, tin weighing of silk.	10	18
Unit-3	Finishing of Garments 3.1 Denim finishing: process sequence, stone wash, enzyme wash, acid wash. Advantages and limitations of all washing treatments 3.2 Stone less stone wash effects: concept of bio-polishing 3.3 Study of mud wash, chalk wash, ion wash treatments and their advantages and limitations 3.4 Concept of puckering effect, sand blasting effect and whiskering treatments	10	18
Unit-4	Machines for Garment Finishing 4.1 Principle and working procedure of garment dyeing machine, washing machine, tumble dryer, curing cabinets, pressing machine, fusing machine, hydro extractor, ironing table 4.2 Electric/steam pressing, brushing mannequins, spray booth systems.	08	14
Unit-5	Stain Removers and Specialty Finishes 5.1 Types of stain & appropriate stain removing agent, techniques for stain removal 5.2 Concept of Nano finish, UV protection finish, fragrance finish	08	10
Total		42	70

List of Recommended Books

Sr. No.	Title	Author	Publication
1	Textile Finishing	J. T. Marsh	B.I. Publications, Delhi, 1986
2	Textile Finishing	Nalankilli	Digital Impressions, 288-N, Salem, Main Road, Komarapalayam, 638 183 (T.N.), 1998
3	Challenges & opportunities in garment processing.	AATCC	AATCC. 1998
4	Fabric Care	Dsouza N.	New age International, New Delhi.

COMPUTER AIDED GARMENT DESIGN (CAGD)

Subject Code 1642604	Theory			No of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

RATIONALE: This course will provide the skill in pattern making on computer through CAD software. Student will develop skills in digitization of pattern. CAD software will also provide the opportunity to use various patterns making tools for modification of the pattern and presenting stylization of the pattern. This subject will help the students to generate and modify skirt, trouser and shirt pattern as per the need of fashion industry. It will also develop skills in students related to pattern grading and marker planning on computer using CAD software.

Objectives: The student will be able to:

5. Create and modify patterns using Auto CAD and CAD software as per requirement.

ii. Carry out pattern grading and marker planning using CAD software.

UNIT	CONTENTS : Theory	Hrs/ Week	Marks
Unit-1	<p>Introduction of apparel CAD system</p> <p>1.1 Hardware requirement.</p> <p>1.2 Comparison of Manual Pattern Making and pattern making using CAD software.</p> <p>1.3 Introduction of cad software</p> <p style="padding-left: 20px;">1.3.1 Screen layout</p> <p style="padding-left: 20px;">1.3.2 Tools bar</p> <p style="padding-left: 20px;">1.3.3 Menu bar</p> <p style="padding-left: 20px;">1.3.4 File menu</p> <p>1.4 Digitizing of Manual Patterns for Basic Bodice, Trouser etc.</p> <p style="padding-left: 20px;">1.4.1 Digitisation tools</p> <p>1.5 Introduction of Basic drawing & drafting tools</p> <p style="padding-left: 20px;">1.5.1 Unit</p> <p style="padding-left: 20px;">1.5.2 Scale</p> <p style="padding-left: 20px;">1.5.3 Rectangle</p> <p style="padding-left: 20px;">1.5.4 Line</p> <p style="padding-left: 20px;">1.5.5 Curve</p> <p style="padding-left: 20px;">1.5.6 Points</p> <p>1.6 Introduction of commands for Pattern creation & Drafting</p> <p style="padding-left: 20px;">1.6.1 Line & points menu</p> <p style="padding-left: 20px;">1.6.2 Drafting menu</p> <p style="padding-left: 20px;">1.6.3 Editing tools menu</p> <p>Assignment: Basic Bodice, Skirt, shirt Trouser)</p>	10	18
Unit-2	<p>Pattern Modification and stylization</p> <p>2.1 Pattern Modification tools</p> <p>2.2 Modification Menu</p> <p style="padding-left: 20px;">2.2.1 Reshape</p> <p style="padding-left: 20px;">2.2.2 Erase</p> <p style="padding-left: 20px;">2.2.3 Shrinkage</p> <p style="padding-left: 20px;">2.2.4 Move</p> <p style="padding-left: 20px;">2.2.5 Pins</p> <p style="padding-left: 20px;">2.2.6 Stretch</p> <p style="padding-left: 20px;">2.2.7 Extend</p> <p style="padding-left: 20px;">2.2.8 Curve length</p> <p style="padding-left: 20px;">2.2.9 Modification of curve</p> <p style="padding-left: 20px;">2.2.10 Modification of line</p> <p style="padding-left: 20px;">2.2.11 Modification of Shape</p> <p>2.3 Pattern stylization tools</p> <p style="padding-left: 20px;">2.3.1 Notch</p> <p style="padding-left: 20px;">2.3.2 Dart</p> <p style="padding-left: 20px;">2.3.3 Princes line</p> <p style="padding-left: 20px;">2.3.4 Seam allowances</p>	10	20

	<p>2.3.5 Seam & cut 2.3.6 Pivoting dart 2.4 Cut & join tools for pattern stylization 2.4.1 Horizontal & vertical 2.4.2 Cut by shape 2.4.3 Cut by angle 2.4.4 Symmetric 2.4.5 Join by two points etc. 2.4.6 Creation of fusing, facing etc.</p> <p>Analysis of the pattern in terms of accuracy.</p> <p>Assignment stylization of pattern</p>		
Unit-3	<p>Introduction of Grading 3.1 Grading tools (Creating grading size table & apply grading value based on grading rules.)</p> <p>Assignment : application of grading tools in Garment like skirt, trouser , basic bodice and shirt</p>	07	10
Unit-4	<p>Measuring tools 4.1 Presentation of Garment and Measurement analysis.</p>	05	07
Unit-5	<p>Introduction of marker planning 5.1 Marker Making style & Fabric for Marker planning 5.2 Preparation for Lay planning 5.2.1 Blocking and buffering of pieces 5.2.2 Rotation and tilting 5.2.3 Alteration 5.2.4 Matching of pieces in stripes and checks etc. 5.3 Cut order planning Sizes, lay length and ratio as per the table length. 5.4 Automatic marker planning 5.5 Exploration of the commands with assignment (Marker Planning for formal Trouser, shirt etc.)</p>	10	15
Unit-6	<p>Study of Apparel Industry 6.1 History of apparel Industry and Organizational charts 6.2 Major steps in garment production 6.2.1 Pre adoption steps: (i) Line planning and consumer research, (ii) Concept development, (iii) Quick costing, (iv) Patten development, (v) Preparing samples for various purposes, (vi) Line reviews – check on check 6.2.2 Post adoption steps: (i) Styling and fit perfection, (ii) Creation of production pattern, (iii) Gradation, (iv) Production marker development, (v) Final costing, (vi) Ware Housing, (vii) Merchandising – Role of Merchandisers.</p>	06	10
	Total	42	70

List of Recommended Books

Sr. No.	Title	Author	Publication
1	Metric pattern cutting for Menswear	Winfred Aldrich	Blackwell Science
2	How to draft Basic Pattern	Kopp Rolfo, Zelin& Gross	Fairchild Books
3	CAD for Apparel Industry	Gerru Cookin	-
4	Lectra & Tuka tech Manual /PDF files		

ELECTIVE - (Any One) - (i) FASHION COMMUNICATION

Subject Code 1642605A	Theory			No. of Period in one session : 42			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale: Fashion communication forms the core of the whole business of fashion. The subject will impart knowledge about study of purposes, procedures, methods and techniques used in various fashion promotional activities, Journalism and special events. Fashion communication students emerge as dynamic professionals qualified to offer the most effective, most creative and financially viable communication solutions for the fashion and lifestyle industry.

Objectives:

- i. To impart students the skill / knowledge of thought to text translation.
- ii. Exposure to promotion and purchases of fashion products through photography, film, digital media, advertising and journalism.

UNIT	CONTENTS :Theory	Hrs/Week	MARKS
UNIT -1	History & nuances of Industry survey of Industry 20 th Century costumes product analysis.	06	10
UNIT -2	Writing & reporting skills, Media & culture, writing for the mass media, print writing & reporting, print journalism, Media ethics.	06	10
UNIT -3	Fashion Journalism: Reporting, editing fashion trends, fashion shows, promotion of special events.	06	10
UNIT -4	Fashion photography Digital photography Graphic design, Broadcast production, Fashion advertising & copyrighting. Fashion vocabulary.	07	10
UNIT -5	Visual Merchandising & Display, store planning PR-writing, publicity.	06	10
UNIT -6	Promotional strategies in fashion communication field's current issues in Global fashion Industries Study of typical fashion designer & their style, statement & impact.	06	10
UNIT -7	PoS and consumer behavior (online consumer).	05	10
TOTAL		42	70

List of Recommended Books

Sr. No.	Title	Author	Publication
1	Fashion as Communication. vol 7	Malcolur Barnard Rout	ASQC, Quality Press , USA8, 1992
2	Fashion	Lehnert Gertrud	1991
3	History of fashions	Distolese, Rosana	1990

ELECTIVE - (Any One) - (ii) KNITTING TECHNOLOGY

Subject Code 1642605 B	Theory			No of Period in one session : 42			Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	10	
				:	20		

Rationale: Knitted fabrics due to its stretchable and favourable properties are in good demand and it is expected to rise day by day. Knitted fabrics find uses for under garments, sportswear, summer and winter dresses, etc. to large extent. Knitting is a major part of costume. Hosiery Garments cannot be imagined without knitting. This sector is now diversifying into synthetics, domestic fabric, carpets, technical and geotextiles.

Objectives: The student will be able to:

- i. Understand Warp & Weft knitting machine.
- ii. Identify different knitted structures.
- iii. Understand pattern cutting & sewing of knitted garments.

UNIT	CONTENTS :Theory	Hrs/ Week	MARKS
UNIT-1	Basic Concept of Knitting 1.1 Introduction, Definition of warp and weft knitting, knitting needles, Various ways of fabric manufacture, Reasons for the growth of knitting, Comparison of knitting with weaving. 1.2 Definition of basic terms in knitting (Course, Wales, Stitch Length, Needle Loop, Face Loop, Back loop, Course Length) 1.3 Hand knitting to machine knitting. 1.4 Classification of knitted fabrics and knitting machines.	05	10
UNIT-2	Weft Knitting 2.1 Single jersey machine 2.1.1 Circular weft knitting: Introduction, different parts, mechanism and their function. Different zones in circular weft knitting (creel, knitting, take- up zone). 2.1.2 Single jersey fabric: Structure, Loop Diagram, Knitting cycle for single jersey machine, Characteristic features of single jersey fabric. 2.2 Weft knitting Machines-double jersey: Types of double jersey fabric (Rib, Interlock, Purl). Details of Rib, Interlock and Purl knitting machine (Structure, loop diagram, machine features, Needle arrangement, trick arrangement, knitting cycle, principle of needle transfer). Characteristic of Rib, interlock & purl fabrics. 2.3 Weft knitted fabrics-design aspects: Basic structure of weft knitted fabrics; Different types of stitches and its effects; Representation of stitches on point paper; Concept of design, needle order and cam order. 2.4 Weft knitting – Jacquard & advanced knitting: Need of jacquard, Concept of Relanit technique, stripper, plush (pile) fabric, fleecy fabric, Stitch length and its importance. 2.5 Weft knitting – Quality and calculations: Weft knit fabric Defects, Causes & Remedies; Tests for weft knit Quality; Production calculations.	20	35
UNIT-3	Warp Knitting 3.1 Warp knitting – Introduction, Loop structure of warp knit fabric, comparison between warp & weft knitting, Elements of warp knitting. 3.2 Raschel machine: Passage of yarn through knitting machine, Knitting cycle for warp knit fabric. 3.3 Flat Bed knitting: Introduction, Types and classification, Knitting elements, Yarn path in flat knitting machine, Knitting cycle.	10	15
UNIT-4	Knit Wear Technology - Only related to knitted Garment Construction 4.1 Pattern making, block pattern 4.2 Fabric spreading 4.3 Cutting of fabric – objects & methods 4.4 Production of sample garment 4.5 Fitting problems & correction for patterns with and without darts 4.6 Study of Planning, drawing and reproduction of the knit garment.	07	10
Total		42	70

List of Recommended Books

Sr. No.	Title	Author	Publication
1	Knitting Technology	David Spencer	Woodhead Publishing - UK. 1996
2	Introduction to clothing manufacture	Terry Cooklin	Om book Services, New-Delhi. 1999
3	The Tech. of clothing Manufacture	Harold carr & Barbara Lathan	Blackwell Science, Ltd. UK. 1997
4	Warp knit engineering.	A Reisfeld	Blackwell Science Ltd. UK. 1996
5	Warp knitting production	S. Raj	Varlag mellinadtext Heidelberg GMBH. 1995
6	Warp knitting Technology	D. F. Paling	Columbine Press Ltd, Manchester. 1998
7	Knitting Technology	D. B. Ajgaonkar	Universal Publishir Mumbai. 1998
8	Knitting Technology	Iyer & Mervinger	Om book Services New-Delhi. 2000

FINISHING OF FABRIC & GARMENTS LAB

Subject Code 1642606	Practical			No of Period in one session : 50			Credits 01
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Sr. No.	CONTENTS : Practical
1	Identification of different stains on garments & their removal.
2	Permanent press finishing of Cotton & Synthetic garment.
3	Application of different types of softeners on Cotton garments.
4	Application of Stiffeners on cotton, synthetic garments & their evaluation.
5	Soil release finishing of synthetic fabrics & its evaluation.
6	Water repellent finishing of Cotton fabrics & its evaluation.
7	Antimicrobial finishing of cotton, woolen and worsted garments.
8	Bio polishing treatment on cotton garments.
9	Stone wash effect on cotton garments.
10	Acid wash effect on cotton garments.

RECYCLING OF WASTE FABRICS LAB

Subject Code 1642607	Practical			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Rationale: The course will provide the brief knowledge about recycling of fabric. The course will help to enhance the ability of creativity and innovation. It helps to generate the new things for different purpose useful/decorative or gift items.

Objectives: The student will be able to:

- Develop new bi-products from waste materials
- Able to design and generate the useful/decorative items.

Sr. No.	CONTENTS : Practical
1	Identify and separation of cutting according to. i) Size wise ii) Color wise. iii) Quality wise.
2	Make at least two items of wall hanging with pocket to use as supporting tools to keep small things in it.
3	Make a rug with strips of small long cloths
4	Make a circular/ Square/ Triangular/Shaped decorative items based on ikkat art/ Pipili art of odisha.
5	Make decorative Flowers for both purposes flower vase and ornaments of dress/ Clip/ hair band/ belts etc.
6	Make pin and needle Cushion normal Small cushion to use very small pieces as a filling items.
7	Small birds cartons to decorate the door/entrance

GARMENT REPRESENTATION METHODS -TW

Subject Code 1642608	Term Work			No of Period in one session : 56			Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	Internal			
	—	—	06	External			
			:	50			
			:	15			
			:	35			

RATIONALE: This subject focuses on imparting the knowhow of illustrating clothing and clothing details for industrial and presentation purposes. The course forms proficiency in drawing and detailing garments on human figures. The focus of the subject is on development of skills in the student for representing garment on human body and designing for industry purpose.

Objectives: The student will be able to:

- i. Draw and detail garments for given human figures.

UNIT	CONTENTS : Term Work	Hours/Week	MARKS
UNIT -1	Represent garments with details on the croqui- one each Menswear, women's wear, kids wear. Minimum 15 drawings.	16	
UNIT -2	Perform media exploration for rendering in different mediums; Minimum 10 drawings.	16	
UNIT -3	Prepare flat drawings and specification - 3 sets' Men's, Women's and kids.	16	
UNIT -4	Compile and present 1 ensemble/ Illustration of the ensemble, flat drawing, specification sheet, measurement sheet, embellishment sheet.	08	
TOTAL		56	

PROJECT WORK & ITS PRESENTATION IN SEMINAR -TW

Subject Code 1642609	Term Work			No of Period in one session :			Credits 03	
	No. of Periods Per Week			Full Marks		:		100
	L	T	P/S	Internal		:		30
	—	—	4 Weeks continuous	External		:		70

Rationale: The project work and seminar is an important subject for diploma students. This course is designed to help students in developing their self confidence. The students are expected to take up any subject related to costume design and garment technology and study it in detail and make a presentation on their plan of action. This will also develop skill in report writing to analyse design, estimating and costing, deciding a process, etc.

Objectives: The students will be able to:

1. Select a topic/problem concerned with the branch.
2. Analyse the problem.
3. Develop logical approach to solution of the problem.
4. Design a product.
5. Make estimation of materials, operation and calculate cost of the product.
6. Manufacture/fabricate the product in the workshop.
7. Test the product.
8. Prepare a project report.
9. Present in the form of a seminar.

Contents : Term Work

		<u>GROUP – A: PROJECT WORK</u>	Hrs/week	Marks
UNIT-1	<u>LIVE PROBLEMS CONCERNED WITH THE BRANCH/INDUSTRIES</u>			
	01.01	Selection of problem		
	01.02	Situation of problem		
	01.03	Analysis of problem		
	01.04	Analysis of situation		
	01.05	Identification of probating remedial means		
	01.06	Selection of best remedial measures		
	01.07	Sustainers for the problems to recurs		
	01.08	Preparation of report and		
	01.09	Presentation in Seminar		
		The Report is to be presented and evaluated in the form of Seminar.		
		<u>GROUP – B: SEMINAR</u>		
UNIT-2	One Project out of the following:			
	1.	On Market Research/ Survey		
	2.	Comparative Study of Product/ Processes		
	3.	Trends in Fashion/garment design		
	4.	Live Industrial Problems and their problem solution(s)		
5.	Design and manufacture a garment and present in a form of fashion show.			
UNIT-3	Suggestive topics:			
	1.	Manual Power in production		
	2.	Role of Women Entrepreneurship in Business		
	3.	Impact of Window display on sales promotion		
	4.	Motivation in an organization		
	5.	Payment of wages – ways and importance		
6.	Layout of a garment factory			
		Total		

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN CERAMIC ENGINEERING

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Glass Technology-II	1613602	04	03	10	20	70	100	28	40	03
3.	Modern and Electronic Ceramics	1613603	04	03	10	20	70	100	28	40	03
4.	Monolithics and steel Plant Refractories	1613604	04	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1613605	04	03	10	20	70	100	28	40	03
Elective-(i) Modern Refractory Technology (1613605A)				(ii) Modern Furnace Technology (1613605B)				(iii) Instrumentation and Automatic Process Control (1613605C)			
Total:- 19							350		500		

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits	
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)		Pass Marks in the Subject
					Internal (A)	External (B)			
6.	Ceramic Engineering Workshop Practice – IV (Glass & Enamel)	1613606	06	04	15	35	50	20	03
Total:- 06							50		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits	
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject		
7.	Ceramic Application Workshop - TW	1613607	04	15	35	50	20	02	
8.	Elective Lab. (Any One) -TW	1613608	04	15	35	50	20	02	
Elective- (i) Modern Refractory Technology (1613608A) -TW			(ii) Modern Furnace Technology (1613608B) -TW			(iii) Instrumentation and Automatic Process Control (1613608C) -TW			
9.	Project Work & Its Presentation in Seminar- TW	1613609	-	30	70	100	40	02	
Total:- 08							200		
Total Periods per week Each of duration one Hours = 33							Total Marks = 750		24

MANAGEMENT (COMMON)

Subject Code 1600601	Theory			Credits		
	No. of Periods Per Week			Full Marks		
	L	T	P/S	ESE	:	100
	03	—	—	TA	:	10
	—	—	—	CT	:	20

CONTENTS ; THEORY

Unit -1	Name of the Topics	Hrs/week	Marks
Unit -1	<p><u>Overview Of Business</u></p> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> • Service • Manufacturing • Trade <p>1.2. Industrial sectors Introduction to</p> <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Ceramic Industry • Agro industry <p>1.3 Globalization</p> <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	<p><u>Management Process</u></p> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	<p><u>Organizational Management</u></p> <p>3.1 Organization :-</p> <ul style="list-style-type: none"> • Definition • Steps in organization <p>3.2 Types of organization</p> <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project <p>3.3 Departmentatin</p> <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control <p>3.4 Forms of ownership</p> <ul style="list-style-type: none"> • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

Unit - 4	<u>Human Resource Management</u> 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel- Training & Development <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow's Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to – <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act	08	
Unit - 5	<u>Financial Management</u> 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to – <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit - 6	<u>Materials Management</u> 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	

Unit - 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-		
Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

GLASS TECHNOLOGY - II

Subject Code 1613602	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
				CT	:	20	

RATIONALE:

Glass is Ceramic Engineering based product which is made by using Silica as the main raw material putting it with other materials such as soda ash, feldspar etc. in a Glass making furnace and subjecting it to be melted as Glass. It is used as various products such as glass tumbler, sheet glass, bangles, optical glass, ophthalmic glass, and safety glass etc.

OBJECTIVE:

The Objective is to know about:

01. Properties and Testing of Glass products and Raw Materials..
02. Plant and Machinery.
03. Glass Manufacture and Decoration.
05. Special Glasses.
06. Defects of Glass.

CONTENTS : THEORY		Hrs/week	Marks
Unit-1	<u>MODERN GLASS PLANT CONCEPT AND LAY OUT:</u> -Concept of Manual, Semiautomatic, and Automatic Glass Plant. -Plant Layout Diagram of Modern Glass Plant Making: Float Glass, Sheet Glass, Bottles and Other Hollow Wares, Optical glass etc. indicating various units such as: Storage, Batch House, Mixing, Furnace, Annealing, Inspection, Sorting, Ware House, Packing, and Dispatch.	[05]	
Unit-2	<u>PROPERTIES AND TESTING:</u> -Sieve Analysis, Density, Purity, Chemical Durability, Viscosity, Thermal Expansion, Thermal Stress and Strain, Strength of Glass, Annealing, Devitrification, Softening point, Bursting Pressure, and Thermal Shock Resistance etc.	[10]	
Unit-3	<u>PLANT AND MECHINERY:</u> -Hand Operated Machine, Feeder, Machine for blowing and Pressing, Moulds, Float Glass Making Equipment etc. -Heat Recovery System, and Pollution Control Equipment.	[15]	
Unit-4	<u>GLASS MANUFACTURE AND DECORATION:</u> -Hollow Wares, Bottles, Rods, Tubes, Sheet Glass, Plate Glass, Float Glass, Optical Glass, Ophthalmic Glass Etc. -Decoration of Glass Using: Etching, Sand Blasting, Silvering, and Straining etc.	[15]	
Unit-5	<u>SPECIAL GLASSESS:</u> Fibre Glass, Glass Wool, Laminated Glass, Glass Insulators, Heat Resistant Glass, and Optical Fiber etc.	[10]	
Unit-6	<u>DEFECTS AND REMEDIES:</u> Seeds and Blisters, Cords, and Stones, etc.	[05]	
Total			

BOOKS RECOMMENDED:

01. Hand Book of Glass Technology	-	Dr. R. Charan
02. Hand Book of Glass Manufacture Vol I & II	-	F. V. Tooley
03. Properties of Glass - W. Morey	-	W. Morey
04. Glass Engineering Hand Book	-	E. B. Shand

MODERN AND ELECTRONIC CERAMICS

Subject Code 1613603	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

RATIONALE: This subject has been introduced to provide knowledge on new Ceramic Products being developed for various advance high technology applications in various fields. It covers wide range of ceramic products which are little different than contemporary and conventional Ceramic products. Products such as Capacitors, Resistors, Coatings for Space Craft, Optical fiber, Sports Ceramic, Medical Ceramic, Dental Ceramic, Nuclear Ceramic, Gas Turbine Ceramic Components etc.

OBJECTIVE:

The Objective is to provide opportunity to students in knowing the developed and developing technology in the field of Ceramic to cope up with the changes and needs of the World in the field of High technology, and know about:

01. Modern Ceramic Products.
02. Electronic Ceramic Products.
03. Properties and uses.

CONTENTS : THEORY		Hrs/week	Marks
Unit-1	<u>INTRODUCTION:</u> -Introduction and Concept of Modern and Electronic Ceramic, Their Continued Development and Uses.	[05]	
Unit-2	<u>MODERN CERAMIC:</u> -Ceramic Material Used in Space Craft, Touch Screen Glass Used in Mobile Smart Phone, Ceramic Gas Turbine Ceramic Component, Nuclear Ceramic, Dental Ceramic, Medical Ceramic, Solar Energy Related Ceramic, Automobile Ceramic, and Sports Ceramic etc. -High Temperature Ceramics: Oxides such as – Berylia, Magnesia, Titania, Thoria, and Uranium etc. Non Oxides such as – Carbon, Carbides, Nitrides, Silicides, and Borides etc.	[25]	
Unit-3	<u>ELECTRONIC CERAMIC:</u> -Carbon Film Resistor, Ceramic Capacitor, Optical Fiber, Quartz Crystal, Piezo Electric, Ferro Electric, Ferrites, Dielectric Ceramic, TV Tube, Silicon Chips, and Electronic components etc.	[25]	
Unit-4	<u>OTHER CERAMIC PRODUCTS AND METERIALS:</u> -Ceramic Cutting Tool, Spark Plug, Steatite and Cordierite Bodies, Silicon Carbide Trough, Abrasives and Grinding Wheels, Cermets, Other Miscellaneous Alumina, and other Ceramic Material Based Products etc.	[05]	
Total		60	

BOOKS RECOMMENDED:

01. Special Ceramics	-	P. Popper
02. Cermets	-	J.R.Tinklepaugh & W.B. Crandall
03. Industrial Ceramics	-	Singer & Singer
04. Advanced Ceramic Technology	-	Vol: I - Dr. S.K.Banerjee
05. Hand Book of Ceramic	-	DR. S.Kumar

MONOLITHICS AND STEEL PLANT REFRACTORIES

Subject Code 1613604	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	70	
			CT	:	20		

Rationale:

The rationale behind introducing this subject is to provide necessary knowledge of monolithics used in industrial furnaces replacing brick construction. Joint less construction is obtained by using monolithics. The steel plant refractories have gained significance do to massive requirement in steel industries with various qualities based on its exposure to steel materials under process.

Objective:

The objective is to provide opportunity to students to know at

01. Joint free construction using castable, plastics, etc.
02. Use of monolithic in various furnaces and heating equipments.
03. Steel plant Refractories type.
04. Use of advance Refractories in iron and steel Industries.

	CONTENTS : THEORY	Hrs/week	Marks
Unit-1	MONOLITHICS: Raw Materials, Castable Refractory, Plastic Refractory. Ramming masses, Gunning mixes, fettling materials.	[10]	
Unit-2	COATINGS, MORTARS:	[05]	
Unit-3	MANUFACTURING:	[10]	
Unit-4	APPLICATIONS:	[05]	
Unit-5	STEEL PLANT REFRACTORIES: Carbon containing Refractories, slide gate, bottom pouring refractories etc.	[05]	
Unit-6	Acid. Basic, neutral and special Refractories used in steel and Ferrous plants.	[10]	
Unit-7	Application of Refractories in- blast furnace, L.D. Converters open hearth, coke oven, Boiler, Basic oxygen furnace, vacuum Degassing unit electric arc, furnace, continuous casting Plant, electric soaking pit, Reheating furnace, working Beam furnace, notched hearth furnace, sheet reheating and annealing furnace, heat treatment furnace ladles etc.	[10]	
Unit-8	Selection and heat treatment with expansion joints provision in the furnace.	[05]	
Total		60	

BOOKS RECOMMENDED:

1.	Monolithic Refractories	-	Subrata Bar
2.	Refractories Production and Properties	-	J. H. Chest
3.	Refractories	-	F.H. Nor
4.	Industrial Ceramics		Singer and Singer

ELECTIVE (ANY ONE) - (i) MODERN REFRACTORY TECHNOLOGY

Subject Code 1613605A	Theory			No of Period in one session : 50			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale:

This subject has been kept as an elective subject for Part-III Diploma students of Ceramic Engineering mainly to converse them with the new development taking place in the field of refractories. With R & D as the base, the refractory industries have gone to a significant change in its technology cope up with the changing needs of the industry. Nearly 60% of the raw materials used in steel plant are only refractories and so even 1 to 5 % savings in refractories speak a lot on the profitability. This in fact has put the focus on ceramic engineers to work hard and contribute towards new development with a view to bring high profitability highly competitive global market.

OBJECTIVE:

The Objective is to facilitate in:

01. Understanding refractory of 21st Century.
02. Developing the Professionals to thrive on Challenges posed by User Industries.
03. Understand new type of Refractory developed for various Users.
05. Keeping track on R&D taking place in the field of Refractories.

CONTENTS : THEORY		Hrs/week	Marks
Unit-1	INTRODUCTION: -Concept of Refractory for high temperature applications in present days. -Plant Layout diagram indicating all the units of a Modern Refractory Manufacturing Plant such as: -Storage, Batch House, Mixing, Shaping, Drying, Firing, Quality Testing, Sorting, ware house, Packing, and Dispatch.	[05]	
Unit-2	TYPE OF REFRACTORIES USED IN VARIOUS USER INDUSTRIES: -Type of Refractories such as: Normal and Conventional Refractories, High Refractories, Super Refractories, Special Refractories like Silicon Carbide Troughs, Typical Shaped Refractories, Fused and Electro Cast Refractories, and Monolithic etc. -User Industries with the place and type of Refractories used: Steel Plant, Alloy steel Plant, and Other Ferrous Industries. -Non Ferrous Industries such as: Copper, Aluminum, Other Metals, Chemical, Petroleum, Boiler, Hot Fluid Carrying Pipe Insulation, and Space Craft Ceramic etc.	[10]	
Unit-3	R & D ACTIVITIES IN INDIA AND ABROAD: -C G C R I. -N M L. -Steel Plant Laboratories. -Refractory Plant Laboratories. -Ceramic Engineering Colleges. -R & D works being carried out Abroad in USA, Japan, EU, and other Countries of significance.	[10]	
Unit-4	RECENT TRENDS IN REFRACTORY APPLICATIONS AND TECHNOLOGY: -Steel Plant and Ferrous Industries. -Ceramic Industries. -Chemical and Petro Chemical Industries. -Other Industries. -Emerging Trends in India. -World Trends.	[10]	
Unit-5	TECHNOLOGY UPGRADATION: -In Raw Material Processing. -Plant and Machinery. -R & D. -Quality Control. -Standardization. -Skill Development. -Factors Effecting Selection and Application of Refractory emphasizing Techno- Economic aspects.	[15]	
Unit-6	PROJECT WORK AND SEMINAR: Project Report Preparation with Plant Layout Drawing. Presentation of the Report to Audience.	[10]	
Total		60	

Books Recommended:

1.	Refractories	-	F.H.Norton
2.	Technology of Ceramics and Refractories	-	P.P.Budnikov
3.	Refractories	-	M.L.Mishra

Journals Recommended:

1.	Indian Ceramic Society.
2.	Indian Refractory Manufacturers Association.
3.	American Ceramic Society.
4.	British Ceramic Society.

ELECTIVE (ANY ONE) - (ii) MODERN FURNACE TECHNOLOGY

Subject Code 1613605B	Theory			No of Period in one session : 60			Credits
	No. of Periods Per Week			Full Marks			3
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	70	
			CT	:	10		

Rationale:

The subject has been taken as an elective considering the very importance of Furnaces used in Ceramic and other industries. The subject deals with entire aspects of Furnaces such as its construction, combustion, Heat transfer in the furnace, Fuel used in the furnace, Fuel economy, Strength & durability of the furnace, Heat releasing equipments, Furnace using Industries, Heat exchanges, material of construction used in a furnace etc. The subject has been designed to provide all the necessary knowledge required to the students about furnaces, which become an important organ of any industry.

OBJECTIVE:

The Objective is to facilitate in:

01. Understanding the Furnace with its role and uses.
02. Understanding the basic principle of operation with scope of improvement.
03. Understanding Fuel Economy in Furnace Operation.
04. Understanding the most suitable Refractory for use in Furnace to achieve Economy.

CONTENTS: THEORY		Hrs/week	Marks
Unit-1	<u>INTRODUCTION:</u> Concept and Definition of Furnace and Kiln, and Functions of Furnace	[05]	
Unit-2	<u>TYPE OF FURNACES:</u> -Furnace or Kiln used in Ceramic Industry such as: Pottery, Glass, Refractory, Enamel, Lime and Cement, and Electronic Ceramic etc. -Furnace used in other Industries such as: Steel and Ferrous, Non Ferrous, Chemical and Petro Chemical, and Power etc.	[10]	
Unit-3	<u>FURNACE CONSTRUCTION AND MATERIALS USED:</u> -Elements of Furnace Construction -Material of Construction such as: Steel, Cast Iron, Cement, and Brick etc. -Construction during Break Down, Hot Repair, Routine Maintenance, Capital Repair, and New Construction of the Furnace.	[05]	
Unit-4	<u>REFRACTORIES USED IN FURNACE WITH TYPE OF CONSTRUCTION:</u> -Basis of selection, and use of Refractory in various Furnaces. -Principle of Wall, arch, Crown, dome, Flat Roof, Bull nose, Burner block, and Monolithic Construction etc. -Type of Brick Joints, Expansion Joints, and other Measures taken during Construction.	[10]	
Unit-5	<u>HEAT TRANSFER, GAS FLOW, HEAT TRANSFER SOLUTION AND HEAT EXCHANGERS:</u> - Heat Transfer: Conduction, Convection. Radiation, Gas Radiation, Heat Loss, and Heat Flow. - Gas Flow: Gas Laws, Nomograms, Streamline and Turbulent Flow, Gas Energy, Energy Loss, Buoyancy, Draught, and Gas Leakage etc. - Heat Transfer Solution: Heat Transfer through a Refractory Wall, Standard Brick Equivalent, Heat Loss by Gas Leakage, Unsteady Heat Flow, Heat Storage, and Heat Loss in Foundation and through openings, Water Cooling, Incomplete Combustion, and Heat Transfer to stock etc. - Heat Exchanger: Recuperator, Regenerator etc.	[10]	
Unit-6	<u>FUELAND FUELECONOMY, CONTROL OF FURNACE TEMPERATURE AND ATMOSPHERE:</u> -Fuel and Fuel Economy: Type of Fuel – Solid, Liquid, Gaseous, and Atomic or Special, -Furnace Efficiency, and Distribution of Heat, -Effective Fuel Economy in various Furnaces. -Control of Furnace Temperature and Atmosphere, and Means of Maintaining a given Temperature. -Device used in measuring Temperature, -Control of Furnace Atmosphere, and Pressure, -Effect of Furnace atmosphere, -Instrumentation, and Process Control Equipment.	[10]	

Unit-7	<u>SAFETY MEASURES:</u> -Prevention of Explosion, Pilot Flames, and Safety Shut Off Valves etc.	[05]	
Unit-8	<u>PREPARATION OF PROJECT REPORT AND SEMINAR:</u> -Project Report preparation of a Furnace with Layout diagram. -Seminar on the prepared Project Report on Furnace.	[05]	
TOTAL		60	

BOOKS RECOMMENDED:

1.	Modern Furnace Technology	-	H.Etherington & G.Etherington
2.	Industrial Furnaces: – Vol – I & II	-	W.Trinks & M.H.Mawhney
3.	The Science of Flames and Furnaces	-	M.H.Thring

ELECTIVE (ANY ONE) - (iii) INSTRUMENTATION AND AUTOMATIC PROCESS CONTROL

Subject Code 1613605C	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

RATIONALE:

This subject is relevant from the operational control point of view dealing with the Instrumentation and Automatic Process Control in Ceramic Plants manufacturing Pottery, Glass, Refractory, Enamel, Cement, Electronic or Special Ceramic Products, and High Tech. Ceramic Products etc.

OBJECTIVE:

The Objective is to facilitate in:

01. Understanding the Instruments used in Ceramic Plants.
02. Understanding various control device used in plant.
03. Understanding the role of Automation for control through Instrumentation.

CONTENTS : THEORY		Hrs/week	Marks
Unit-1	<u>INTRODUCTION:</u> Concept and Role of Instrumentation and Automatic Process Control.	[05]	
Unit-2	<u>INSTRUMENTATION:</u> General Principle of Industrial Instrumentation. Instrument/Equipment used for: Fluidity, Mass/Weight, Temperature, Pressure, Flow, Velocity, DTA, RUL, PCE, Thermal Shock, CCS, and MOR etc.	[25]	
Unit-3	<u>AUTOMATIC PROCESS CONTROL:</u> Concept and General Principle of Automatic Process Control in Industry. Automatic Controls on: Mechanical, Hydraulic, Pneumatic, Electrical, Electronic, and Other System. Flow Measurement, and Temperature Control on Automatic Control. On-Off, Proportional, and Integral Control System etc.	[20]	
Unit-4	<u>PROJECT REPORT AND SEMINAR:</u> Project Report Preparation on Instrumentation or Automatic Process Control System. Seminar on the prepared Project Report.	[10]	
Total		60	

BOOKS RECOMMENDED:

- | | |
|----------------------------------------------|-------------------------|
| 01. Instrument Technology | -E.B.Jones Buttle Worth |
| 02. Principles of Industrial Process Control | - D.P.Ekman |
| 03. Flow Measurement and Meters | - A.Linford |

CERAMIC ENGINEERING WORKSHOP PRACTICE – IV

(GLASS AND ENAMEL)

Subject Code 1613606	Practical			No of Period in one session : 90			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

RATIONALE:

This Workshop is kept mainly to get students work with hand on various process involved in making glass and Enamel products. It provides practical knowledge on operations required to be carried out in industry on laboratory scale.

OBJECTIVE:

The Objective is to know about:

01. Working with hand and practice the shaping techniques.
02. Familiarizing with the machine used for the purpose.
03. Practicing various care and precautions required for getting good products without defects.

Contents : Practical		Hrs/week	Marks
GLASS			
Unit-1	<u>PREPARATION OF COLOURED GLASS BATCH:</u> Selection of different colour ingredients, Selection of different Enamel batch, Preparation of coloured Glass batch to produce: Glass having colours as green, yellow, ruby, and blue etc.	[10]	
Unit-2	<u>MELTING OF GLASS BATCH:</u> Melting of different Glass batch in Crucible.	[10]	
Unit-3	<u>GLASS WARE FORMATION:</u> Glass Ware Formation by: Glowing, Blowing, and Pressing.	[10]	
Unit-4	<u>POLISHING:</u> Methods adopted and applied for polishing of different shape of Glass wares.	[15]	
Unit-5	<u>DECORATION:</u> Decoration such as: Etching, Silvering, Staining, and Sand Blasting etc.	[10]	
Enamel			
Unit-1	<u>COMPOUNDING OF ENAMEL BATCH:</u> Compounding of: Ground coat Enamel, Cover Coat Enamel, and Special Tailor made Enamel.	[10]	
Unit-2	<u>MILLING IN BALL MILL:</u> Milling of Ground Coat, and Cover Coat Enamel in Ball Mill. Frit and Colour Ingredients Grinding in Pot Mill.	[10]	
Unit-3	<u>METAL SURFACE CLEANING FOR ENAMELLING:</u> Different Process adopted for Metal Preparation such as: Cleaning, Pickling, and Neutralization etc.	[05]	
Unit-4	<u>APPLICATION:</u> Application of Enamel using: Dipping, Spraying, Screen Printing, and Hand Printing etc.	[10]	
Unit-5	<u>FIRING:</u> Firing of Enamel Wares in Muffle Furnace after drying.	[10]	
Total:-		(90)	

BOOKS RECOMMENDED:

01. Hand Book of Glass Technology
02. Porcelain Enamel

- Dr. R. Charan
- A. I. Andrew

CERAMIC APPLICATIONS WORKSHOP -TW

Subject Code 1613607	Term Work			No of Period in one session : 50			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal Examiner	:	15	
	—	—	04	External Examiner	:	35	

RATONALE:

Ceramic application workshop has been introduced to provide application techniques adopted in furnace construction and other ceramic related equipments. There is growing demand of employment of ceramic Engineer in this field and so the term work has been designed to take care of the required knowledge needed by the students.

OBJECTIVE:

The objective is to provide the students the fundamental knowledge on ceramic products applications with.

- Knowing the shapes and sizes of refractory bricks.
- Refractory brick laying using various joints.
- Arch construction.
- Dome construction.
- Flat roof construction.
- Casting
- Ramming
- Vertical wall construction in brick work construction.
- Hearth bottom construction.
- Roof construction etc.

Contents : Term Work		Hrs/week	Marks
Unit-1	Identification of shapes and sizes used in brick work construction.	[02]	
Unit-2	Brick laying using. <ul style="list-style-type: none"> - Rowlock - Header - Stretcher - Soldier 	[03]	
Unit-3	Wall making using one type of bricks- <ul style="list-style-type: none"> - 9" thick with alternate header and using one stretcher courses. - 13½" thick with alternate header and stretcher courses. - 18" thick with header and stretcher courses. 	[08]	
Unit-4	Furnaces Hearth, side walls and roof making using different type of bricks.	[07]	
Unit-5	Arch making, door openings, Dome construction, Catenary construction, skew back construction.	[10]	
Unit-6	Ideas and concept of stacks lining, blast furnace lining, ladle lining, electric arc furnace lining, reheating furnace lining and others furnaces used in ceramic and other industries.	[10]	
Unit-7	Hanger bricks construction for flat roof making.	[05]	
Unit-8	Casting and ramming of Refractory materials.	[05]	
Total:-		50	

BOOKS RECOMMENDED:

1.	Refractories	-	F. H. Norton
2.	Refractory Pocket Catalog	-	A.P. Green, USA
3.	Monolithic refractories	-	Subrata Banerjee

ELECTIVE - (Any One) - (i) MODERN REFRACTORY TECHNOLOGY -TW

Subject Code 1613608A	Term Work			No of Period in one session : 50			Credits 2
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal Examiner	:	15	
	—	—	04	External Examiner	:	35	

Rationale:

This subject has been kept as an elective subject for Part-III Diploma students of Ceramic Engineering mainly to converse them with the new development taking place in the field of refractories. With R & D as the base, the refractory industries have gone to a significant change in its technology cope up with the changing needs of the industry. Nearly 60% of the raw materials used in steel plant are only refractories and so even 1 to 5 % savings in refractories speak a lot on the profitability. This in fact has put the focus on ceramic engineers to work hard and contribute towards new development with a view to bring high profitability highly competitive global market.

Objective:

This course will facilitate in:-

- (i) Understanding refractory of 21st century.
- (ii) Developing the professionals to thrive on challenges pored by user industries.
- (iii) Understand new type of refractory developed for various user.

Contents : Term Work		Hrs/week	Marks
Unit-1	Preparation of Project Report on a Refractory manufacturing unit.	[35]	
Unit-2	Presentation of the project report in a seminar.	[15]	
TOTAL		50	

BOOKS RECOMMENDED:

1.	Refraction	-	F.H.Norton
2.	Refraction	-	M. L. Mishra

ELECTIVE - (Any One) - (ii) MODERN FURNACE TECHNOLOGY -TW

Subject Code 1613608B	Term Work			No of Period in one session : 50			Credits 2
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal Examiner	:	15	
	—	—	04	External Examiner	:	35	

Rationale:

The subject has been taken as an elective considering the very importance of Furnaces used in Ceramic and other industries. The subject deals with entire aspects of Furnaces such as its construction, combustion, Heat transfer in the furnace, Fuel used in the furnace, Fuel economy, Strength & durability of the furnace, Heat releasing equipments, Furnace using Industries, Heat exchanges, material of construction used in a furnace etc. The subject has been designed to provide all the necessary knowledge required to the students about furnaces, which become an important organ of any industry.

Objective:

The objective in general to achieve will be to:-

- (i) Understand the furnace with its role and use.
- (ii) Understand the basic principle of operation.
- (iii) Understand fuel economy in furnace operation which is very important.
- (iv) Understand the use of refractories to achieve economy.
- (v) Understand various type of furnaces used in industries.

Contents :Term Work		Hrs/week	Marks
Unit-1	Preparation of Project Report on a Furnace.	[35]	
Unit-2	Presentation of the project report in a seminar.	[15]	
TOTAL		50	

BOOKS RECOMMENDED:

1.	Modern Furnaces Technology	-	Etheringlin & Elheringlon
2.	Industrial Furnaces Vol. I & II	-	Trinkst & Mawhney

ELECTIVE - (Any One) - (iii) INSTRUMENTATION AND AUTOMATIC PROCESS CONTROL -TW

Subject Code 1613608C	Term Work			No of Period in one session : 50			Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal Examiner	:	15	2
	—	—	04	External Examiner	:	35	

RATIONALE:

This subject has been kept as one of the Elective papers considering the very importance of Instrumentation and Automatic Process Control adopted in Industry. The subject deals with various Instrument and Device used in Ceramic and Other Industries. It also deals with the Automation in Process Control adopted in controlling the operational parameters.

OBJECTIVE:

The Objective is to know about:

01. Role and Use of Instruments and Device used in Industry.
02. Principle of operation.
03. R&D taking place in developing new and more economical and efficient Instruments and Automatic Process Control Device for the industry.

Contents : Term Work		Hrs/week	Marks
Unit-1	Preparation of Project Report on Instrumentation and Automatic Process Control related Topic.	[35]	
Unit-2	Presentation of prepared Project Report in a Seminar.	[15]	
TOTAL		50	

BOOKS RECOMMENDED:

1.	Instrument Technology	-	E. B. Jones Buttle Walth
2.	Principles of Industrial Process Control	-	D.P. Ekman

PROJECT WORKS & ITS PRESENTATION IN SEMINAR -TW

Subject Code 1613609	Term Work			No of Period in one session :			Credits 2
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal Examiner	:	30	
	—	—	—	External Examiner	:	70	

RATIONALE:

Project Work and its presentation in Seminar has been kept in the curriculum to provide an opportunity to the students to develop skill in preparing Project Work and be eligible to give its Presentation in a Seminar. This exercise not only develops communication skill, it also generates confidence to the students in presenting the Project Work to the Audience in a Seminar.

OBJECTIVE:

The Objective is to prepare and achieve:

01. Trained Professionals.
02. Strong Data Base for the Project.
03. Skill to give good and impressive Presentation in a Seminar.

CONTENTS : TERM WORK		Hrs/week	Marks
Unit-1	<p><u>SELECTION OF A PROJECT:</u> This exercise should be carried out in consultation with the Professor concerned. A suitable Project is selected related to that particular branch of Engineering. Allotment of Project Work Should preferably is done in the beginning of the Session to give ample time to students for its preparation.</p>		
Unit-2	<p><u>PREPARATION OF DATA BASE:</u> Visit to Plant similar to the Project, if required. - Collection of Data. - Compilation of Data. - Analysis and Assimilation of Data.</p>		
Unit-3	<p><u>PREPARATION OF DRAFT REPORT:</u> Introduction. - Market Prospect and Marketing. - Location. - Manufacturing Programme and Annual Turnover. - Cost of Project. - Means of Finance. - Requirement of Raw Materials, Consumables, Utilities and Working Capital. - Organizational Structure, Management and Manpower. - Project Implementation Schedule. - Profitability and Cash flow.</p> <p><u>Existing Project:</u> This will deal with the problem related area in any one of the following: - Technical. - Human Relation. - Welfare. - Safety. - Any Other Area. The Report should have: - Introduction. - Problem details (Identified for the Project) - Details of Plant/Works/Institution towards: . Technical. . Management. . Marketing. . Financial, and Commercial. . Profitability (Profit/Loss) - Reason for selecting the problem. - Analysis and Remedy. - Conclusion.</p>		

Unit-4	<u>PRESENTATION IN SEMINAR:</u> - Presentation of Draft Project Report. - Discussion on Draft Project Report. - Recording of useful Suggestions for incorporation in the Final Report.		
	<u>FINAL REPORT:</u> Report finalization after incorporating changes. - Preparation of Final Report and Submission.		
Total			

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for

VI SEMESTER DIPLOMA IN CHEMICAL ENGINEERING

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME								
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03	
2.	Chemical Engineering Drawing	1614602	03	04	10	20	70	100	28	40	03	
3.	Environmental Technology	1614603	03	03	10	20	70	100	28	40	03	
4.	Mass Transfer Operation	1614604	03	03	10	20	70	100	28	40	03	
5.	Elective-(Any One)	1614605	03	03	10	20	70	100	28	40	03	
(i) Bioprocess Engineering(1614605A)				(ii) Food Processing & Engineering (1614605B)			(iii) Sugar Technology (1614605C)			(iv) Petrochemical Technology (1614605D)		
Total :-			15					350	500			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME						
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits	
					Internal(A)	External(B)				
6.	Environmental Technology Lab	1614606	02	03	15	35	50	20	01	
7.	Mass Transfer Operation Lab	1614607	02	03	15	35	50	20	01	
8.	Elective-(Any One)	1614608	02	03	07	18	25	10	01	
(i) Bioprocess Engineering Lab (1614608A)			(ii) Food Processing & Engineering Lab (1614608B)		(iii) Sugar Technology Lab (1614608C)			(iv) Petrochemical Technology Lab (1614608D)		
9.	Process Simulation Lab	1614609	02	03	15	35	50	20	01	
Total :-			08					175		

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
10.	Chemical Engineering Drawing -TW	1614610	02	07	18	25	10	01
11.	Industrial Project -TW	1614611	04	07	18	25	10	02
12.	Professional Practices-VI TW	1614612	04	07	18	25	20	02
Total :-			10			75		
Total Periods per week Each of duration One Hour				33	Total Marks = 750			24

MANAGEMENT (COMMON)

Subject Code	Theory			Full Marks			Credits
	No. of Periods Per Week				:		
1600601	L	T	P/S	ESE	:	100	03
	03	—	—	TA	:	70	
				TA	:	10	
				CT	:	20	

CONTENTS: THEORY

	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none">• Service• Manufacturing• Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none">• Engineering industry• Process industry• Textile industry• Chemical industry• Agro industry 1.3 Globalization <ul style="list-style-type: none">• Introduction• Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.)	02	---

Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	11
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Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of-organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentation <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	11
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Unit - 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel– Training & Development <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow’s Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to – <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act 	08	14
Unit - 5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and ccounts <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	14
Unit - 6	Materials Management 6.1. Inventory Management (No Numericals) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	14

Unit - 7	Project Management (No Numericals) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	07
	TOTAL	48	

Text / Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New Delhi
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	Everest Publication , Pune

CHEMICAL ENGINEERING DRAWING

(CHEMICAL ENGINEERING)

Subject Code 1614602	Theory					Credits 03	
	No. of Periods Per Week			Full Marks	:		100
	L	T	P/S	ESE	:		70
	03	—	—	TA	:		10
				CT	:		20

CONTENTS :THEORY

	Name of the Topic	Hrs/week
Unit -1	Process Instrumentation Symbols.	01
Unit -2	Valves: Sectional views of: Gate valve, Globe valve, Ball valve, Check valve, (Swing & lift check valve), Diaphragm valve, safety valve (Spring Loaded / Rams bottom).	05
Unit - 3	Pipe Joints. 3.1 Threaded, flanged and other joints 3.2 Bend (Short & Long) 3.3 Elbow 3.4 Tee 3.5 Nipple 3.6 Socket, Reducing socket 3.7 Union Joint 3.8 Plug 3.9 Flanges. Blind, C.I., Slip on, welded Neck, Hub type, Hap type Screwed type. 3.10 Socket and spigot joint. 3.11 Hydraulic joint. 3.12 Expansion joints loop and Corrugated.	02
Unit - 4	Supports for pipe and vessels. 4.1 Hanger 4.2 Roller 4.3 Yard piping support. 4.4 Vessel support. Vertical vessel, Leg, Skirt, Bracket, lug support. Horizontal vessel saddle type.	03
Unit - 5	Fabrication Drawing. 5.1 Shell and tube heat exchanger. 5.2 Batch Reactor. 5.3 Horizontal storage tank. 5.4 Short tube Vertical Evaporator 5.5 Types of Packing. 5.6 Types of distributor: Weir type and spider type. 5.7 Liquid redistributor. 5.8 Grid bar support plate. 5.9 Types of Heads.	05
Unit - 6	Specification Sheet. 6.1 Centrifugal Pump. 6.2 Reciprocating pump. 6.3 Batch reactor. 6.4 Shell and tube heat Exchanger.	04

Unit - 7	7.1 Process flow sheeting (ULD & PFD) 7.2 Piping and Instrumentation Diagram of Chemical processes. 7.3 Equipment Layout 7.4 Tank Form	10
Unit - 8	Revision of CAD & Process flow Diagram on CAD.	02
	TOTAL	32

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Process Equipment Design	M.V. Joshi V.V. Mahajan	1997 Mac Milan India Ltd. New Delhi
Process Design of Equipments	Dr. S.D. Dawande	1999 Central Techno publication Nagpur
Chemical Process Equipment	Sranley M. Walas	1988 Butter worth Publishers Reed Publishing Inc (USA) Boston.
A First Year Engineering Drawing	A.C. Parkinson	1995 A.H. Wheeler & Co. Allahabad
Machine Drawing	N.D. Bhatt	1986 Charottar Publishing House Anand (Gujrat)

ENVIRONMENTAL TECHNOLOGY
(CHEMICAL ENGINEERING)

Subject Code 1614603	Theory				Credits	
	No. of Periods Per Week			Full Marks		
	L	T	P/S	ESE	:	100
	03	—	—	TA	:	10
				CT	:	20

CONTENTS :THEORY

	Name of the Topic	Hrs/week	Marks
Unit -1	Air Pollution 1.1 Introduction. 1.2 Air Pollutants. 1.3 Natural sources of air pollution. 1.4 Man made sources of air pollution. 1.5 Effect of air pollution on health, animals and material. 1.6 Principle of air sampling, particulate and gaseous sample collection methods. 1.7 Controlling methods. 1.7.1 Gravity Settling Chamber. 1.7.2 Cyclone separator. 1.7.3 Fabric Filter. 1.7.4 Wet Scrubber. 1.6.5 Electrostatic Precipitator. 1.6.6 Absorption, Adsorption and incineration.	12	18
Unit -2	Water Pollution. 2.1 Introduction. 2.2 Role of Pollution Control Board. 2.3 Different Sampling Methods. 2.4 Different Physical Treatment methods, 2.5 Different Chemical Treatment Methods. 2.6 Different Biological Treatment Methods.	10	14
Unit - 3	Solid Waste Management. 1.1 Solid Waste Characteristics. 1.2 Solid Waste Collection. 1.3 Solid Waste Processing. 1.4 Reuse, Recycle and Recovery. 1.5 Disposal. (Biomedical)	08	12
Unit - 4	Waste Water Treatment 4.1 Introduction. 4.2 Preliminary Treatment. 4.3 Primary Treatment 4.4 Secondary (Biological) Treatment. 4.4.1 Trickling Filters. 4.4.2 Activated Sludge Treatment. 4.5 Sludge Management. 4.6 Sludge Characteristics 4.7 Sludge Treatment. 4.7.1 Sludge Thickening. 4.7.2 Sludge Digestion. 4.7.3 Sludge Dewatering. 4.7.4 Sludge Disposal.	12	18

Unit - 5	Environmental Audit & ISO – 14000 5.1 Need of Environmental Audit. 5.2 Procedure for Environmental Audit. 5.3 Advantages of Environmental Audit. 5.4 Need of ISO 14001. 5.5 Business benefits of ISO 14000.	06	08
	TOTAL	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Environmental Pollution.- 2004	Dr. P. K. Khatolitya	C. Chand & Company Ltd. New Delhi- 55.
Introduction to Environmental Engineering.- 1997	Mr. P. A. Vesilind	PWS Publishing Company, Boston.
Basic environmental Technology.- 2002	Jerry Natheson	New Delhi Prentice- Hall of India Pvt. Ltd.
Environmental Engineering- 1989	G. N. Pandey & G. C. Carney	Tata Mc GrawHill, New Delhi.
Text Book of Environmental Pollution and Control.- 1998	Dr. H. S. Bhatia	New Delhi Galgotia Publication.
A Text Book of Environmental Chemistry and Pollution Control.- 1991	Mr. S. S. Dara.	S. Chand & Company Ltd. New Delhi.
Environmental Pollution control	S. S. Rao	Wiky Eastern Ltd. New Delhi
Environmental Problem and Solution.- 2001	Mr. D. K. Asthana & Mrs. Meera Asthana.	S. Chand & Company Ltd. New Delhi.
Pollution Control in Process Industries.- 1985	Mr. S. P. Mahajan.	Tata Mc GrawHill, New Delhi.

MASS TRANSFER OPERATION
(CHEMICAL ENGINEERING)

Subject Code 1614604	Theory						Credits 03
	No. of Periods Per Week						
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
				CT	:	20	

CONTENTS : THEORY

	Name of the Topic	Hrs/week	Marks
Unit -1	<p>Diffusion.</p> <p>1.1 Definition, Ficks Law, Flux equation, Molecular diffusion in gases, Steady state diffusion of A through non diffusing B, Steady state equimolar counter diffusion. Problems.</p> <p>1.2 Analogy between mass transfer and heat transfer, film theory, surface renewal theory, penetration theory, equilibrium.</p>	05	08
Unit -2	<p>Distillation.</p> <p>Concept of distillation, Gibbs phase rule, concept of degree of freedom, boiling point diagram, change of pressure on boiling point diagram. Vapour liquid equilibrium diagram. Henry's Law, Raoults Law. Determination of vapor composition by above laws. Volatility, Relative volatility, Derivation to calculate vapour composition and liquid composition Problems.</p> <p>Methods of distillation, Differential distillation, Rayleigh's equation, problems, Flash distillation, material balance, Problems .</p> <p>Rectification, Fractionating column, material balance, Mc Cabe Theile method. Lewis Sorrel method, problems.</p> <p>Feed plate, feed line, q line, effect of feed conditions on slope of q line. Reflux ratio, total reflux ratio, minimum reflux ratio, relative advantages and dis-advantages on operating and capital cost.</p> <p>Optimum reflux ratio.</p> <p>Batch distillation, Azeotropic distillation, steam distillation- Equipment for distillation, plate column, Bubble cap plate, sieve plate, and valve plate, down comers, weir, packed columns.</p>	16	22
Unit - 3	<p>Absorption.</p> <p>3.1 Concept of Gas Absorption, comparison with distillation, selection criteria for solvent.</p> <p>3.2 Concept of equilibrium, minimum liquid-gas ratio, material balance Concept of HETP.</p> <p>3.3 Hydrodynamics of packed column. Loading and flooding of packed columns.</p> <p>3.4 Gas absorption equipments- mechanically agitated vessel, packed columns, types of packing, channeling in packed columns.</p>	06	08
Unit - 4	<p>Extraction.</p> <p>4.1 Concept of Extraction liquid-liquid extraction comparison between distillation and extraction, distribution coefficient, triangular diagram.</p> <p>4.2 Extraction equipments mixer settler, spray column, rotating disc contactor, pulse column.</p>	06	08
Unit - 5	<p>Drying.</p> <p>5.1 Concepts & general principles, equilibrium Rate of drying curve, time of drying, Problems based on above topic.</p> <p>5.2 Drying equipments- Tray drier, Rotary drier, Drum drier, Spray drier, fluidized bed drier, Pneumatic drier, applications.</p>	08	14

Unit - 6	Crystallization. a. Concept of crystallization, saturation, super saturation, solubility curves b. Method of super saturation, Mier's super saturation theory. c. Crystallization equipments- Agitated tank crystalliser, vacuum crystalliser, Oslo (cooler and evaporative) crystalliser.	07	10
	TOTAL	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Introduction to Chemical Engineering	Mr. Walter L. Badger & Mr. Julius T. Bachero	Mc Graw Hill International
Unit Operations of Chemical Engineering.	Mc Cabe, W. L. Smith & Harriot.	Mc Graw Hill International
Mass Transfer Operations	Treybal	Mc Graw Hill International

ELECTIVE-(ANY ONE)- (i) BIOPROCESS ENGINEERING (CHEMICAL ENGINEERING)

Subject Code 1614605A	Theory			Credits		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	ESE	:	70
	03	—	—	TA	:	10
				CT	:	20

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	General reaction kinetics for biological system.(08 Marks) <ul style="list-style-type: none"> • Enzyme Kinetics • Michaleis-Menten kinetics • Determination of enzyme kinetic constants • Kinetics of enzyme deactivation. Immobilization of enzymes and cells. (04 Marks) Kinetics of Microbial growth. (04 Marks) Death rate kinetics (04 Marks)	06	16
Unit -2	Stoichiometry <ul style="list-style-type: none"> • Thermodynamics of bio system • Material and energy balances (Problems) 	06	08
Unit - 3	Sterilization Design, preparation and sterilization of media. Air sterilization.	10	08
Unit – 4	Bioreactor Bioreactor Configuration. Practical consideration for bioreactor configuration. Monitoring and control of bioreactors. Ideal Reactor operation. Scale up of bioreactor	08	10
Unit – 5	Diffusion <ul style="list-style-type: none"> • Role of diffusion in bio processing. • Oxygen uptake in cell culture. (04 Marks) • Oxygen transfer in fermenters. (04 Marks) • Measuring dissolved oxygen concentration. (04 Marks) • Mass transfer correlation. Measurement of $K_L a$. (04 Marks) 	10	14
Unit – 6	Bio separation <ul style="list-style-type: none"> • Down stream processing and bio separation. (08 Marks) • Waste water treatments. (08 Marks) 	08	14
Total		48	70

Text/ Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Bioprocess Computations in Biotechnology	Ghose T.K	Eiils Horwood Ltd
Biochemical Engineering Fundamental	Bailey Jams E. and Oils D.F.	McGraw Hill Book Co.
Bioprocess Engineering Principles	Pauline M. Doran	Academic Press Limited, London
Biochemical Engineering	Aiba, Arthur E. Humphery and Nancy F. Millis	University of Tokyo Press.

ELECTIVE-(ANY ONE)- (ii) FOOD PROCESSING & ENGINEERING
(CHEMICAL ENGINEERING)

Subject Code 1614605B	Theory			Credits		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	ESE	:	70
	03	—	—	TA	:	10
				CT	:	20

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Overview of Food Chemistry. Food Constituents: Carbohydrates, Protein, Lipids, Enzymes and water. Vitamins and Minerals. Food Additives.	08	07
Unit -2	Classification and terminology of microorganisms. Nutritional requirement of microorganisms. Growth of microorganisms. Factors affecting growth and inhibition of microorganisms	08	07
Unit - 3	Spoilage and associated chemical / physical changes in food. Basic principles and unit operations in food processing and preservation. Food preservation by high temperature, low temperature, dehydration, evaporation, chemicals, irradiation. Food Packaging.	08	14
Unit – 4	Process technology of Fruits and Vegetables : Unit operations in processing and canning of fruit and vegetables and their products. Technology of Juice and Beverages, Jams, Jellies, Marmalade, tomato products, pickles and chutneys. Process Technology of Milk and Milk Products : Processing, storage and distribution of milk and milk products. Standards for milk and milk products.	08	14
Unit – 5	Process Technology of Cereals and Legumes : Process technology of milling of cereals and legumes. By product of Milling Industry. Processing of Malt. Process technology of Baked Goods : Manufacturing of bread, biscuits, cookies and cakes. Quality control in finished product.	08	14
Unit – 6	Process Technology of Alcoholic Beverages: Types of alcoholic beverages, Raw material, fermentation and processing of alcoholic beverages. Process technology of chocolate and confectionary : Manufacture of chocolates. Types of confectionary products. Production of sugar based and Indian confection.	08	14
TOTAL		48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Food Chemistry	L.H. Meyer	Van Nostrand Reinhold co., New York
Principles of Food Science, Part I – Food Chemistry	Owen R. Fennema	Marcel Dekker Inc, New York
Principles of Food Preservation, Part II	Owen R. Fennema	Marcel Dekker Inc, New York
Preservation of Fruits and Vegetables	Giridharilal and Sidappa	Indian Council of Agricultural Research, New Delhi.
Food Industry	--	IIT, Madras
Outlines of Biochemistry	E.E. Conn and P.K. Stumpf Food	Tata McGraw Hill publishing Co., New Delhi.
	Microbiology: W.C. Frazier	
The Manufacturer of Biscuits, Cakes and Wafers	British J. and Grosphicree	Sir Isaac Pitman & Sons Ltd. London.
Sugar confectioner and Chocolate Manufacturer	E.B. Jackson and Less R	Leonard Hill Books 24 Market Square Aylesbury.
Modern Dairy Products	Lampert I.M.	Eurasia Publishing House, Ramnagar, New Delhi.
The Chemistry and Testing of Dairy Products	Newlander J.A. and Artherton H.V.	Olsen Publishing Co. Milwalie Wisconsin.
Chemical Analysis of Foods	David Pearson	JDA Churchil, London.
Manual of Analysis of Fruits and Vegetables Products	Ranganna S.	McGraw Hill publishing Co., New Delhi.

ELECTIVE-(ANY ONE)- (iii) SUGAR TECHNOLOGY
(CHEMICAL ENGINEERING)

Subject Code 1614605C	Theory			Full Marks			Credits 03
	No. of Periods Per Week						
	L	T	P/S	ESE			
	03	—	—	TA			
			CT			:	100
			ESE			:	70
			TA			:	10
			CT			:	20

CONTENTS : THEORY

Unit -1	Name of the Topic	Hrs/week	Marks
	Introduction 1.1 Sugarcane producing states in India 1.2 Cultivating factors affecting sugarcane quality 1.3 Harvesting	03	04
	Manufacture of Sugar 2.1 Chemical composition of juice, methods of polarization (04Marks) 2.2 Extraction of juice, Brix curve (04 Marks) 2.3 Juice treatment (08 Marks) <ul style="list-style-type: none"> • Screening • General constituents of juice from immature cane • Process of treatment – Defecation, Sulphitation • Ion exchange 2.4 Multiple effect evaporation (12 Marks) <ul style="list-style-type: none"> • Working of evaporators • Evaporators- Forward, Backward, Mixed feed • Falling film evaporators • Cleaning of evaporators- Methods 2.5 Crystallization (08 Marks) <ul style="list-style-type: none"> • Principle of crystallization • Types of crystallizer and their working • Crystallization calculations 	15	30
	Cane sugar Refining 3.1 Affination, clarification/defecation (8 Marks) 3.2 pH adjustment (4 Marks) 3.3 Decolonization- char filtration (4 Marks)	12	14
	Byproducts of sugar Industry 4.1 Use of Bagasse [Processes of Biogas, Bio manure, Pulp & paper, Particle board, as fuel, Bagasse ash] (8 Marks) 4.2 Composition & uses of Molasses [Fermentation, abs. Alcohol, rectified spirit & cattle feed] (4 Marks) 4.3 Ethanol as a fuel- properties & advantages (4 Marks) 4.4 Sugar based Industries [Processes of Confectionary, sugar candies, Indian sweets, sugar cubes]- (8 marks)	18	22
Total		4	70

Text/ Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
System of Technical Control	N.C. Verma	STA of India, New Delhi
Principle of Cane Sugar Technology	P.Hoing	Elsevier Publisher Co. London
Cane sugar factory control	K.C.Banerjee	M.L.Kakar,Hazratganj,Lucknow
Sugarcane factory analytical control	J.H.Payne	Elsevier Publisher Co. London
Introduction to sugarcane technology	Jenkins	Elsevier Publisher Co. London

ELECTIVE-(ANY ONE)- (iv) PETROCHEMICAL TECHNOLOGY
(CHEMICAL ENGINEERING)

Subject Code 1614605D	Theory			Full Marks			Credits 03
	No. of Periods Per Week						
	L	T	P/S	ESE			
	03	—	—	TA			
				CT			
			100				
			70				
			10				
			20				

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Introduction to Petroleum Refining: 1.1 Indian Refineries, Their location and capacity 1.2 Global crude oil producers, 1.3 Characteristics of crude, Composition, constituents of crude oil	08	08
Unit -2	Refining: 2.1 Process of Refining of crude oil to obtain various fractions (8 Marks) 2.2 Unit operations used in separation processes- Fractionation, Vacuum Distillation (4 Marks) 2.3 List of Hydrocarbons/ fractions obtained, their Boiling Ranges and their uses (4 Marks)	10	14
Unit - 3	Unit Processes in Refineries: Flow charts, Reactions, Description 3.1 Hydrogenation, Cracking, Alkylation, Polymerisation, (10 Marks) 3.2 Hydrocracking, Isomerisation, Reforming, Esterification & Hydration. (10 Marks) 3.3 Waste Treatment (8 Marks)	12	24
Unit - 4	C₁ to C₄ Hydrocarbons: (4 Marks each) 4.1 C ₁ Hydrocarbons, Petrochemicals from C ₁ 4.2 C ₂ Hydrocarbons, Petrochemicals from C ₂ 4.3 C ₃ Hydrocarbons, Petrochemicals from C ₃ 4.4 C ₄ Hydrocarbons, Petrochemicals from C ₄ 4.5 Aromatic Fractions	10	16
Unit - 5	Hazard & Safety (4 Marks each) 5.1 Hazards in Petrochemical Industry 5.2 Safety in Petrochemical Industry	08	08
TOTAL		48	70

Text/ Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Dryden's Outlines of Chemical Tech	M. Gopala Rao, M. Sittig,	East West Press
Shreve's Chemical Process	George Austin	Mc Graw Hill Publication
Petrochemicals	Peter Wiseman	John Willey & Sons
Petrochemicals	Bhaskar Rao	--

ENVIRONMENTAL TECHNOLOGY LAB
(CHEMICAL ENGINEERING)

Subject Code 1614606	Practical						Credits 01	
	No. of Periods Per Week			Full Marks		:		50
	L	T	P/S	ESE		:		50
	—	—	02	Internal		:		15
	—	—	—	External		:		35

CONTENTS: PRACTICAL

Skills to be Developed:

Intellectual skills:

- 1) To identify different pollution in atmosphere.
- 2) To decide pollution control methods.
- 3) To classify different solid waste.
- 4) To select proper method for disposal of solid waste.
- 5) To design simple parameter for waste water treatment.

Motor skills:

- 1) To work on effluent treatment plant.
- 2) To prepare audit report.
- 3) To set procedure for ISO-14000.
- 4) To handle different pollution controlling equipment.

List of Practicals:

- 1) To estimate the concentration of H₂S and CS₂ in work room by modified gas analyser.
- 2) Determination of COD of the given effluent sample.
- 3) To measure the suspended particles in liquid by turbidity?
- 4) To estimate chloride content of given water sample.
- 5) To determine BOD of given sample.
- 6) Determination of acidity / alkalinity in given effluent sample.
- 7) Determination of total solids , total suspended solids , total dissolved solids in given effluent sample.
- 8) Prepare an environment audit report for any process industry.
- 9) Estimation of suspended particulate in matter , in air by high volume sampler

MASS TRANSFER OPERATION LAB
(CHEMICAL ENGINEERING)

Subject Code 1614607	Practical						Credits 01
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
				External	:	35	

CONTENTS : PRACTICAL

Intellectua

I Skills:

1. To compare different types of distillation.
2. To design a fractionating column.
3. To select suitable solvent for extraction.
4. To compare the effect of dry and wet packing on pressure drop.

Motor Skills:

1. To operate different distillation columns.
2. To operate different types of dryers.
3. To control operating parameters of distillation column.

List of Practicals:

1. To verify Rayleigh's equation by simple distillation.
2. To calculate HETP by carrying out distillations in a packed column at total reflux.
3. To calculate the pressure drop of a given packed column for wet and dry packing.
4. To find out distribution coefficient for liquid - liquid mixture.
5. To plot binodal curve for ternary system.
6. To plot drying rate curves.
7. To plot the solubility curve while heating and cooling.
8. Control of distillation column on simulator.

ELECTIVE-(ANY ONE):- (i) BIOPROCESS ENGINEERING LAB
(CHEMICAL ENGINEERING)

Subject Code	Practical			Credits		
	No. of Periods Per Week			Full Marks	:	25
1614608A	L	T	P/S	ESE	:	25
	—	—	02	Internal	:	07
	—	—	-	External	:	18
				01		

CONTENTS :PRACTICAL

Intellectual Skills:

1. Observations
2. Cultivation of micro organisms
3. Analysis of growth
4. Aseptic

Conditions Motor Skills

1. Equipment handling
2. Preparation of aseptic conditions

LIST OF PRACTICALS:

1. Preparation and Sterilization of Media.
2. Microscopic Examination of different groups of Micro-organisms.
3. Growth and enumeration of Micro-organisms.
4. Aseptic Techniques.
5. Assay of enzyme activity and specific activity.
6. Kinetic analysis of an enzyme catalyzed reaction.
7. Determination of $K_L a$ and dissolved oxygen.
8. Study of fermentation processes and controls.
9. Immobilization of enzymes and whole cells.
10. Draw anyone flow sheet for bioprocess.

ELECTIVE-(ANY ONE):- (ii)FOOD PROCESSING & ENGINEERING LAB
(CHEMICAL ENGINEERING)

Subject Code	Practical			Credits		
	No. of Periods Per Week			Full Marks	:	25
1614608B	L	T	P/S	ESE	:	25
	—	—	02	Internal	:	07
	—	—	-	External	:	18
						01

CONTENTS :PRACTICAL

List of Practicals:

1. Quantitative determination of carbohydrate, protein and ascorbic acid.
2. Analysis of food materials and food products.
3. Enzymes kinetics study. Culturing of microorganisms. Counting of microorganisms.
4. Growth curve experiments.
5. Processing of fruit and vegetables products like juice, Jams, Jellies.
6. Processing of Marmalade, tomato products, pickles and chutneys
7. Preparation of bakery products like bread, biscuits, cakes.
8. Preparation of confectionary products like soft and hard-boiled candies, fruit candies, chikki etc.
9. Preparation of dairy products
10. Industrial visit to food industry and report writing.

ELECTIVE-(ANY ONE):- (iii) SUGAR TECHNOLOGY LAB
(CHEMICAL ENGINEERING)

Subject Code	Practical			Credits		
	No. of Periods Per Week			Full Marks	:	25
1614608C	L	T	P/S	ESE	:	25
	—	—	02	Internal	:	07
	—	—	-	External	:	18
				01		

CONTENTS: PRACTICALS

Skills to be developed:

Intellectual Skills:

- 1) Interpret test results.
- 2) Follow systemic procedure for handling chemicals.

Motor Skills:

- 1) To handle equipments/instruments.
- 2) To observe physical phenomenon.

List of Practical's:

1. Determination of Brix & Purity of juice
2. Determination of moisture present in white sugar
3. Determination of grade & color of white sugar
4. Determination of SO₂ content in white sugar
5. Determination of phosphate content of juice
6. Determination of CO₂ % in limestone
7. Determination of active CaO in lime
8. Determination of true sucrose of gur
9. Determination of ash% of gur
10. Determination of viscosity of sucrose solution & molasses

ELECTIVE-(ANY ONE):-(iv)PETROCHEMICAL TECHNOLOGY LAB
(CHEMICAL ENGINEERING)

Subject Code	Practical			Credits			
	No. of Periods Per Week			Full Marks	:	25	
1614608D	L	T	P/S	ESE	:	25	01
	—	—	02	Internal	:	07	
	—	—	-	External	:	18	

CONTENTS : PRACTICAL

Skills to be developed:

Intellectual Skills:

- 1) Interpret test results
- 2) Follow systemic procedure for handling chemicals

Motor Skills:

- 1) To handle equipments/instruments
- 2) To observe physical phenomenon

List of Practical's:-

1. Determination of Aniline Point.
2. Determination of Fire Point, Flash Point.
3. Determination of calorific value.
4. Determination of viscosity index.
5. Preparation of Ethyl Acetate by Esterification.
6. Preparation of PF Resin.
7. Preparation of Biodiesel by Trans esterification.
8. ASTM, TVP Distillation.
9. Determination of Drop Point.
10. Determination of Pour Point.

PROCESS SIMULATION LAB
(CHEMICAL ENGINEERING)

Subject Code 1614609	Practical			Full Marks : 50			Credits 01
	No. of Periods Per Week						
	L	T	P/S	Internal : 15			
	—	—	02	External : 35			
	—	—	-				

CONTENTS: PRACTICAL

Note- content of theory are to be taught in practical period.		Hrs/week
Unit -1	<i>Process Simulators</i> Need of simulators, Application simulators distributed controlled system-Dynamic Graphic (mimic), Bar graph, Trend and Alarm.	
Unit -2	<i>Process Simulator Software</i> Installation of software. Introduction of software feature using member, Toolbar, dilogbar, Toolbar, Status bar Scroll bar Title bar. Screens (Display), Mimics, bar graph, trend alarms, snapshots, back track, caution longing, connectivity between bar graph – mimics-trends-alarm exercise-loading, saving, delete, controlling the session – run freeze, quit etc. mal function, online help, star up and shut down procedure.	
List of Practical :		Hrs/week
	<ol style="list-style-type: none"> 1) Practice correct startup and shutdown procedure of the plant. 2) Change the P, I, D values and process parameters and observe then change in trend, bar graphs and mimics. 3) The should attend the malfunction occurring in the plant then restoring to its design conditions. 4) The should practice the above exercise on any six process modules given below using process simulators. <ol style="list-style-type: none"> i) Binary distillation column for Benzene and Toluene. ii) Temperature and pressure control iii) Stirred tank reactor. iv) Filtration. v) Level and Flow in different type size vessels. vi) Three-element boiler control. vii) Level control in coupled tanks. viii) Pressure control in different sizes valve. ix) Catalytic reactor. x) Absorption xi) Superheated steam xii) Dryer xiii) Heat Exchanger xiv) Multi component distillation column 	
Note :-	<ol style="list-style-type: none"> 1. Print of logs to be attached 2. Study of simulation software based various computer languages. 	

CHEMICAL ENGINEERING DRAWING -TW

(CHEMICAL ENGINEERING)

Subject Code	Term Work					Credits
	No. of Periods Per Week			Full Marks		
	L	T	P/S	Internal	External	
1614610	—			02	07	01
	—			02	18	

CONTENTS: TERM WORK

Notes : 1) Students should be use A3 size sketch book for class work. 2) Use Approximately 570mm×380mm size drawing sheet for term work.		
List of Term Work	Skill to be Developed	
	Intellectual Skills	Motor Skills
1) VALVES, Two sheet comparison of the above topic to be drawn	To develop ability to learn different type of valve	To developed the ability to draw the sectional view
2) Two sheet on all pipe joints	To developed ability to identify different types of pipe joint flanges.	To developed ability of different types of pipe joint
3) One sheet on support for pipe & vessels	To developed learn support for pipe & vessels	- -
4) Two sheet on fabrication drawing	To developed ability to identify the different types of chemical equipment	To developed the ability draw the sectional view
5) One sheet on preparation of any one from the topic, chapter 06 specification	To draw prepare the details of the equipment	To learn details construction of the equipment.
6) Two sheet on topic 7.1 & 7.2 one sheet on topic 7.2 one sheet on topic (7.3 7.4 combined)	To developed ability between PFD, ULD & P & I diagram	- -
7) One sheet on CAD w.r.t. to topic 7.1	To develop ability to learn CAD	To draw PFD on computer.

INDUSTRIAL PROJECT-TW

(CHEMICAL ENGINEERING)

Subject Code 1614611	Term Work					Credits 02	
	No. of Periods Per Week			Full Marks	:		25
	L	T	P/S	Internal	:		07
	—	—	04	External	:		18

CONTENTS: TERM WORK

<i>Skills To be Developed</i>		Hrs/week
Unit -1 Intellectual Skills	<ul style="list-style-type: none"> ▪ Design the related machine components & mechanism. ▪ Convert innovative or creative idea into reality. ▪ Understand & interpret drawings & mechanisms ▪ Select the viable, feasible & optimum alternative from 	
Unit -2 Motors skills	<ul style="list-style-type: none"> • Use of skills learnt in workshop practical. • Assemble parts or components to form machine or mechanisms. • Classify & analyze the information collected. • Implement the solution of problem effectively. 	

- Notes:** 1) Project group size: Maximum 4 students
 2) Project report will be of minimum 40 pages unless otherwise specified.
 3) Project diary should be maintained by each student

Part A-Project

A batch of maximum 4 students will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Student is expected to apply the knowledge & skills acquired. Batch may select any one problem/project work from following categories.

- a) *Fabrication of small machine / devices/ test rigs/ material handling devices/ jig & fixtures/ demonstration models, etc. Report involving aspects of drawing, process sheets, costing, Installation, commissioning & testing should be prepared and submitted.*
- b) Design & fabrication of mechanisms, machines, Devices, etc. Report involving aspects of designing & fabricating should be prepared & submitted .
- c) Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots etc.
- d) Industry sponsored projects- project related with solving the problems identified by industry should be selected.
 One person / engineer from industry is expected to work as co- guide along with guide from institution.
- e) Literature survey based projects: Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments in mechanical or mechatronics field, and should not be a part of diploma curriculum. Report should be of min 60 pages.
- f) Investigative projects- Project related with investigations of causes for change in performance or structure of machine or component under different constraints through experimentation and data analysis.
- g) Maintenance based projects: The institute may have some machine/ equipment/ system which are lying idle due to lack of maintenance. Students may select the specific machines/equipment/system. Overhaul it, repair it and bring it to working condition. The systematic procedure for maintenance to be followed and the report of the activity be submitted.

- h) Industrial engineering based project: Project based on work study , method study, methods improvement, leading to productivity improvement, data collection, data analysis and data interpretation be undertaken .
- i) Low cost automation projects: Project based on hydraulic/pneumatic circuits resulting into low cost automated equipment useful in the identified areas.
- j) Innovative/ Creative projects – Projects related with design, develop & implementation of new concept for some identified useful activity using PLC, robotics, non-conventional energy sources, CIM , mechatronics, etc.
- k) Environmental management systems projects: Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Project management & team work	Karl Smith	Tata- Mc Graw Hill
Project management	Cliffored gray & Erik Lasson	Tata- Mc Graw Hill

PROFESSIONAL PRACTICES VI - TW

(CHEMICAL ENGINEERING)

Subject Code	Term Work					Credits	
	No. of Periods Per Week			Full Marks	:		25
	L	T	P/S	Internal	:		07
	—	—	04	External	:		18
1614612						02	

CONTENTS: TERM WORK

		Hrs/week
Unit -1	Industrial Visits: Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work. Visits to any two of the following : v) To see working of a Distillation Column. vi) E. T. P. of a chemical industry. vii) To visit a sugar industry. viii) To visit a food or pharmaceutical industries. ix) H. R. department of a chemical industry.	08
Unit -2	<i>Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any of the following areas:</i> xii) Energy auditor. xiii) Management. xiv) Enterpriser. xv) Recent trends in Distillation. xvi) Pollution control board official.	08
Unit - 3	Group Discussion : The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are - v) Steam distillation. vi) Azeotropic Distillation. vii) Interview techniques. viii) Non-conventional and energy sources.	08
Unit - 4	Student Activities : The students in a group of 3 to 4 will perform any one of the following activities others similar activities may be considered. Activity : i) Collect five different types of crystalline chemical with their purification. ii) Different types of packing material used in packed towers. iii) Energy audit for chemical engineering department. 1) Mass transfer lab. 2) Heat transfer lab. iv) Collect information are distillation from internal. v) Various universities for higher education. vi) Various job avenue for a student diploma.	08
Total		32

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

**Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN CIVIL ENGINEERING / CIVIL (RURAL) ENGINEERING
(Effective from Session 2016-17 Batch)**

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Contracts and Accounts	1615602	03	03	10	20	70	100	28	40	03
3.	Environment Engineering	1615603	03	03	10	20	70	100	28	40	03
4.	Design of Structures	1615604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1615605/ 1616605	02	03	10	20	70	100	28	40	02
Elective For Civil Engineering											
(i) Advanced Construction Techniques and Equipments (1615605 A)			(ii) Maintenance and Rehabilitation of Structures (1615605 B)			(iii) Architectural Practices and Interior Design (1615605 C)			(iv) Earthquake Resistant Design & Construction (1615605 D)		
Elective For Civil (Rural) Engineering											
(i) Micro Irrigation (1616605 A)			(ii) Maintenance and Rehabilitation of Structures (1615605 B)				(iii) Water shade Management (1616605 C)				
Total :-				14	350	500					

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME						
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits	
					Internal(A)	External(B)				
6.	Environment Engineering Lab	1615606	02	03	15	35	50	20	01	
7.	Elective (Any One) Lab	1615607/ 1616607	02	03	15	35	50	20	01	
Elective For Civil Engg.										
(i) Advanced Construction Techniques and Equipments Lab (1615607 A)			(ii) Maintenance and Rehabilitation of Structures Lab (1615607 B)			(iii) Architectural Practices and Interior Design Lab (1615607 C)		(iv) Earthquake Resistant Design & Construction Lab (1615607 D)		
Elective For Civil (Rural)Engg.										
(i) Micro Irrigation Lab (1616607 A)				(ii) Maintenance and Rehabilitation of Structures Lab (1615607 B)			(iii) Water shade Management Lab (1616607 C)			
Total :-				04	100					

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
8.	Contracts and Accounts -TW	1615608	02	07	18	25	10	01
9.	Design of Structures -TW	1615609	02	07	18	25	10	01
10.	Professional Practices-VI -TW	1625610	03	07	18	25	10	02
11.	Civil Engineering Project -TW	1615611	05	15	35	50	20	03
12.	Rural Engineering -TW	1615612	03	07	18	25	10	01
Total :-				15	150			
Total Periods per week Each of duration One Hour				33	Total Marks = 750			24

MANAGEMENT (COMMON)

Subject Code 1600601	Theory					Credits 03	
	No. of Periods Per Week			Full Marks	:		100
	L	T	P/S	ESE	:		70
	03	—	—	TA	:		10
	—	—	—	CT	:		20

CONTENTS ; THEORY

Unit	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentation <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

<p>Unit - 4</p>	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel- Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow's Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to -</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act <p>Industrial Dispute Act</p>	<p>08</p>	
<p>Unit - 5</p>	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to -</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	<p>08</p>	
<p>Unit - 6</p>	<p>Materials Management</p> <p>6.1. Inventory Management (No Numerical)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	<p>08</p>	

Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-

Titles of the Book	Name of Authors	Name of the Publishe
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	Everest Publication , Pune
Management	Deepak Chandra	Foundation Publishing

CONTRACTS AND ACCOUNTS
(CIVIL ENGINEERING GROUP)

Subject Code 1615602	Theory			Full Marks			Credits 03
	No. of Periods Per Week						
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic	Hrs/week	Marks
Unit -1 PROCEDURE OF EXECUTION OF WORK BY P.W.D. 1.1 ORGANIZATION OF P.W.D. FUNCTIONS OF THEIR PERSONNEL. 1.2 P.W.D. PROCEDURE OF INITIATING THE WORK, ADMINISTRATIVE APPROVAL, TECHNICAL SANCTION, BUDGET PROVISION. 1.3 METHODS USED IN P.W.D. FOR CARRYING OUT WORKS CONTRACT METHOD AND DEPARTMENTAL METHOD , RATE LIST METHOD , PIECE WORK METHOD , DAY'S WORK METHOD , DEPARTMENT METHOD (NMR AND CASUAL MUSTER ROLL.)	08	10
Unit -2 Contract 2.1 DEFINITION OF CONTRACT, OBJECTS OF CONTRACT, REQUIREMENTS OF VALID CONTRACT 2.2 TYPES OF ENGINEERING CONTRACT - LUMP SUM CONTRACT, ITEM RATE CONTRACT, PERCENTAGE RATE CONTRACT, COST PLUS PERCENTAGE, COST PLUS FIXED FEE, COST PLUS VARIABLE PERCENTAGE AND COST PLUS VARIABLE FEE CONTRACT, LABOUR CONTRACT, DEMOLITION CONTRACT , FEE CONTRACT, TARGET CONTRACT, NEGOTIATED CONTRACT . 2.3 Class of contractor, Registration of contractor. 2.4 BOT PROJECT.	12	16
Unit - 3 Tender & Tender Documents 3.1 DEFINITION OF TENDER, NECESSITY OF TENDER, TYPES-LOCAL AND GLOBAL. 3.2 TENDER NOTICE, POINTS TO BE INCLUDED WHILE DRAFTING TENDER NOTICE , DRAFTING OF TENDER NOTICE . 3.3 Meaning of terms: Earnest money, security deposit, validity period, right to reject one or all tenders, corrigendum to tender notice and its necessity. 3.4 TENDER DOCUMENTS – LIST, SCHEDULED A, SCHEDULE B, SCHEDULE C . 3.5 TERMS RELATED TO TENDER DOCUMENTS – CONTRACT CONDITIONS , TIME LIMIT , TIME EXTENSION, PENALTY , DEFECTIVE MATERIAL AND WORKMANSHIP , TERMINATION OF CONTRACT, SUSPENSION OF WORK, SUBLETTING OF CONTRACT, EXTRA ITEMS ,ESCALATION ,ARBITRATION ,PRICE VARIATION CLAUSE, DEFECT LIABILITY PERIOD, LIQUIDATED AND UNLIQUIDATED DAMAGES. 3.6 FILLING THE TENDER BY CONTRACTOR AND POINTS TO BE OBSERVED BY HIM . 3.7 PROCEDURE OF SUBMITTING FILLED IN TENDER DOCUMENT , PROCEDURE OF OPENING TENDER , COMPARATIVE STATEMENT , SCRUTINY OF TENDERS ,AWARD OF CONTRACT, ACCEPTANCE LETTER AND WORK ORDER. 3.8 UNBALANCED TENDER, RING FORMATION.	12	16
Unit - 4 Accounts in P.W.D. VARIOUS ACCOUNT FORMS AND THEIR USES-MEASUREMENT BOOKS ,NOMINAL MUSTER ROLL, IMPREST CASH , INDENT, INVOICE, BILLS, VOUCHERS, CASH BOOK, TEMPORARY ADVANCE.	04	06
Unit - 5 Payment to Contractors MODE OF PAYMENT TO THE CONTRACTOR- INTERIM PAYMENT AND ITS NECESSITY, ADVANCE PAYMENT, SECURED ADVANCE, ON ACCOUNT PAYMENT , FINAL PAYMENT , FIRST AND FINAL PAYMENT , RETENTION MONEY, REDUCED RATE PAYMENT, PETTY ADVANCE, MOBILIZATION ADVANCE .	04	06

Unit – 6	SPECIFICATIONS 6.1 NECESSITY AND IMPORTANCE OF SPECIFICATIONS OF AN ITEMS, POINTS TO BE OBSERVED IN FRAMING SPECIFICATIONS OF AN ITEM, TYPES OF SPECIFICATION –BRIEF AND DETAILED, STANDARD AND MANUFACTURERS SPECIFICATION. 6.2 PREPARING DETAILED SPECIFICATIONS OF ITEMS IN CIVIL ENGINEERING WORKS. STANDARD SPECIFICATION BOOK. 6.3 LEGAL ASPECTS OF SPECIFICATION.	08	10
Unit – 7	VALUATION 7.1 DEFINITION, NECESSITY OF VALUATION. DEFINITIONS – COST PRICE, VALUE, DIFFERENCE BETWEEN THEM, CHARACTERISTICS OF VALUE, FACTORS AFFECTING VALUE. 7.2 TYPES OF VALUE: - BOOK VALUE, SCRAP VALUE, SALVAGE VALUE, SPECULATIVE VALUE , DISTRESS VALUE, MARKET VALUE, MONOPOLY VALUE, SENTIMENTAL VALUE, FACTORS AFFECTING VALUE . 7.3 DEPRECIATION, OBSOLESCENCE, SINKING FUND. METHODS OF CALCULATION OF DEPRECIATION – STRAIGHT LINE METHOD, SINKING FUND METHOD CONSTANT PERCENTAGE METHOD QUANTITY SURVEY METHOD. 7.1 COMPUTATION OF CAPITALIZED VALUE, GROSS INCOME, OUTGOING, NET INCOME, YEARS PURCHASE. TYPES OF OUTGOING AND THEIR PERCENTAGES. 7.2 VALUATION OF LANDS & BUILDINGS, FACTORS AFFECTING THEIR VALUATION, BOOK VALUE METHOD, REPLACEMENT VALUE METHOD AND COMPARISON METHOD. USE OF VALUATION TABLES .DEFERRED VALUE OF LAND. 7.3 FIXATION OF RENT AS PER PWD PRACTICE	16	16
	TOTAL	64	80

Text/Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
ESTIMATING & COSTING IN CIVIL ENGINEERING	B.N. Datta	UBS Publishers
Estimating & costing, Specification and Valuation in Civil Engineering	M. Chakraborti	M. Chakraborti , Calcutta
Estimating & costing	S.C. Rangwala	Charotar Publication
Civil Engineering Contracts and accounts Vol I, II	B.S. Patil	Orient Longman,
ESTIMATING & COSTING	G. S. Birdie	Dhanpat Rai and Sons
Contracts and Accounts	S.P. Khattar	Foundation Publishing

ENVIRONMENTAL ENGINEERING
(CIVIL ENGG. GROUP)

Subject Code 1615603	Theory						Credits 03		
	No. of Periods Per Week			Full Marks				:	100
	L	T	P/S	ESE				:	70
	03	—	—	TA				:	10
	—	—	—	CT				:	20

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	<p>ENVIRONMENTAL POLLUTION AND CONTROL</p> <p>1.1 Introduction Environment, Ecosystem, Environmental Pollution and its types, Causes of Pollution, Effects of Pollution, Control of Pollution, Existing laws related to Environmental Pollution.</p>	02	02
Unit -2	<p>PUBLIC WATER SUPPLY</p> <p>2.1 Quantity of Water Demands of water: Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand ; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, Design period for water supply scheme. Estimation of quantity of water supply required for a town or city, Types of water supply schemes.</p> <p>2.2 Sources of Water Surface and Subsurface sources of water, Intake Structures- Definition and types, Factors governing the location of an intake structure, Water conservation, Ground water recharging – Necessity Importance and advantages.</p> <p>2.3 Quality of Water Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN, Sampling of water, Water quality standards as per I.S.</p> <p>2.4 Purification of Water Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Filtration-theory of filtration, classification of filters : slow sand filter, rapid sand filter, pressure filter, domestic filter, filter media, construction and working of slow sand filter and rapid sand filter, Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, orthotolidine test, Miscellaneous water Treatments (Water softening, Defluoridation techniques), Advanced Water Treatments (Electrolysis, Reverse Osmosis), Flow diagram of water treatment plants, Low cost water Treatments: Necessity and importance in rural areas, Prevention of pollution of bores and bore wells.</p>	18	24

	<p>2.5 Conveyance and Distribution of Water :Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline. Methods of distribution of water- Gravity, pumping, and combined system Service reservoirs – functions and types , Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system ; their suitability, advantages and disadvantages.</p>		
Unit – 3	<p>DOMESTIC SEWAGE</p> <p>3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage</p> <p>3.2 Building Sanitation Definitions of the terms related to Building Sanitation- Water pipe, Rain water pipe, Soil pipe , Sullage pipe, Vent pipe, Building Sanitary fittings- Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps- types, qualities of good trap, Systems of plumbing – one pipe, two pipe, single stack, choice of system Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan) , inspection and junction chambers, their necessity, location , size and shape. Maintenance of sanitary units.</p> <p>3.3 Systems of Sewerage Types of Sewers, Systems of Sewerage, Design of sewers, self cleansing velocity and non scouring velocity Laying, Testing and maintenance of sewers.</p> <p>3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts, ,location, spacing, construction details, Sewer Inlets , Street Inlets, Flushing Tanks – manual and automatic</p> <p>3.5 Analysis of Sewage Characteristics of sewage, B.O.D./ C.O.D. and significance. , Aerobic and anaerobic process, Maharashtra Pollution Control Board Norms for the discharge of treated sewage</p> <p>3.6 Treatment of Sewage Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch.</p>	16	28
Unit – 4	<p>INDU STRIAL WASTE</p> <p>4.1 Industrial Waste Water Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments</p>	02	02
Unit – 5	<p>ENVIRONMENTAL POLLUTION</p> <p>5.1 Air Pollution and Noise Pollution Sources, Effects and Control of Air Pollution, Sources , Effects and Control of Noise Pollution (only brief idea) Global warming, Acid Rain</p>	02	02

Unit - 6	SOLID WASTES FROM THE SOCIETY 6.1 Solid Waste Management Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste. 6.3 Hazardous Wastes Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.	04	05
Unit - 7	ENVIRONMENTAL SANITATION 7.1 Environmental Sanitation Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine- construction and working Composting (Nadep or Vermiculture), 7.2 Emerging Trends (only brief idea) ant Gadge Baba Swachhatha Abhiyan Low cost atrines Jalswarajya Scheme.	03	05
Unit - 8	PLUMBING 8.1 Sanitary Plumbing, Layout, Details of water supply arrangement for residential and public building Rainwater and sewage collection systems	01	02
	Total	48	70

Text / Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Environmental Engineering (Volume I & II)	Santosh kr. Garg	Khanna Publishers,
Environmental Engineering	Kamla A. & Kanth Rao D. L.	Tata McGraw Hill,
Water Supply and Sanitary Engineering	Birdie G. S. Birdie J. S.	Dhanpat Rai & Sons
Plumbing – Design and Practice	Deolalikar S. G.	Tata McGraw Hill,
Air Pollution	Rao M. N. Rao H. V. N.	Tata McGraw Hill,
Ground Water	H. M. Raghunath	New Age International
Industrial Water Treatment	Rao & Dutta	-----
Environment Engineering	Rahul Sinha	Foundation Publishing

DESIGN OF STRUCTURES
(CIVIL ENGINEERING GROUP)

Subject Code 1615604	Theory						Credits	
	No. of Periods Per Week			Full Marks		:	100	03
	L	T	P/S	ESE		:	70	
	03	—	—	TA		:	10	
	—	—	—	CT		:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	<p>Working Stress Method & Prestressed Concrete</p> <p>1.1 Introduction to reinforced concrete, R.C. Sections their behavior, grades of concrete steel. Permissible stresses, Assumptions in W.S.M.</p> <p>1.2 Equivalent bending stress distribution diagram for singly reinforced section,</p> <p>1.3 Concept of prestressed concrete, externally and internally prestressed member.</p> <p>1.4 Advantages and disadvantages of prestressed concrete.</p> <p>1.5 Methods of prestressing, pretensioning and post tensioning. Losses in prestressing. (No numerical problems shall be asked in written examination on pre-stressed concrete.)</p>	05	07
Unit -2	<p>Limit State Method</p> <p>2.1 Definition, types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load. Loading on structure as per I.S 875.</p> <p>2.2 I.S. Specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchoring effective span for beam, & slab.</p>	03	05
Unit - 3	<p>Analysis and Design of Singly Reinforced Sections (LSM)</p> <p>3.1 Limit State of collapse (Flexure), Assumptions, stress, Strain relationship for concrete and steel, neutral axis, Stress block diagram and Strain diagram for singly reinforced section.</p> <p>3.2 Concept of under- reinforced, over-reinforced and balanced section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for balanced singly R.C. Section.</p> <p>3.3 Simple numerical problems on determining design constants, moment of resistance and area of steel.</p>	07	10
Unit - 4	<p>Analysis and Design of Doubly Reinforced Sections (LSM)</p> <p>4.1 General features, necessity of providing doubly reinforced section reinforcement limitations.</p> <p>4.2 Analysis of doubly reinforced section, strain diagram, stress diagram, depth of neutral axis, moment of resistance of the section.</p> <p>4.3 Simple numerical problems on finding moment of resistance and design of beam sections.</p>	06	08

Unit – 5	Shear, Bond and Development Length (LSM) 5.1 Nominal Shear stress in R.C. Section, design shear strength of concrete, Maximum shear stress, Design of shear reinforcement, Minimum shear reinforcement, forms of shear reinforcement. 5.2 Bond and types of bond, Bond Stress, check for bond stress, Development length in tension and compression, anchorage value for hooks 90° bend and 45° bend Standard Lapping of bars, check for development length. 5.3 Simple numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams; Determination of Development length required for tension reinforcement of cantilevers beam and slab, check for development length.	06	18
Unit – 6	Analysis and Design of T-Beam (LSM) 6.1 General features, advantages, effective width of flange as per IS : 456-2000 code provisions. 6.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam Section with neutral axis lying within the flange 6.3 Design of T-beam for moment and shear for Neutral axis within or up to flange bottom. 6.4 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section with N. A. lies within or upto the bottom of flange shall be asked in written examination.)	05	08
Unit – 7	Design of Slab (LSM) 7.1 Design of simply supported one-way slabs for flexure check for deflection control, and shear. 7.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear. 7.3 Design of two-way simply supported slabs for flexure with corner free to lift. 7.4 Design of dog-legged staircase. 7.5 Simple numerical problems on design of one-way simply supported slabs cantilever slab & two-way simply supported slab. (No problem on design of dog-legged staircase shall be asked in written examination.)	09	14
Unit – 8	Design of Axially Loaded Column and Footing (LSM) 8.1 Assumptions in limit state of collapse – compression 8.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties. 8.3 Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only; check for short column and check for minimum eccentricity may be applied. 8.4 Types of footing, Design of isolated square footing for flexure and shear. 8.5 Simple numerical problems on the design of axially loaded short columns and isolated square footing. (Problems on design of footing shall be asked in written examination for moment and two way shear only.)	07	10
	Total	48	80

Titles of the Book	Name of Authors	Name of the Publisher
Limit State Theory & Design of Reinforced Concrete	Dr. V. L. Shah & Late Dr. S. R. Karve	Structures Publications
Fundamentals of Reinforced Concrete	N. C. Sinha & S. K. Roy	S. chand & Company,
Reinforced concrete Design (IS 456- 2000) Principles & Practice	N. Krishna Raju R. N. Pranesh	New Age International
Prestressed Concrete	N. Krishna Raju	--
Reinforced concrete Design	S.U.Pillai & Devdas Menon	Tata Mcgraw Hill.
Limit State Design of Reinforced Concrete	P. C. Varghase	Prentice Hall of India,
Design of Structures	B.P. Pandey	Foundation Publishing

**ELECTIVE (ANY ONE) –(i) ADVANCED CONSTRUCTION
TECHNIQUES & EQUIPMENTS (CIVIL ENGG.)**

Subject Code 1615605A	Theory						Credits 02
	No. of Periods Per Week						
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	<p>1.0 Advanced Construction Materials</p> <p>1.1 FIBERS AND PLASTICS. Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers. Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material.</p> <p>1.2 Artificial Timber Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber.</p> <p>1.3 Miscellaneous materials Properties and uses of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.</p>	02	08
Unit -2	<p>Advanced Concreting Methods</p> <p>2.1 Prestressed Concrete Grades of Concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prerstressing. Precautions during prestressing of members.</p> <p>2.2 Under water Concreting Underwater concreting for bridge piers and bored pile construction. Tremy method of under water concreting. Procedure and equipments required for tremy method. Properties, workability and water cement ratio of the concrete required.</p> <p>2.3 Ready Mix concrete Necessity and use of Ready Mix Concrete. Production and equipments for RMC. Ready Mix Concrete plant. Conveying of RMC. Transit mixers- working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC.</p> <p>2.4 Tremix Concreting method Definition, application of vacuum dewatering concreting. Equipments used in tremix concreting. Procedure of vacuum dewatering concreting (Tremix).</p> <p>2.5 Special Concretes Properties, uses and procedure of Roller compacted concrete. Properties and uses of High Impact Resisting concrete. Properties, uses and constituents of Steel fiber reinforced concrete. Percentage of steel fibers in SFRC. Effect of size, aspect, ratio and percentage of steel fibers on strength of concrete.</p>	06	12

Unit – 3	Advanced Construction Methods. 3.1 Formwork Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms. 3.2 Construction of Multistoried Buildings Use of lifts, belt conveyors, Pumped concrete, Equipments and machinery required for construction of Multistoried Buildings. Precautions and safety measures. 3.3 Prefabricated Construction Meaning of prefabrication and precast. Methods of prefabrication- plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural members. 3.4 Soil Reinforcing techniques Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.	08	14
Unit – 4	Hoisting and Conveying Equipments 4.1 Hoisting Equipments Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks. 4.2 Conveying Equipments Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.	04	08
Unit – 5	Earth Moving machinery 5.1 Excavation Equipments Use, Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines. 5.2 Compacting Equipments Use of rollers, Roller types- Plain rollers , Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.	04	10
Unit – 6	6.1 Concreting Equipments 6.2 Concrete Mixers Types of concrete mixers. Weigh batching equipments, Equipments for transportation of concrete- trollies, lifts. Transit mixers, Concrete vibrator- Needle vibrators, Screed vibrators. Automatic concrete plants – layout, process and working. 6.3 Stone Crushers Types of stone crushers, capacities and working. Equipments for production of artificial sand.	04	10
Unit – 7	7.1 Miscellaneous Equipments and Equipment management 7.2 Miscellaneous Equipments Pile driving equipment, Pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine. 7.3 Equipment Management Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment. Preventive maintenance of equipment, Break down maintenance of equipments.	04	06
Total	32	68	

Text Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Construction Technology Vol. I to IV	R. Chudly	ELBS- Longman Group
Construction Planning equipment and methods	R.L. Peurifoy	McGraw-Hill Co. Ltd.
Construction Engineering and management	S. Seetharaman	Umesh Publication, New Delhi.
Construction management and Planning	B. Sengupta and Guha	Tata McGraw Hill
Concrete Technology(Third Edition)	M. L. Gambhir	Tata McGraw Hill
Materials of construction	R. C. Smith	McGraw-Hill Co. Ltd.
Building Technology and valuation	TTTI Madras	TTTI Madras
Construction Planning and Equipment	R. Satyanarayana and S. C. Saxena	Standard Publication New Delhi
Civil Engineering materials	TTTI Chandigarh	TTTI Chandigarh
Construction of structures and Management of Works	S. C. Rangawala	Charotar Publication
Construction Materials	D.N. Ghose	Tata McGraw-Hill
A to Z of Building Construction	Mantri Construction	Mantri Publication

Reference books :-		
Titles of the Book	Name of Authors	Name of the Publisher
PWD Handbooks for - Materials - Foundation - Construction equipments	Govt. of Maharashtra	Govt. of Maharashtra
Practical Civil Engineering Handbook	Khanna ublication	Khanna Publication
Advanced Construction Techniques and Equipments	R.K. Yadav	Foundation Publishing

ELECTIVE (ANY ONE) –(ii) MAINTENANCE & REHABILITATION OF STRUCTURES
(CIVIL ENGINEERING GROUP)

Subject Code 1615605B	Theory						Credits 02	
	No. of Periods Per Week			Full Marks				: 100
	L	T	P/S	ESE				: 70
	02	—	—	TA				: 10
	—	—	—	CT				: 20

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Introduction 1.1 Necessity, operation, maintenance & repairs of structures 1.2 Classification of maintenance, 1.3 Rehabilitation (restoration), strengthening, retrofitting. 1.4 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.	03	06
Unit -2	Causes & detection of damages: 2.1 Causes of damages, damages due to earthquakes, fire hazards, flood, hazards, dilapidation, 2.2 List of basic equipments for investigation.	02	08
Unit - 3	Materials for repairs: 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting, cement mortar, 3.2 Shot-creting 3.3 Mechanical anchors.	02	06
Unit -4	Masonry walls: 4.1 Damp walls, causes effects, remedies, eradication of efflorescence 4.2 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.	03	07
Unit -5	Repairs to foundation: 5.1 Remedies, types & processes of settlement, foundation sinking 5.2 Examination of existing foundation, strengthening of foundation.	03	07
Unit -6	Water proofing: 1.1 Leaking Basements & roofs	02	03
Unit -7	Concept of repairs & strengthening of RCC structures: 7.1 Concept of repairs of RCC structures 7.2 Physical examination of common defects, 7.3 Structural repairs & strengthening repairs by new developments.	02	03
Unit -8	Damage due to fire: 8.1 Fire resistance, effects of temp. of RCC, 8.2 Repairs to RCC structures damaged due to fire	02	03
Unit -9	Advanced Damage detection techniques: 9.1 Advanced damage detection techniques, non destructive testing.	03	05
Unit -10	Strengthening methods: 10.1 Cantilevers, beams, slabs, walls, columns, foundation.	04	09
Unit -11	Evaluation of strength, economic & age of building: 11.1 Determination of approx. age of a building. 11.2 Determination of strength of structural member of old building. 11.3 Finding cost in use of a existing building.	02	05
Unit -12	Maintenance of life lines: 12.1 Maintenance of electric supply, water supply leaking pipe joints and sewerage systems, closed drains, sewers. 12.2 Maintenance of roads, road berms, side drain maintenance of bridges, culverts causeways	02	05

Unit -13	Estimates and tendering:		
	13.1 Estimates of annual repairs, special repairs and maintenance work.	02	03
	13.2 Preparation of tender		
	Total	32	70

Text /Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Maintenance and Repairs of Buildings	P.K. Guha	New Central book Agencies
Maintenance Engineering For Civil Engineers	Nayak B. S.	Khanna Publication
Maintenance and Repairs of Buildings	Hutchin Son, BD	Newnes –Butterworth.
Building Failures – Diagnosis and Avoidance	Ransom W. H.	E and F. N. Span.
Maintenance and Rehabilitation of Structures	P.K. Goyal	Foundation Publishing

ELECTIVE (ANY ONE) –(iii) ARCHITECTURAL PRACTICES & INTERIOR DESIGN (CIVIL ENGINEERING)

Subject Code 1615605C	Theory			Full Marks	:	100	Credits 02
	No. of Periods Per Week						
	L	T	P/S	TA	:	10	
	02	—	—	CT	:	20	
	—	—	—				

CONTENTS : THEORY

Section A – Architectural Practice		Hrs/week	Marks
Unit -1	Architectural Design: 1.1 Review of principles of Architecture. 1.2 Site selection, climatic conditions, sun control, orientation of building & site. 1.3 Building by laws & its applications.	02	05
Unit -2	Building Aesthetics: 2.1 Feeling for aesthetics and utility, composition, unity, mass composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern. 2.2 Character of Building.	02	05
Unit – 3	Design of Projects: 1.1 A case study of residential building. 1.2 A case study of public / commercial building. 1.3 Aspect of working drawing – plan, elevation section	08	15
Unit – 4	Landscaping: 4.1 Soft and Hard landscaping. 4.2 Basic Principle of landscaping. 4.3 Assessment of land. 4.4 Design procedure. 4.5 A case study of land scape for public/ commercial building campus.	04	10
Total		16	35
Section – B: Interior Design		Hrs/week	Marks
Unit – 1	Elements and principles of design. 1.1 Elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern. 1.2 Importance of colour as art element. Various colour scheme.	03	05
Unit – 2	Anthropometrics Data: 2.1 Relation of human measurement to furniture and movement and to circulation patterns.	01	05
Unit – 3	Interior Materials: 3.1 Different interior materials, paneling, partitions, finishing materials, furniture. 3.2 False ceiling, flooring, paints.	02	04
Unit – 4	Interior of Residential building: 4.1 Use of space, circulation, standard size of furniture. 4.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.	07	17
Unit – 5	Interior of small commercial building: 7.1 Planning of interior for small commercial units such as offices, consulting chambers, shops etc. 7.2 Furniture details such as executive table, architectures table etc. used in commercial units.	03	04
Total		16	35

Text/Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Building construction	M. G. Shah, C.M. Kale / S.Y. Patiki	Tata McGraw Hill
Time saver standard for interior design & space planning	Joseph De Chiara, Julins Panch, martin Zelnik	MC Graw Hill
The use of colours in interiors	Albert O. Halse	Mc Graw Hill
Nwtert – Architects	Bousmaha Baiche & Nicholes Walliman	Black Well Science
Architectural Practices and Interior Design	-	-

1. **IS/International codes** – National building codes.
2. **Journals / Periodicals:**
 1. Inside out side
 2. A + D Journal on architecture.
 3. Indian Architects and builders.
 4. Design & Interiors.
4. **Software:**
 1. Auto CAD
 2. 3 D Max.
 3. 3 D Home

**ELECTIVE (ANY ONE) –(iv) EARTHQUAKE RESISTANT
DESIGN & CONSTRUCTION (CIVIL ENGINEERING)**

Subject Code 1615605D	Theory			Credits		
	No. of Periods Per Week			Full Marks	:	100
	L	T	P/S	ESE	:	70
	02	—	—	TA	:	10
	—	—	—	CT	:	20

CONTENTS : THEORY

S.No.	UNIT	Periods
01	The Earthquakes	(06)
02	Vibrations of Single Degree of freedom System	(20)
03	Vibration of Multiple Degrees of Freedom System	(08)
04	Earthquake Motion & Reponse	(06)
05	Aseismic Design of Structures	(20)
	Total :	(60)

<u>UNIT: 01 - THE EARTHQUAKES</u>		[06]
01.01	Earthquakes	
01.02	Epicentre, hypocentre and earthquake waves	
01.03	Measurement of Ground Motion	
01.04	Cause of Earthquake (Plate tectonic)	
01.05	Intensity and Isoseismals of an earthquake	
01.06	Magnitude and Energy of an earthquake	
01.07	Relationship of fault length, affected area and duration with magnitude	
01.08	Consequences of earthquakes	
01.09	Sesimic Zoning	
01.10	Risk Maps	
01.11	Strong Ground Motion Arrays	
<u>UNIT 02 - VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEM :</u>		[20]
02.01	Types of Vibrations	
02.02	Degrees of Freedom	
02.03	Spring action and damping	
02.04	Equation of motion of single degree of freedom	
02.05	Free Vibrations of Undamped systems having single degree of freedom	
02.06	Combination of stiffnesses	
02.07	Vibration of Damped System having single degree of freedom	
02.08	Dry Friction Damping	
02.09	Negative Damping	
02.10	Forced Vibration of a Undamped System	
02.11	Forced vibrations of a damped system	

02.12	Equivalent viscous damping	
02.13	Vibration isolation	
02.14	Vibration Measuring Instruments	
02.15	System subjected to transient forces	
<u>UNIT: 03 - VIBRATION OF MULTIPLE DEGREES OF FREEDOM SYSTEMS:</u>		[08]
03.01	Introduction	
03.02	Two Degrees of freedom	
03.03	Many degrees of freedom	
03.04	Forced vibration – earthquake excitation	
<u>UNIT: 04 - EARTHQUAKE MOTION AND RESPONSE:</u>		[06]
04.01	Introduction	
04.02	Strong motion earthquakes	
04.03	Numerical method for spectra	
04.04	Elastic spectra	
04.05	Ground velocity and displacement	
04.06	Inelastic spectra	
<u>UNIT: 05 - SEISMIC DESIGN OF STRUCTURES:</u>		[20]
05.01	Design data and philosophy of design	
05.02	Multistory Buildings(G+2) Design-Analysis Design	
05.03	Earthquake resistant construction of buildings	
05.04	Ductility provisions in reinforced concrete construction	
05.05	Base Isolation	
05.06	Capacity building Design and Pushover Analysis	
05.07	Retrofitting of Buildings	

Books Recommended:-

1.	Earthquake Resistant Design & Analysis	Jai Krishna.
2.	Dynamic of Structures	Mario Paz.
3.	Dynamic of Structures	A. K. Chopra.
4.	IS : 1893-2002; IS : 13920-1993; IS : 13828-1993, IS : 4326-1993	
5.	Theory of Structures	Farzard Naim.
6.	Dynamics of Structures	Clough & Penzien.

ELECTIVE (ANY ONE) –(i) MICRO IRRIGATION
(CIVIL (RURAL) ENGINEERING)

Subject Code 1616605A	Theory						Credits 02		
	No. of Periods Per Week			Full Marks				:	100
	L	T	P/S	ESE				:	70
	02	—	—	TA				:	10
	—	—	—	CT				:	20

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Introduction: 1.1 Definition of micro irrigation 1.2 Necessity of micro irrigation, 1.3 Advantages of micro irrigation system, 1.4 Difficulties in micro irrigation. 1.5 Comparison between micro irrigation and other methods of irrigation.	02	04
Unit -2	Soil-Plant-Water-Relation: 2.1 Soil moisture relation, Hygroscopic water, Field capacity water, Gravitational water, Field capacity, Permanent wilting point, Available moisture, Readily available moisture, Soil moisture deficiency, Equivalent moisture. 2.2 Definition of irrigation frequency. Estimating depth and frequency of irrigation on the basis of soil moisture regime concept, Simple problems. 2.3 Optimum utilization of irrigation water, Definition of irrigation efficiencies. 2.4 Evapotranspiration and/or Consumptive use of water, Methods of finding evapotranspiration by Pan Evaporimeter and Modified Penman method . (No Problems) 2.5 Water audit , Concept of water audit , Necessity of water audit, Benefits of water audit,	06	14
Unit - 3	Methods of Micro Irrigation: 3.1 Sprinkler and Drip irrigation. 3.2 Benefits and limitations of sprinkler and drip irrigation systems. 3.3 Comparison between sprinkler irrigation and drip irrigation system. 3.4 Layout of sprinkler irrigation system and drip irrigation system.	04	06
Unit - 4	Design of Sprinkler Irrigation System: 4.1 Design of main, sub-main, lateral and sprinkler. 4.2 Types of sprinklers and selection 4.3 Design and selection of micro sprinkler Irrigation systems.	08	18
Unit - 5	Design of Drip Irrigation System: 5.1 Design of main, Submain, Lateral and Drippers 5.2 Types of drippers and selection 5.3 Design and selection of micro jet 5.4 Selection of Pumps 5.5 Installation and maintenance of drip irrigation system	08	18
Unit - 6	Fertigation And Filtrations: 6.1 Advantage and limitations of Fertigation 6.2 Methods for Fertilizer injection 6.3 Filtration – Particle size, Selection of filter, Filtration methods, Methods of cleaning filters. 6.4 Filters and their types.	04	10
Total		32	70

Text/Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Irrigation Theory and Practice	A.M.Michael	Vikas Publisher House, New Delhi.
Sprinkler Irrigation	--	WALMI Aurangabad.
Drip Irrigation	--	WALMI Aurangabad .
Principle of Drip Irrigation	Dr.M.S.Mane, B.L.Ayare Dr.S.S.Magar	Jain Brothers New Delhi.
Sprinkler Irrigation	R.K.Sivanappan	Oxford & I B Publishing New Delhi.
Micro Irrigation	S.P. Jain	Foundation Publishing

ELECTIVE (ANY ONE) –(ii) MAINTENANCE & REHABILITATION OF STRUCTURES
(CIVIL ENGINEERING GROUP)

Subject Code 1615605B	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Name of the Topic		Hrs/week	Marks
Unit -1	Introduction 1.5 Necessity, operation, maintenance & repairs of structures 1.6 Classification of maintenance, 1.7 Rehabilitation (restoration), strengthening, retrofitting. 1.8 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.	03	06
Unit -2	Causes & detection of damages: 2.3 Causes of damages, damages due to earthquakes, fire hazards, flood, hazards, dilapidation, 2.4 List of basic equipments for investigation.	02	08
Unit - 3	Materials for repairs: 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting, cement mortar, 3.4 Shot-creting 3.5 Mechanical anchors.	02	06
Unit -4	Masonry walls: 4.3 Damp walls, causes effects, remedies, eradication of efflorescence 4.4 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.	03	07
Unit -5	Repairs to foundation: 5.3 Remedies, types & processes of settlement, foundation sinking 5.4 Examination of existing foundation, strengthening of foundation.	03	07
Unit -6	Water proofing: 1.1 Leaking Basements & roofs	02	03
Unit -7	Concept of repairs & strengthening of RCC structures: 7.4 Concept of repairs of RCC structures 7.5 Physical examination of common defects, 7.6 Structural repairs & strengthening repairs by new developments.	02	03
Unit -8	Damage due to fire: 8.3 Fire resistance, effects of temp. of RCC, 8.4 Repairs to RCC structures damaged due to fire	02	03
Unit -9	Advanced Damage detection techniques: 9.1 Advanced damage detection techniques, non destructive testing.	03	05
Unit -10	Strengthening methods: 10.1 Cantilevers, beams, slabs, walls, columns, foundation.	04	09
Unit -11	Evaluation of strength, economic & age of building: 11.1 Determination of approx. age of a building. 11.2 Determination of strength of structural member of old building. 11.3 Finding cost in use of a existing building.	02	05
Unit -12	Maintenance of life lines: 12.1 Maintenance of electric supply, water supply leaking pipe joints and sewerage systems, closed drains, sewers. 12.2 Maintenance of roads, road berms, side drain, maintenance of bridges, culverts causeways	02	05

Unit -13	Estimates and tendering:		
	13.3 Estimates of annual repairs, special repairs and maintenance work.		
	13.4 Preparation of tender		
		Total	32 70

Text /Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Maintenance and Repairs of Buildings	P.K. Guha	New Central book Agencies
Maintenance Engineering For Civil Engineers	Nayak B. S.	Khanna Publication
Maintenance and Repairs of Buildings	Hutchin Son, BD	Newnes –Butterworth.
Building Failures – Diagnosis and Avoidance	Ransom W. H.	E and F. N. Span.
Maintenance and Rehabilitation of Structures	P.K. Goyal	Foundation Publishing

ELECTIVE (ANY ONE) –(iii) WATERSHED MANAGEMENT
(CIVIL (RURAL) ENGINEERING)

Subject Code 1616605C	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	02
	L	T	P/S	ESE	:	70	
	02	—	—	TA	:	10	
	—	—	—	CT	:	20	

Contents : Theory		Hrs/week	Marks
Unit -1	<p>Introduction:</p> <p>1.1 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management</p> <p>1.2 Characteristics of watershed, objectives of watershed management, benefits of watershed development</p> <p>1.3 Causes and effects of degradation</p> <p>1.4 Integrated multi disciplinary approach for watershed, steps in watershed management.</p> <p>1.5 Ill effects of urbanisation on watershed management</p>	06	08
Unit -2	<p>Soil and Water Conservation:</p> <p>2.1 Soil erosion- definition of erosion, problems of erosion, types of soil erosion.</p> <p>2.2 Land classification for watershed management</p> <p>2.3 Soil conservation, need of soil conservation, soil conservation technology.</p> <p>2.4 Engineering measures for erosion control such as contour cultivation, contour bunding, graded bunding, bench terracing, trenching, construction of grade stabilisation structure, retention of detention reservoirs, agronomical measures (names only)</p> <p>2.5 Contour bunds, design of contour bunds, drainage of excessive water to protect contour bunds, maintenance of contour bund.</p> <p>2.6 Graded bunding, design of graded bunding, alignment and construction, maintenance, advantages and limitations of graded bunding.</p> <p>2.7 Bench terracing, types, design.</p> <p>2.8 Grassed waterways, shape, planning, construction and vegetation, maintenance, diversion drains.</p> <p>2.9 Control of gullies and their reclamation for various land Use</p>	08	20
Unit -3	<p>Water Harvesting:</p> <p>3.1 Definition, need of rainwater harvesting, advantages of Rainwater harvesting,. Techniques of rainwater harvesting- roof water harvesting and surface water harvesting(definition)</p> <p>3.2 Traditional methods of rainwater harvesting in deccan plateau-cheruva, kohli tank, phad, kere, the ramtek model and bhandaras (short description with neat sketch).</p> <p>3.3 Roof water harvesting- techniques as storage and ground water recharge, components- catchment, coarse mesh, gutters, conduits, first flushing, filters, storage facilities, recharge structures Recharge structures – pit, trench, dug well, hand pump, recharge well, lateral shaft with borehole, percolation pit with borehole. Types of filters</p> <p>3.4 Reuse of domestic water</p>	08	18

Unit - 4	Water Harvesting Structures: 4.1 Types of watershed structures- such as small weir, banchara, K.T. weir, percolation tank, jalbandh, farm pond and check dam. 4.2 Details of watershed structure with neat sketch.	05	14
Unit - 5	Socio Economic Aspects: .1 People's awareness, participation and response. .2 State and integrated approach. .3 Sustainable society for economical upliftment. .4 Economics.	05	10
	Total	32	70

Text /Reference Books:-		
Titles of the Book	Name of Authors	Name of the Publisher
Watershed management	V. V. Dhruvanarayana G. Sastry, U. S. Patnaik	Indian Council for Agricultural Research, Krishi Anusandhan Bhawan, Pusa, New Delhi
Watershed management in India	J. V. S. Murty	Wiley Estern Ltd.
Watershed planning and management	Raj Vir Singh	Yash publishing House,
Field manual on watershed management	--	Central Research Institute For Dry Land Agriculture, Hydrabad- 500659
Watershed management	E. M. Tideman	Omega Scientific Publications, New Delhi
Watershed management	N. D. Mani	Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
Watershed management : practice, policies and coordination	Robert J. Reimold	BOSS International US ISBN0070522995
Watershed Management	K.P. Sinha	Foundation Publishing

ENVIRONMENT ENGINEERING LAB
(CIVIL ENGINEERING GROUP)

Subject Code 1615606	Practical						Credits 01	
	No. of Periods Per Week			Full Marks	:	50		
	L	T	P/S	ESE	:	50		
	—	—	02	Internal	:	15		
	—	—	—	External	:	35		

Contents : Practical

Skills to be developed:

Intellectual Skills:

1. Identify the method for testing of water.
2. Interpret the results.

Motor Skills:

1. Observe chemical reactions
2. Handle instruments carefully

List of Practical:

Water Supply Engineering:

- 1) To determine fluoride concentration in given water sample
- 2) To determine the turbidity of the given sample of water.
- 3) To determine residual chlorine in a given sample of water.
- 4) To determine suspended solids, dissolved solids, and total solids of water sample
- 5) To determine the dissolved oxygen in a sample of water.
- 6) To determine the optimum dose of coagulant in the given sample by jar test.

Sanitary Engineering:

- 1) To determine the dissolved Oxygen in a sample of waste water.
- 2) To determine B.O.D. of given sample of waste water.
- 3) To determine C.O.D. of given sample of waste water.
- 4) To determine suspended solids, dissolved solids and total solids of waste water sample.
- 5) Design the Septic Tank for the public building such as hostel or hospital. Draw Plan and Section of the same along with the drainage arrangement in soak pit.
- 6) To determine various pollutant levels in the atmosphere using Digital Air Volume Sampler.
 - a) Energy generation plants from solid wastes.
 - b) Energy generation plants from Gobar Gas.

ELECTIVE (ANY ONE) –(i) ADVANCED CONSTRUCTION
TECHNIQUES AND EQUIPMENTS LAB
(CIVIL ENGINEERING)

Subject Code	Practical			Full Marks	:	50	Credits
	No. of Periods Per Week						
1615607A	L	T	P/S	ESE	:	50	01
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

Contents: Practical

Skills to be developed:

Intellectual Skills:

1. know the new materials of construction.
2. get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

List of Practical:

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (l/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.
6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/ LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two-storied framed structured residential building.

**ELECTIVE (ANY ONE) –(ii) MAINTENNANCE AND
REHABILITATION OF STRUCTURES LAB
(CIVIL ENGINEERING GROUP)**

Subject Code 1615607B	Practical			Credits			
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

S.No	Contents: Practical
1	<ul style="list-style-type: none"> • Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
2	<ul style="list-style-type: none"> • Finding the approximate. strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
3	<ul style="list-style-type: none"> • Prepare estimate of retrofitting of plumbing of a building.
4	<ul style="list-style-type: none"> • Determine approximate age and economics of an old house.
5	<ul style="list-style-type: none"> • Determine load carrying capacity of a slab, beam, column by using rebound hammer

ELECTIVE (ANY ONE) –(iii) ARCHITECTUREAL PRACTICES AND
INTERIOR DESIGN LAB
(CIVIL ENGINEERING)

Subject Code 1615607C	Practical						Credits 01	
	No. of Periods Per Week			Full Marks	:	50		
	L	T	P/S	ESE	:	50		
	—	—	02	Internal	:	15		
	—	—	—	External	:	35		

CONTENTS: PRACTICAL

1. Prepare working drawing – plans, elevation, sections, considering thickness of plastering with
micro level details and with scale 1:50 of a given submission drawing.
2. Prepare innovative plans, elevations, sections, considering the thickness of plastering with
micro details and working drawings for residential building with scale 1:50 special
details of
components (Minimum 3 components such as kitchen otter details, compound wall gate, grill,
front door, windows, staircase etc.) with scale 1:20 / 1:15 with respect to No. 1
3. Design a landscape for any existing public building campus
4. Prepare interior plan for 2 BHK residential bungalow / flat.
5. Prepare interior plan of any one commercial unit such as office, bank, restaurant,
shop etc. Prepare a report of market survey for different materials required for interiors

ELECTIVE (ANY ONE) –(i) MICRO IRRIGATION LAB
(CIVIL(RURAL) ENGINEERING)

Subject Code 1616607A	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS : PRACTICAL

1	<ul style="list-style-type: none"> • Report writing on visit to farm with sprinkler irrigation system and preparing layout plan and neat-labeled sketches.
2	<ul style="list-style-type: none"> • Report writing on visit to farm with drip irrigation system and preparing layout plan and neat-labeled sketches.
3	<ul style="list-style-type: none"> • Design of sprinkler irrigation system for given farm with cost estimation.
4	<ul style="list-style-type: none"> • Design of drip irrigation system for a given fruit garden farm with cost estimation.

**ELECTIVE (ANY ONE) –(ii) MAINTENANCE AND
REHABILITATION OF STRUCTURES LAB
(CIVIL ENGINEERING GROUP)**

Subject Code 1615607B	Practical			Credits			
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

Contents : Practical

1	<ul style="list-style-type: none"> • Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
2	<ul style="list-style-type: none"> • Finding the approximate. strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
3	<ul style="list-style-type: none"> • Prepare estimate of retrofitting of plumbing of a building.
4	<ul style="list-style-type: none"> • Determine approximate age and economics of an old house.
5	<ul style="list-style-type: none"> • Determine load carrying capacity of a slab, beam, column by using rebound hammer

ELECTIVE (ANY ONE) –(iii) WATER SHADE MANAGEMENT LAB
(CIVIL(RURAL) ENGINEERING)

Subject Code 1616607C	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS :PRACTICAL

Practical should contain Mini project on any one of the following:

1. Rain Water Harvesting of a building.
2. Integrated water resource management of small area (e.g. college campus, small village etc.)
3. Preparation of complete water shed management plan for small area identified from top sheet
4. Case study of watershed management plan.

CONTRACTS AND ACCOUNTS -TW
(CIVIL ENGINEERING GROUP)

Subject Code 1615608	Term Work						Credits 01	
	No. of Periods Per Week			Full Marks	:	25		
	L	T	P/S	Internal	:	07		
	—	—	02	External	:	18		

CONTENTS :TERM WORK

Term Work :-

1. COLLECTING OLD SET OF TENDER DOCUMENT AND WRITING A REPORT ON IT
2. COLLECTION OF TENDER NOTICES PUBLISHED IN NEWSPAPERS FOR VARIOUS ITEMS OF CIVIL ENGINEERING WORKS.
(AT LEAST 5) WRITE SALIENT FEATURES OF THEM.
3. DRAFTING A TENDER NOTICES FOR CONSTRUCTION OF A CIVIL ENGINEERING WORK
(W. B. M. ROAD, RESIDENTIAL BUILDING)
4. PREPARATION OF TENDER DOCUMENT FOR THE BUILDING. (DETAILED ESTIMATE PREPARED FOR R.C.C. BUILDING IN ESTIMATING AND COSTING SHALL BE USED)
5. COLLECTION OF VARIOUS ACCOUNT FORMS FROM PWD & WRITING REPORT ON IT
6. WRITING A REPORT ON STORE PROCEDURE AND ACCOUNT PROCEDURE OF PWD. FOR IT A GUEST LECTURE OF PWD OFFICIAL MAY BE ARRANGED.
7. WRITING DETAILED SPECIFICATIONS FOR ONE ITEM FROM EACH OF FOLLOWING :
 - A) BUILDING CONSTRUCTION SYSTEM.
 - B) IRRIGATION ENGINEERING SYSTEM.
 - C) TRANSPORTATION ENGINEERING SYSTEM.
 - D) ENVIRONMENT ENGINEERING SYSTEM.

DESIGN OF STRUCTURES -TW
(CIVIL ENGINEERING GROUP)

Subject Code 1615609	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	—	—	02	External	:	18	

C

CONTENTS :TERM WORK

1. ANALYSE THE DATA FOR DESIGN.
2. Design component parts of

building. **Motor Skills:**

1. Draw proportionate sketches.
2. Draw constructional details.

Term work shall consist of sketch book, design of R.C.C structural components.

Sketch

book:

Sketch book consists of approximately ten plates from R.C.C. Design shall include important information of clauses of IS 456-2000 code. Typical sketches of components members/stress distribution & strain distribution diagrams R.C.C. section/detailing of reinforcement in joints/members. Design of R.C.C. structural components by LSM.

The students should make detailed simple design and drawing of reinforcement detailing on two full imperial size sheets finished in pencil on *any five* of the following R.C.C. component members of a two - storied building with detailing of reinforcement (G+1) at the joints as per requirements & IS 13920

1. One-way simply supported slab.
2. Two-way simply supported slab.
3. Cantilever slab/chajja.
4. T-Beam.
5. Column and column footing.
6. Dog-legged staircase

I.S. Codes:

1. IS 456:2000 - Plain and Reinforced concrete code of Practice.
2. SP16- Design Aids for reinforced concrete to IS 456.
3. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.
Part 1 - Dead load
Part 2 - Imposed (live) load
Part 3 - Wind load
4. SP 24 - Explanatory Handbook on IS 456
5. IS 1343-1980 - Indian Standard code of (Reaffirmed 1990) Practice for Prestressed concrete.
6. SP34 : 1987- Handbook on concrete reinforcement and Detailing.
7. IS 13920-1993 DUCTILE detailing of R. C. Building subjected to Scrim forces.

PROFESSIONAL PRACTICES VI - TW
(MECH.+CIVIL ENGINEERING GROUP)

Subject Code 1625610	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	02
	L	T	P/S	Internal	:	07	
	—	—	03	External	:	18	

CONTENTS :TERM WORK

		Hrs/week
Unit -1	Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work. (minimum 3 visits) Following are the suggested type of Industries/ Fields - i) Visit to RCC framed structure building for details of reinforcement. ii) Visit to water /sewage treatment plant. iii) Visit to works carried out under watershed development/micro irrigation scheme. iv) Visit to any structure undergoing rehabilitation/retrofitting.	18
Unit -2	The Guest Lecture/s from field/industry experts, professionals to be arranged (2 Hrs duration), minimum 2 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work. a) HRD and civil engineering projects. b) Project planning and execution of civil engineering projects. c) PWD system of accounts d) Contract Management e) RCC design and detailing	14
Unit - 3	Information Search ,data collection and writing a report on the topic a) Collection of data for valuation of old building b) Collection of details of BOT project under execution. c) Collection of Data and case study of failure of RCC structure. d) Collection of information on any topic from journal available in library.	10
Unit - 4	The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are - i) Role of civil engineer in disaster management. j) Scope of out sourcing of civil engineering services. k) Pollution control.	10
Unit - 5	Seminar Presentation The students should select a topic for Seminar based on recent developments in civil engineering field, emerging technology etc.	12
Total		64

CIVIL ENGINEERING PROJECT -TW
(CIVIL ENGINEERING GROUP)

Subject Code 1615611	Term Work						Credits 03
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal	:	15	
	—	—	05	External	:	35	

CONTENTS :TERM WORK

Project:

Skills to be developed:

Intellectual skills:

- 1) Decide and collect data for projects.
- 2) Read and interpret the drawing, data.
- 3) Design the components.
- 4) Apply the principles rules regulations and byelaws.

Motor skills:

- 1) Plan for different phases of a task.
- 2) Prepare drawings for project.
- 3) Use of computer for drawing, networking.

List of Projects:

Following is the list /areas of suggested civil engineering projects to be undertaken by a group of 4 to 6 students .The project can be selected from any four civil engineering system like Building construction system, transportation engineering system, irrigation engineering system. A topic for project can also be selected on recent development in civil engineering.

The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

LIST OF CIVIL ENGINEERNG PROJECTS:

- 1) K.T. Weir
- 2) Lift Irrigation scheme.
- 3) Micro irrigation –Drip/Sprinkler Irrigation.
- 4) Junction planning for city roads/planning for roads for congested area/parking Studies etc.

- 5) Water shed development of small catchments.
- 6) Rain water harvesting for domestic or public building.
- 7) Campus development.
- 8) Interior decoration.
- 9) Concrete mix design.
- 10) Bridge design.
- 11) NDT of any RCC building.
- 12) Solid waste management.
- 13) Hospital waste disposal.
- 14) Recycling of resources.
- 15) Manufacturing of Pre cast concrete products.
- 16) Prestressed concrete.
- 17) Non conventional sources of energy.
- 18) Concrete pipe manufacturing unit.
- 19) Advance construction techniques.
- 20) Transfer of technology to villages.
- 21) Planning and design for residential apartments/commercial complex.
- 22) Planning and design of water treatment plant for given data.
- 23) Planning and design of water supply scheme for given lay out.
- 24) Planning and design of sewage treatment plant for given data.
- 25) Planning and design of sanitary scheme for given lay out.

Any other similar project can be selected.

Term Work: Shall consist of ----Detailed project report in above format.

Learning Resources:

- 1) Civil Engineering Hand Books / Reference books.
- 2) Civil Engineering Magazines
- 3) Relevant IS / International codes.
- 4) PWD Handbooks / M.I.Manuals
- 5) Material / Machinery / Product Catalogue.

RURAL ENGINEERING -TW
(CIVIL ENGINEERING GROUP)

Subject Code	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	
	1615612	L	T	P/S	Internal	:	
—		—	03	External	:	18	

CONTENTS :TERM WORK

Term work shall consist of reports on any six of the following assignments:

- 1.1 Socio Economic survey of village, to identify, the needs of village people
- 1.2 Visit to the Structures built under water shade management program (at least two structure)
 1. Gabian structure
 2. Underground Bandhara
 3. Kolhapur type weir
 4. Cement Plug, Contour Bunding Rain Water Harvesting
 Prepare neat labeled sketches and report on the above visits.
- 2 Visit to a farmer's house
 - 2.1 Profile of a farmer for case study
 - 2.2 Measured drawing of existing farmers house
 - 2.3 Preparation of modified plan with due suggestions with respect to water supply, sanitations, cattle shade, fodder shade, court yard, composting yard, bio/Gobar Gas plant.
- 3 Report writing on the following with neat labeled sketches (Minimum one)
 - 3.1 Sprinkler Irrigation System, with capacity calculation, head and discharge calculation, power calculation for pump, pressure calculation for pipe.
 - 3.2. Drip Irrigation System with capacity calculation, head and discharge calculation, Power calculation for pump, pressure calculation for pipe
 - 3.3 Layout of Lift Irrigation, with capacity calculation, head and discharge calculation, power calculation for pump, pressure and dia. Calculation for pipe.
- 4 Report writing on any one of the cottage industries related to civil engineering regarding demand, utility, advantages, effect on rural economy etc.
 - 1 Brick Manufacturing
 - 2 Cement Block manufacturing
 - 3 Cement concrete pole for fencing
 - 4 Roof tiles / decorative Terracotta tiles manufacturing.
 - 5 Stone Crusher.
- 5 Collecting information regarding schemes declared by State / Central Govt. in which Civil Engineer has effective participation (at least one)
 1. Indira Awas Yojna
 2. Walmiki Awas Yojna
 3. Swajal Dhara Yojna
 4. Jawahar Well Yojna
 5. Village / Farm Tank.
- 6 Collecting information regarding use of non-conventional energy source like- Solar energy, Bio/Gobar Gas plant, wind mill,

- 7 A Study report on any one
- 1) Basic Study of electrical installation for house wiring, its components, different types of wires and its uses, need of fuse and its material used, need of earthing and its use.
 - 2) Identification of electrical motor pump set, its electrical connection, fault finding and its remedies.
- 8 A Study report on
Concept of Community Polytechnic in India regarding their role in upliftment of rural population, their area of working, such as manpower development, transfer of technology, technical support services, information dissemination, community services. A visit to nearest Community Polytechnic shall be arranged. A visit report shall be prepared covering all aspect.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN COMPUTER SCIENCE & ENGINEERING
(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	EXAMINATION – SCHEME							Credits	
				Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject		
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03	
2.	System Software	1618602	03	03	10	20	70	100	28	40	03	
3.	Visual Basic	1618603	04	03	10	20	70	100	28	40	03	
4.	Computer Graphics	1618604	03	03	10	20	70	100	28	40	03	
5.	Elective (Any One)	1618605	04	03	10	20	70	100	28	40	03	
Elective - (i) Artificial Intelligence & Expert System (1618605A)					(ii) E-Commerce (1618605B)			(iii) Multimedia (1618605C)				
Total:- 17								350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	EXAMINATION – SCHEME			Credits	
					Practical (ESE)		Total Marks (A+B)		Pass Marks in the Subject
					Internal (A)	External (B)			
6.	Visual Basic Lab	1618606	06	03	15	35	50	20	03
Total:- 06							50		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	EXAMINATION – SCHEME				Credits
				Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	
7.	Computer Graphics -TW	1618607	04	15	35	50	20	02
8.	Elective (Any One) - TW	1618608	06	15	35	50	20	02
Elective- (i) Artificial Intelligence & Expert System (1618608A) - TW					(ii) E-Commerce (1618608B) -TW		(iii) Multimedia (1618608 C) -TW	
9.	Project Work & Its Presentation in Seminar -TW	1618609	-	30	70	100	40	02
Total:- 10							200	
Total Periods per week Each of duration One Hours = 33							Total Marks = 750	24

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Unit	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentation <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

Unit - 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel- Training & Development <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow's Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to - <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act	08	
Unit - 5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to - <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit - 6	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	

Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-

Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

SYSTEM SOFTWARE

Subject Code 1618602	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale & Objective:

This course will enable the students to have understanding and knowledge of various System Software's like assembler, compiler, macro-processor, linker and loader

Contents : Theory		Hrs/week	Marks
UNIT-1	<p><u>INTRODUCTION:</u></p> <p>01.01 What is System Software?</p> <p>01.02 Components of System Software</p> <p>01.03 Evolution of System Software</p> <p>01.04 The model of a computer system</p>	[06]	
UNIT-2	<p><u>LANGUAGE PROCESSORS:</u></p> <p>02.01 Introduction</p> <p>02.02 Language Processing activities.</p> <p>02.03 Fundamental of Language Processing.</p> <p>02.04 Fundamentals of Language Specification.</p>	[04]	
UNIT-3	<p><u>ASSEMBLERS:</u></p> <p>03.01 Elements of Assembly Language Programming.</p> <p>03.02 A Simple Assembly Scheme.</p> <p>03.03 Pass Structure of Assemblers.</p>	[08]	
UNIT-4	<p><u>MACROS AND MACRO PROCESSORS:</u></p> <p>04.01 Macro Instructions</p> <p>04.02 Macro Instruction argument</p> <p>04.03 Conditional Macro expansion</p> <p>04.04 Macro calls with macros</p>	[06]	
UNIT-5	<p><u>COMPILERS AND INTERPRETERS:</u></p> <p>05.01 Aspects of compilation</p> <p>05.02 Memory Allocation</p> <p>05.03 Memory Allocation</p> <p>05.04 Various phases of a compiler and their functions</p> <p style="padding-left: 20px;">Code Optimization</p> <p>05.05 Interpreters</p>	[10]	
UNIT-6	<p><u>LINKERS:</u></p> <p>06.01 Relocation and Linking Concepts</p> <p>06.02 Design of a Linker</p> <p>06.03 Loaders</p> <p>06.04 Various types of linking and loading schemes</p>	[08]	

UNIT-7	<u>SOFTWARE TOOLS:</u> 07.01 Software Tools for Program Development 07.02 Editors 07.03 Debug Monitors 07.04 Programming Environments 07.05 User Interfaces	[08]	
Total		50	

Books Recommended:-

1.	System Programming	-	J.J. Donovan McGraw Hill, New Delhi
2.	System Programming and Operating Systems	-	Dhamdhare Tata McGraw Hill, New Delhi
3.	Assemblers, Compilers and Program Translation	-	P. Calingaert Computer Science Press, Meryland
4.	System Software - An Introduction to System Programming	-	Leland L. Beck, Addison Wesley

VISUAL BASIC

Subject Code 1618603	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale & Objective:-

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>VISUAL BASIC 6.0:</u> 01.01 Data Access: <ul style="list-style-type: none"> - Developing for the Internet - Controls and Application Design Capabilities - VB's Control Set - Building Controls in Visual Basic 01.02 Integrating Development Environment with Wizards	[08]	
UNIT-2	<u>VISUAL BASIC DEVELOPMENT:</u> 02.01 The Development Interface 02.02 Development Windows: <ul style="list-style-type: none"> - Event-Driven Programming - Working with Objects and Controls <ul style="list-style-type: none"> - Toolbox controls - Working with objects - Visual Basic Modules - Building Event-Driven Code 	[10]	
UNIT-3	<u>BUILDING OBJECTS IN VISUAL BASIC:</u> 03.01 Object Basics 03.02 Building Object Models	[08]	
UNIT-4	<u>CONNECTING TO DATABASES:</u> 04.01 Date Access Objects, Remote Data Objects, ActiveX Data Objects, OLE DB, Data Bound Controls. 04.02 Using DAO to build a simple database interface 04.03 Working with the Visual Basic Report Designer	[12]	
UNIT-5	<u>INTRODUCTION TO BUILDING INTERNET APPLICATIONS:</u> 05.01 HTML basics 05.02 IIS and Active Server Pages 05.03 Building IIS Applications: <ul style="list-style-type: none"> - Web Class Designer - IIS Object Model - Building the interface - Building the functionality 	[12]	
UNIT-6	<u>DESIGNING USER INTERFACES:</u> 06.01 Visual Elements of a Visual Basic Application: <ul style="list-style-type: none"> - Menus, Toolbars and Tab Strips - ActiveX and Other Controls 	[10]	
Total		60	

COMPUTER GRAPHICS

Subject Code 1618604	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	10	

Rationale:

This course will provide an introduction to fundamental concepts in Computer Graphics from a practical perspective. It aims to cover mathematical concepts essential for computer graphics, graphic devices, various algorithms and multimedia systems. Ideally, a student who successfully completed these courses will be familiar with modern methods in computer graphics, with the use of commonly used tools in this area and having knowledge to write algorithms for generating images.

Objective:

This course is an introduction to computer graphics and provides familiarity with graphics software and hardware systems. The course covers the following concepts:

- Understanding of graphics and its applications
- The fundamentals of input, display and hardcopy devices, scan conversion of geometric primitives
- Output primitives
- Geometric representations
- Two and Three-dimensional Transformations
- Windowing and clipping methods
- Segments
- Three-dimensional concepts
- Hidden-element removal
- Multimedia hardware and applications

Contents : Theory		Hrs/week	Marks
UNIT-1	<p><u>INTRODUCTION AND APPLICATIONS:</u> What is CG, Characteristics & Classification of CG Applications: Presentation graphics, painting and drawing, scientific visualization, image processing, digital art, entertainment, CAD in architecture, animation.</p>	[03]	
UNIT-2	<p>Display devices: Random-scan and raster scan monitors, Color CRT, Plasma panel displays, LCD Panels Input/ Output Devices.</p>	[05]	
UNIT-3	<p><u>2 D DRAWING GEOMETRY:</u> 2 D transformation: Use of homogeneous coordinate systems, translation, scaling, rotation, mirror reflection, rotation about an arbitrary point. Interactive techniques: Constraints, Grids, Gravity field, Rubber-band, Dragging, Painting & drawing.</p>	[08]	
UNIT-4	<p><u>CONICS AND CURVES:</u> DDA lines circle drawing algorithm, Bresenham's lines circle drawing algorithm, Generation of ellipses, Curve drawing, Parametric representation, need of cubic curves, Drawing cubic Bezier and B-spline curves & their properties. (No derivations needed)</p>	[08]	

UNIT-5	Windowport and viewport: <ul style="list-style-type: none"> - Elimination of totally visible and totally invisible lines with respect to a rectangular window using line end point codes - Explicit line clipping algorithm - Sutherland cohen algorithm - Mid point sub-division algorithm - Polygon Clipping : Sutherland- Hodgman algo - Polygon representation, Inside & outside test of Polygon Filling: <ul style="list-style-type: none"> - Stack based and queue based seed fill algorithms - Scan line fill algorithm Character generation	[12]	
UNIT-6	3 D GRAPHICS: Transformations: <ul style="list-style-type: none"> - Transformation matrices for translation, scaling and rotation around axis Parallel Projection: Orthographic, Axonometric, Oblique projection with multi views Perspective Projection: <ul style="list-style-type: none"> - Vanishing point : Single – point, Two- point & Three point Hidden Surface Removal: Back face removal	[10]	
UNIT-7	ANIMATION: Basics of animation, Types of animation, Types of animation system. Tweaking and Morphing	[04]	
Total		50	

Books Recommended:

Text Books

1.	Computer Graphics, 2 nd Edition 2010	-	Udit Agarwal, Katson Publications
2.	Computer Graphics, Second Edition, 1995.	-	D. Hearn & P.M. Baker Prentice Hall of India
3.	OpenGL Programming Guide, Third Edition, 2000	-	Woo, Nelder, Davis, Shreiner Pearson Education Asia
4.	Multimedia, Making It Working, Fifth Edition, 2001	-	T. Vaughan McGraw Hill

Reference Books

1.	Fundamentals of Interactive Computer Graphics, Second Edition	-	J.D. Foley & A. Van Dam Addison Wesley
2.	Computer Graphics - A Programming	-	S. Harrington McGraw Hill Approach International Ed.
3.	Multimedia Systems, 2000	-	Rajneesh Agrawal & Bharat Bhushan Tiwari, Excel Publications

ELECTIVE - (ANY ONE) - (i) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Subject Code 1618605A	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale & Objective:

For effective teaching / learning of "Artificial Intelligence & Expert System", it is necessary that the list of assignment should be prepared by the subject teacher based on the topic covered in related theory papers and given to the students based on present day professional scenario. The assignment should cover problems related to "Artificial Intelligence & Expert System" based on wide requirement in Information technology / Computer science. These should strive to inculcate the skills necessary for a student to effectively use the tools & techniques as per the present day industry requirement.

The teacher should prepare the students to cover minimum ten problems.

Contents : Theory		Hrs/week	Marks
UNIT-1	Meaning of artificial intelligence, artificial intelligence and the world, representation in artificial intelligence, state space search.	[12]	
UNIT-2	Architecture of artificial intelligence system, production system design, implementation and limitation, Intervence & control, logic, uncertainty, Fuzzy logic.	[12]	
UNIT-3	Knowledge representation, prdicates calculus, logic & deductions using predicates calculus, syntax & semanties, qualifiers and anioms, encoding facts as predicate calculus , deduction as search-forward chaining & unification, sholeneisation, backward chaining, goal trees for backward chaining.	[14]	
UNIT-4	Natural language processing, Introduction. Overview of linguistics, grammars and languages, Basic parsing techniques, Natural language generations and systems.	[10]	
UNIT-5	Vision expert system, defining the problems, overview of the solution, phylosophical issues, human versus machine, MYCIN & DENDRAL.	[12]	
Total		60	

Books Recommended:-

1.	Artificial Intelligence, Tata McGraw Hill	-	Rowe & Rich
2.	Artificial Intelligence – An Engineering Approach, McGraw Hill	-	Robert Sehalhott
3.	Artificial Intelligence & Expert System, PHI	-	W. Patterson

ELECTIVE - (ANY ONE) - (ii) E- COMMERCE

Subject Code 1618605B	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale & Objective:

"Electronic Commerce" or "Doing, business online" is becoming critical in three interrelated dimensions. Customer-to-business interactions, customer-to-customer, intra-business interactions. Electronic Commerce facilitates the network form of organization where small flexible firms rely on other partner companies for component supplies and product distribution to meet changing customer demand more effectively. The transaction management aspect of electronic commerce enables firms to reduce costs by enabling better coordination in sales, production and distribution processes and automated supply chain network. Electronic Data Interchange (EDI), Electronic Mail and Electronic Fund Transfer (EFT), streamline business process, reduces paperwork and increase automation. The course will enable the students to understand e-commerce, its applications, the processes and the security issues.

Contents : Theory		Hrs/week	Marks
UNIT-1	<p><u>ELECTRONIC COMMERCE FRAMEWORK:</u> Defining electronic commerce; technology of digital convergence; convergence of content and transmission types of electronic commerce – inter-organizational E-commerce, EDI over WAN, Extranets, Electronic Fund Transfer, e-mail, Fax, Intra-organizational e-mail, Customer to Business e-mail (B2B, B2C, C2C). Components of E-Commerce - Institutions – Government, Merchants, Manufacturers, Suppliers, consumers, banks, - financial institutions - Processes – Marketing, Sales, Payments, Fulfillment, Support Networks – Corporate, Internet, Commercial</p>	[08]	
UNIT-2	<p><u>ARCHITECTURAL FRAME WORK OF E-COMMERCE:</u> - Web Architecture - web browser, HTTP, TCP/IP, Web server, HTML, CGI Scripts</p>	[08]	
UNIT-3	<p><u>E-BUSINESS ACTIVITIES:</u> Supply-chain management, selling-chain management, operating resource management, ERP, CRM, customer asset management.</p>	[06]	
UNIT-4	<p><u>SECURITY ISSUES:</u> Firewalls and proxy application gateways, Secure Electronic Transaction (SET), public and private key encryption, digital signatures and digital certificates, Secure Socket Layer (SSL)</p>	[10]	
UNIT-5	<p><u>ELECTRONIC PAYMENT SYSTEMS:</u> Digital cash, electronic to ATM, Debit cards at Point of Sale (POS), Smart Cards, Online Credit Card based Systems, Electronic Fund Transfer (EFT), Payment gateways.</p>	[08]	
UNIT-6	<p><u>ELECTRONIC COMMERCE APPLICATIONS:</u> E-commerce Banking, Online Shopping, Business Models and Revenue Models, On-line publishing, E-commerce in retailing industry, Digital Copyrights, Electronic Data Interchange, Electronic Fund Transfer, Electronic Bulletin Boards, Electronic Cataloguing.</p>	[12]	

UNIT-7	<u>IMPLEMENTATION OF E-COMMERCE:</u> Visit and analyse various popular sites. Developing E-commerce Enabled Application - getting an internet, merchant bank account, web hosting, obtaining digital certificate, finding a provider of online transactions, creating of purchasing a shopping cart software	[08]	
Total		60	

Books Recommended:-

1.	Electronic Commerce - A Manager's Guide	-	Ravi Kalakota and Andrew B. Whinston Addison Wesley (Singapore) Pvt. Ltd., New Delhi
2.	E-Business - Roadmap for Success	-	Ravi Kalakota and Maxia Robinson Addison Wesley (Singapore) Pvt. Ltd., New Delhi
3.	E-Business (R) Evolution	-	Amor Addison Wesley (Singapore) Pvt. Ltd., New Delhi
4.	Frontiers of Electronic Commerce	-	Ravi Kalakota and Andrew B. Whinston Addison Wesley (Singapore) Pvt. Ltd., New Delhi
5.	E-Business with Net Commerce (with CD)	-	Shurety Addison Wesley (Singapore) Pvt. Ltd., New Delhi

ELECTIVE - (ANY ONE) - (iii) MULTIMEDIA

Subject Code 1618605C	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale & Objective:

This course will enable the students to understand the basic concepts of graphics and multimedia, familiarize with multimedia input, output and storage devices and appreciate features of multimedia software and develop small applications.

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>INTRODUCTION TO COMPUTER GRAPHICS AND MULTIMEDIA:</u> Introduction to multimedia, concepts of animation and simulation, various applications of multimedia in education, research and development, business and games, training, entertainment.	[10]	
UNIT-2	<u>MULTIMEDIA HARDWARE:</u> Sound and Video cards, compression techniques, Memory & Storage devices, Input devices, Output hardware, Communication device. Introduction of Multimedia authoring tools & its types.	[14]	
UNIT-3	<u>MULTIMEDIA SOFTWARE:</u> Features of any one of authoring tools such as Macro-media/ Adobe Photo-shop/ 3-D studio/ Paint-Shop Pro/ Animator Pro/ Director and Harvard graphics	[08]	
UNIT-4	<u>BASIC CONCEPTS OF VIRTUAL REALITY:</u>	[02]	
UNIT-5	<u>MULTIMEDIA SYSTEM AND ITS APPLICATIONS:</u> Music & Sound: Audio basic concepts, Analog and Digital concepts, MIDI hardware, MIDI file. Sound- editing process. Audio file format, MIDI versus digital Audio, Video: Basic concepts, Analog Video & Digital Video, Video capture & editing, Video file format. Text & Images: Introduction, file format	[26]	
Total		60	

Books Recommended:-

1.	Multimedia	-	Villam Casanove and Molina Prentice Hall of India, New Delhi
2.	Multimedia Bible	-	Win Rosch
3.	Multimedia Making IT work, Osborne McGraw Hill	-	Tay Vaughan
4.	Multimedia System, Addison Wesley	-	Buford
5.	Multimedia System, Excel	-	Agrwal & Tiwari
6.	Multimedia in Action, Vikas	-	James E. Skuman
7.	Multimedia Technology and Its Application, Galgotia Publications	-	David Hillman
8.	Multimedia Systems, Addison Wesley	-	Sleinritz

VISUAL BASIC LAB

Subject Code 1618606	Practical			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Rationale & Objective:-

List of Experiments:-

Contents : Practical		Hrs/week	Marks
UNIT-1	<p>Create a form with one textbox and two command buttons having caption "Font" and "Exit". The user types text in the textbox and clicks on Fonts. The current form gets enlarged and now in addition to above controls, the form contains frame on which following control are placed.</p> <ul style="list-style-type: none"> (a) Combo box, which will contain list of fonts. (b) Combo box, which will contain font style (bold, italic). (c) Combo box, which will contain font size. (d) Check box with caption "Underline". (e) Checkbox with caption "Strikethrough". (f) Label with caption "Sample" for showing preview. (g) Two command buttons with caption "OK" and "Cancel" respectively. 	[]	
	<p>The user should now be able to do the following:</p> <ul style="list-style-type: none"> (i) Choose an option from each combo box for Font, Style & Size. (ii) Select effect as Underline or Strikethrough. (iii) While performing a & b, the user should be able to see the preview as label. (iv) To complete the task, the user has to click on OK. The form should shrink back to its original size and display, and the text should be displayed according to the attribute set. (v) Exit is used to terminate the application. 		
UNIT-2	Develop an application, which will contain numbers of images using control array. Using scrollbar increase or decrease numbers of images.	[]	
UNIT-3	Develop a program that will cut, copy and paste text of text box.	[]	
UNIT-4	Create a project that will open & save contents of file using menu editor.	[]	
UNIT-5	Create a project with a file list, picture box & command button. Write appropriate code in appropriate event of controls so that upon startup, the list box should display the list of all *.bmp & *.ice in the current directory. After the user selection of file from the list box, the selected file should be displayed in the picture box control on clicking a command button.	[]	
UNIT-6	<p>Write a user-defined procedure that:</p> <ul style="list-style-type: none"> (a) Takes a name of text file as arguments, opens that file, reads it & then displays its contents in a textbox. (b) Open a text file & retrieve the contents of the first line in the text file. Put first 3 text words into three string variables. 	[]	
UNIT-7	Write a simple animation application using timer control. Your project should contain an image, which moves around the form and changes its direction when it hits, the sides of the form.	[]	

UNIT-8	Create a form with two command button having caption "Display Windows Directory" and "Exit". Make use of windows API DLL GetWindowDirectory () to display the directory in which Microsoft Window is installed when command button named "Display Window Directory" is clicked. "Exit" button is used to exit the application.	[]	
UNIT-9	Develop an application that will take the name of sound file (e.g. file with extension.wav) as an argument and will play the file. Use API function for playing the file.	[]	
UNIT-10	Create a Employee database named emp.mdb. Select six fields at minimum such as empno, empname, salary, destination etc. Design a form so that senior manager of the company can navigate through the records using (a) Data control (b) DAO	[]	
UNIT-11	Design a control, by extending textbox by offering the following features: (a) The textbox will support all the regular properties values that the standard textbox control supports, but it will not accept numeric letters. (b) The textbox will also contain two new properties called Autosize that supply four possible values -> NA, 2-small, 3-medium, 4-large. These values will appear as an enumeration in dropdown list box inside a properties window. When set to 1-NA, the textbox font size will not change. When set to 2-small the text box will be sized to 25% of the textbox height value. When set to 4-large the text box will be sized to 75% of the textbox height value. (c) The textbox will also contain two new properties called Ucase & Lcase. These will be boolean properties. When Ucase is set to true, the text in the textbox will be converted to uppercase letters. When Lcas is set to true, the text in the textbox will be converted to lowercase letters. Both Ucase & Lcase are said to be false by default. Your control must make sure when one of the case property is set to true, the other is set to false.	[]	
	(a) The textbox will also have a event called Badkey for, when the user tries to type something like numeric letter in the textbox.		
UNIT-12	The home page of AdWorld should contain a list of all the stores containing "Toys, Flowers, Books and Confectionery". Write a code for the following. (a) The caption of the web page "AdWorld" should be in blue colour and centered. (b) The scrolling text displaying "A shop at your fingertips" should be in green. (c) The list of stores on the web page should be displayed in red colour and the font size should be 30. (d) The home page should have the pink colour as background. (e) When the user moves the mouse pointer or click on any of the stores, the corresponding image associated with the store should appear along with the description of the store. (f) Whenever the mouse moves over the item, flowers from the list of stores the item colour should change to green and the size should change to 60.	[]	
	Total		

COMPUTER GRAPHICS - TW

Subject Code 1618607	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Contents : Term Work		Hrs/week	Marks
UNIT-1	Study of basic graphics functions defined in “graphics. h”.		
UNIT-2	Study of graphics standards like CORE, GKS (Graphics Kernel System), GKS- 3D (Graphics Kernel System -3 Dimensions), PHIGS (Programmer’s Hierarchical Interactive Graphics Systems), CGM (Computer Graphics Metafile), CGI (Computer Graphics Interface).		
UNIT-3	Program to implement basic graphics primitives in OpenGL.		
UNIT-4	Program for Line Drawing using DDA algorithm using C and OpenGL.		
UNIT-5	Program for Line Drawing using Bresenham’s algorithm using C and OpenGL.		
UNIT-6	Programs using 2-D transformations in C.		
UNIT-7	Implement Polygon filling algorithms [Flood-Fill Algorithm] in C.		
UNIT-8	Programs to study window to viewport transformations in C.		
UNIT-9	Program for Cohen Sutherland Line clipping algorithm in C.		
UNIT-10	Programs to study 3-D transformations in C.		
Total			

ELECTIVE - (ANY ONE) - (i) ARTIFICIAL INTELLIGENCE &

EXPERT SYSTEMS - TW

Subject Code 1618608A	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	50	
	—	—	06	External	:	15	
						35	

Rationale & Objective:

For effective teaching / learning of "Artificial Intelligence & Expert System", it is necessary that the list of assignment should be prepared by the subject teacher based on the topic covered in related theory papers and given to the students based on present day professional scenario. The assignment should cover problems related to "Artificial Intelligence & Expert System" based on wide requirement in Information technology / Computer science. These should strive to inculcate the skills necessary for a student to effectively use the tools & techniques as per the present day industry requirement.

The teacher should prepare the students to cover minimum ten problems.

Contents : Term Work		Hrs/week	Marks
UNIT-1	Meaning of artificial intelligence, artificial intelligence and the world, representation in artificial intelligence, state space search.	[12]	
UNIT-2	Architecture of artificial intelligence system, production system design, implementation and limitation, Intervence & control, logic, uncertainty, Fuzzy logic.	[12]	
UNIT-3	Knowledge representation, prdicates calculus, logic & deductions using predicates calculus, syntax & semanties, qualifiers and anioms, encoding facts as predicate calculus, deduction as search-forward chaining & unification, sholeneisation, backward chaining, goal trees for backward chaining.	[14]	
UNIT-4	Natural language processing, Introduction. Overview of linguistics, grammars and languages, Basic parsing techniques, Natural language generations and systems.	[10]	
UNIT-5	Vision expert system, defining the problems, overview of the solution, phylosophical issues, human versus machine, MYCIN & DENDRAL.	[12]	
Total		60	

Books Recommended:-

1.	Artificial Intelligence, Tata McGraw Hill	-	Rowe & Rich
2.	Artificial Intelligence – An Engineering Approach, McGraw Hill	-	Robert Sehalhott
3.	Artificial Intelligence & Expert System, PHI	-	W. Patterson

ELECTIVE - (ANY ONE) - (ii) E-COMMERCE -TW

Subject Code 1618608B	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	50	
	—	—	06	External	:	15 35	

Rationale & Objective:-

For effective teaching / learning of “Electronic Commerce” or "Doing, business online", it is necessary that the list of assignment should be prepared by the subject teacher based on the topic covered in related theory papers and given to the students because e-commerce is becoming critical in three interrelated dimensions. Customer-to-business interactions, customer-to-customer, intra-business interactions. Electronic Commerce facilitates the network form of organization where small flexible firms rely on other partner companies for component supplies and product distribution to meet changing customer demand more effectively. The assignment should cover present explosive problems related to e-commerce. These should strive to inculcate the skills necessary for a student to effectively use the tools & techniques as per the present day industry requirement.

Problems based on following topics:-

Contents : Term Work		Hrs/week	Marks
UNIT-1	Electronic Commerce Framework	[]	
UNIT-2	Architectural Frame Work of E-Commerce	[]	
UNIT-3	E-Business Activities	[]	
UNIT-4	Security Issues	[]	
UNIT-5	Electronic Payment Systems	[]	
UNIT-6	Electronic Commerce Applications	[]	
UNIT-7	Implementation of E-commerce	[]	
UNIT-8	Banking system in e-commerce.	[]	
Total			

ELECTIVE - (ANY ONE) - (iii) MULTIMEDIA - TW

Subject Code 1618608C	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	06	External	:	35	

Rationale & Objective:-

For effective teaching / learning of "Multimedia", it is necessary that the list of assignment should be prepared by the subject teacher based on the topic covered in related theory papers and given to the students based on present day professional requirement. Students will enable the students to understand the basic concepts of graphics and multimedia, familiarize with multimedia input, output and storage devices and appreciate features of multimedia software and develop small applications. These should strive to inculcate the skills necessary for a student to effectively use the tools & techniques as per the present day industry requirement.

Contents : Term Work		Hrs/week	Marks
UNIT-1	Introduction to Computer Graphics and Multimedia	[10]	
UNIT-2	Sound and Video cards,	[03]	
UNIT-3	CD ROM and DVD	[03]	
UNIT-4	sound file formats, compression techniques scanners, digital cameras, printers, plotters and other peripheral and storage devices.	[04]	
UNIT-5	Features of any one of authoring tools such as Macro-media/ Adobe Photo-shop/ 3-D studio/ Paint-Shop Pro/ Animator Pro/ Director and Harvard graphics	[10]	
UNIT-6	Education, Video Conferencing, training, Entertainment, electronic encyclopedia	[04]	
UNIT-7	Music & Sound: Audio basic concepts, Analog and Digital concepts, MIDI hardware, MIDI messages, MIDI file.	[06]	
UNIT-8	Video: Basic concepts.	[06]	
UNIT-9	Analog Video & Digital Video	[06]	
UNIT-10	Text, Sound MIDI, Digital Audio file format, MIDI under video environments, Audo & Video capture.	[08]	
Total		[60]	

PROJECT WORK AND ITS PRESENTATION IN SEMINAR - TW

Subject Code	Term Work			No of Period in one session :			Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	100	
1618609	—	—	—	External	:	70	02

Rationale :-

The Project work and its presentation in seminar has impressed a lot to the professionals by giving tangible result in achieving the required competence in handling a project and finding out solutions to various problem and at the same time enhancing the knowledge by interactions and discussions in a seminar on the project. Therefore this subject has its unchallenged place in the curriculum.

Objective:-

The objective to achieve by covering this curriculum are many fold :

- Innovative skills in the students.
- self confidence.
- Ability to select a problem.
- Ability to analyse the problem.
- Logical approach to solution of a problem.
- Skill in quality documentation and report writing.
- Ability to prepare Project Report (Computer Printed).
- Ability to participate in Seminar.
- Commercial Skill.
- Learning to learn the process in a student.

The project assignments may consist of :-

Contents : Term Work		Hrs/week	Marks
UNIT-1	<p><u>PROJECT WORK</u></p> <p>01.01 Installation of Computer Systems, peripherals & software.</p> <p>01.02 Programminng customer based application.</p> <p>01.03 Web page designing.</p> <p>01.04 Data Base applications.</p> <p>01.05 Networking.</p> <p>01.06 Software Development.</p> <p>01.07 Fabrication of Components / equipments.</p> <p>01.08 Fault diagnosis & their rectification in computer systems / equipments.</p> <p>01.09 Bringing improvements in the existing Systems / equipments.</p>	[]	

The Project report should consists of :-

UNIT-2	<u>REPORT WRITING</u> 02.01 Introduction. 02.02 Problem statement. 02.03 Background. 02.04 Organisational Setup. 02.05 Plan Lay Out. 02.06 General Environment of Problem and problem identification. 02.07 Analysis of problem & Development of Algorithm. 02.08 Probable Solution. 02.09 Reasons. 02.10 Suggestions. 02.11 Others-as introduced by teacher.guide.	[]	
UNIT-3	<u>PRESENTATION IN SEMINAR</u> 03.01 Presentation of the project work. 03.02 Discussion by participation. 03.03 Suggestion of improvement in report to be recorded. 03.04 Incorporation of approved suggestions in the report.	[]	
UNIT-4	<u>FINAL REPORT</u> 04.01 Preparation of final project report incorporating all suggestions approved.	[]	
Total			

NOTE:-

The students have various aptitudes and strengths. Project Work, therefore, should match the aptitudes of students. For this purpose, students should be asked to identify the type of Project Work, they would like to execute. It is also essential that the faculty of the respective department may have a brain storming to identify suitable project assignments.

The project work should be done individually. It is not possible, then it can not be done in group of more than 3 students.

The teachers are free to evolve other criteria, depending upon the type of project report.

It is advisable that two students or two projects which are related best be given merit certificate preferably at the annual day of the institute.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING
(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Advance Communication Systems	1638602	04	03	10	20	70	100	28	40	03
3.	Digital Communication	1638603	04	03	10	20	70	100	28	40	03
4.	Signal System	1621604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1621605	03	03	10	20	70	100	28	40	03
	Elective-(i) Advanced Microprocessor (1621605A)		(ii) Advanced Instrumentation & Measurement (1621605B)		(iii) Mining Electronics (1621605C)		(iv) Medical Electronics (1621605D)		(v) Microwave Engineering (1621605E)		
Total:-				17			350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits	
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject		
					Internal (A)	External (B)				
6.	Advance Communication Systems Lab.	1638606	06	03	15	35	50	20	03	
Total:-							06	50		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits	
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject		
7.	Signal and System -TW	1621607	04	15	35	50	20	02	
8.	Digital Communication -TW	1638608	06	15	35	50	20	02	
9.	Project Work & Its presentation in Seminar -TW	1621609	-	30	70	100	40	02	
Total:-						10	200		
Total Periods per week Each of duration One Hours =						33	Total Marks = 750	24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentatin <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

<p>Unit - 4</p>	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel- Training & Development</p> <ul style="list-style-type: none"> • Types of training <p>➤ Induction</p> <p>➤ Skill Enhancement</p> <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow's Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to -</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act <p>Industrial Dispute Act</p>	<p>08</p>	
<p>Unit - 5</p>	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets <ul style="list-style-type: none"> ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to -</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	<p>08</p>	
<p>Unit - 6</p>	<p>Materials Management</p> <p>6.1. Inventory Management (No Numerical)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	<p>08</p>	

Unit - 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-

Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

ADVANCE COMMUNICATION SYSTEMS

Subject Code 1638602	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

Contents : Theory		Hrs/week	Marks
UNIT-1	Introduction (1.1) Introduction to electronic communication system, (1.2) classification of radio wave, (1.3) AM, (1.4) FM, (1.5) PM and etc. (1.6) Related concepts. (Simple problems based on formulae)	(08)	
UNIT-2	Waveguide (2.1) Microwave region and band designations, (2.2) Introduction to TEM/TE/TM. (2.3) Comparison of wave guide with two wire Transmission line, (2.4) definition and interpretation of cut off frequency of a wave guide, wave length, phase velocity and group velocity. Simple related problems.	(09)	
UNIT-3	Microwave components (3.1) Microwave components, (3.2) construction and working principle and application of multicavity klystron amplifier, reflex klystron amplifier, TWT, Magnetron. (3.3) Construction and working principle of Pin diode, Gunn diode, IMPATT, and TRAPATT diode.	(09)	
UNIT-4	Propagation of waves (4.1) Modes of propagation (4.2) Ground wave, sky wave, space wave propagation, (4.3) Fading, ionospheric layer, virtual height, skip distance. (Simple problems based on formulae)	(08)	
UNIT-5	Satellite communication System (5.1) Introduction to satellite communication system, (5.2) Satellite orbits, (5.3) Basic components of satellite communication system, commonly used frequencies in satellite communication in India.	(08)	
UNIT-6	Radar System (6.1) Basic Radar system, (6.2) radar range, (6.3) pulsed radar system, (6.4) PPI, (6.5) MTI, (6.6) Doppler effect, (6.7) MTI principle, (6.8) Radar beacons, (6.9) LORAN	(08)	
Total		50	

Recommended Books :-

- | | | |
|----------------------------------------------------|---|--------------|
| (i) Communication System-Mg Graw Hill. | - | Kenedy |
| (ii) Principles of Communication | - | B.P. Lathi- |
| (iii) Principles of Communication. Kataria & Sons- | - | A.K. Gautam- |

DIGITAL COMMUNICATION

Subject Code 1638603	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale:

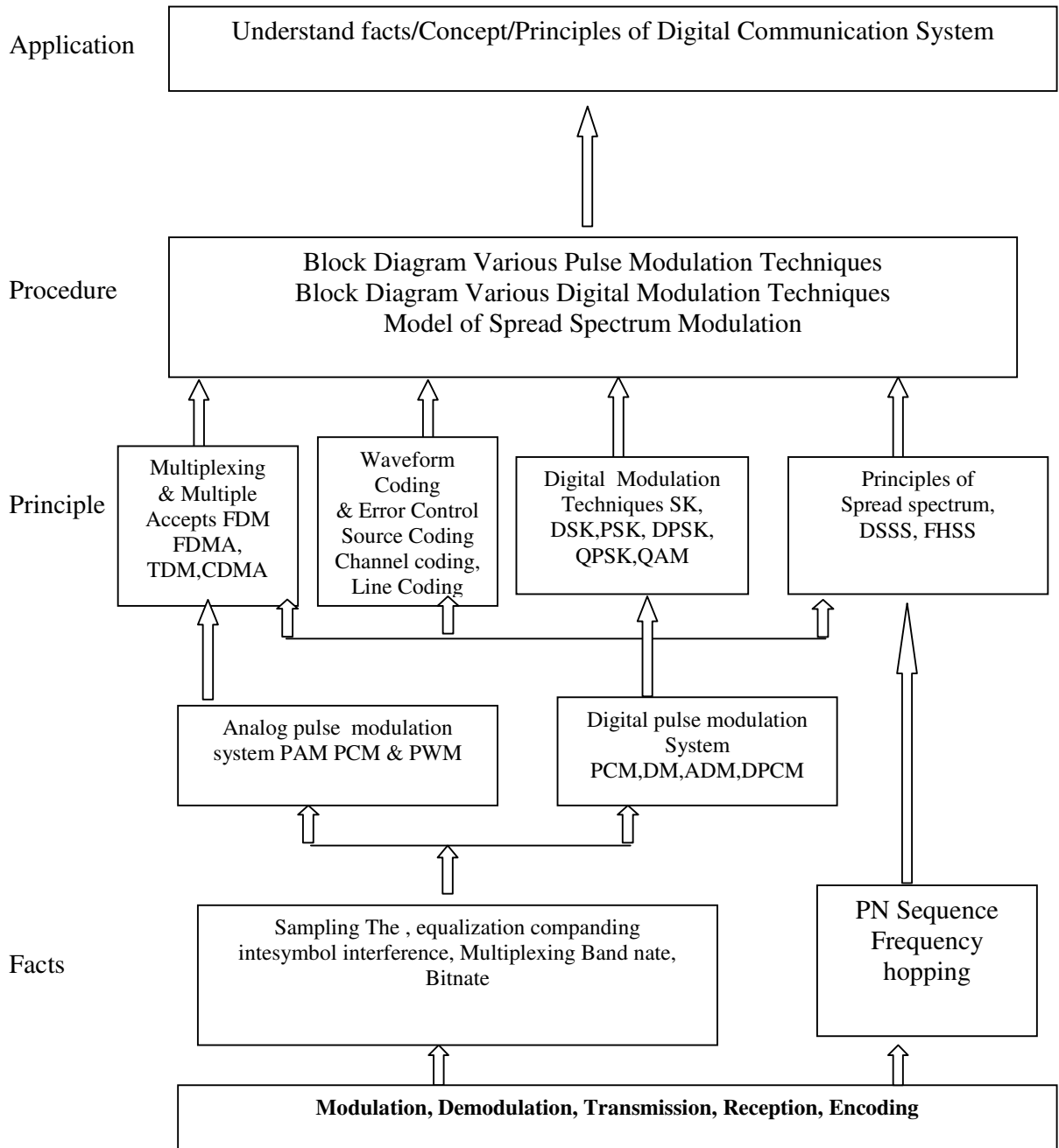
Digital communication systems are becoming increasingly attractive because of ever- growing demand for data communication. Digital transmission offers data processing option and flexibility not available with analog transmission. This is technology group subject, which will enable student to comprehend facts, concepts & working principle of digital communication system. This subject familiarizes the student with information theory, measurement of information rate & capacity. This subject helps the student to understand the concept of various pulse modulations, Digital modulation techniques, coding methods and error control, multiplexing & multiple access techniques and S.S. modulation. The knowledge acquired by students will help them to apply it in various modern communication systems.

Objectives:

The students will be able to:

1. Compare analog communication system with digital communication system.
2. Define channel capacity and entropy.
3. Explain sampling theorem.
4. Compare PAM, PWM, PCM.
5. Describe PCM.
6. Draw the block diagram of PCM, DM, ADM, and DPCM.
7. Draw block of PSK transmitter & receiver. Compare ASK, FSK, PSK.
8. Draw block diagram for QFSK, QAM DP
9. Describe the various types of coding methods & error detection and correction.
10. Explain need of multiplexing.
11. Explain concept of TDMA, FDMA, and CDMA.
12. Define PN sequence.
13. Explain spread spectrum modulation.
14. Differentiate Direct sequence spread spectrum signal & frequency spread spectrum.
15. List the application of S.S. modulation.

Learning Structure:



Contents : Theory		Hrs/week	Marks
UNIT-1	Introduction of Digital Communication 1.1 Basic digital communication system, block diagram 1.2 Channel capacity-definition, Hartley's law, Shannon-Hartley theorem, Channel capacity equation, channel noise and its effect, entropy 1.3 Advantages and disadvantages of digital communication	10	
UNIT-2	Pulse Communication 2.1 Introduction, comparison with Continuous Wave Modulation, advantages 2.2 Sampling theorem, Nyquist rate, aliasing, natural & flat top sampling. 2.3 PAM, PWM, PPM definition, generation, block diagram, waveform analysis, and their comparison. 2.4 Pulse code modulation- block diagram of PCM transmitter & receiver, sampling quantization, quantization error, companding, inter symbol interference 2.5 Delta modulation- block diagram of DM, slope overload, granular noise. 2.6 ADM, DPCM, block diagram and its working.	14	
UNIT-3	Digital Modulation Techniques 3.1 ASK, FSK, PSK definition & waveforms, their transmitter and receiver block diagram and working. 3.2 M-ary encoding. 3.3 QPSK, QAM, DPSK block diagram of transmitter and receiver and working. 3.4 Bandwidth for each modulation technique and their comparison.	12	
UNIT-4	Coding methods and Error control 4.1 Baud rate, Bit rate. 4.2 Line coding - unipolar, bipolar – NRZ, RZ, Manchester 4.3 Source coding, ASCII, EBCDIC and baudot code. 4.4 Channel coding, Error, Causes of error and its effects, error detection & correction using parity, Hamming code & simple numerical.	12	
UNIT-5	Multiplexing and Multiple Access 5.1 Need of Multiplexing, TDM, FDM definition block diagram and their comparison. 5.2 Introduction to WDM. 5.3 Access technique TDMA, FDMA, CDMA (only concepts), advantages of TDMA over FDMA.	12	
Total			

Recommended Books:

Sl.No.	Author	Title	Publisher
1	Wayne Tomasi	Electronic communication system	Pearson Education
2	Louis E. Frenzl	Electronics Communication	Tata McGraw Hill
3	Roddy Collen	Communication System	Prentice Hall of India
4	Amitabha Bhattacharya	Digital Communication	Tata McGraw Hill
5	K. Sam. & Shanmugar	Digital & Analog Communication	Jhon wiley & sons
6	B. Sklar	Digital Communication Fundamentals & Applications	Pearson Education
7	Siman Haykin	Digital Communication	Jhon wiley & sons
8	J.S. Chitode	Digital Communication	Technical Publication, Pune
9	Fronuzen	Data Communication Networking	Tata Mc-graw Hill

SIGNAL SYSTEM

Subject Code 1621604	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale :

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Signals & their representation.	(07)
02	Introduction to Linear System.	(05)
03	Fourier Series & Transforms.	(08)
04	Laplace Transforms.	(10)
05	Inverse Laplace Transformations.	(09)
06	Sampled-Data System & the Z-Transformations.	(12)
07	Mathematical modelling of physical systems.	(09)
Total :		(60)

Contents : Theory		Hrs/week	Marks	
UNIT-1	<u>SIGNALS & THEIR REPRESENTATION:</u>		(07)	
	01.01	Basic Continuous time Signals.		
	01.02	Basic discrete time Signals.		
	01.03	Linear time invariant Signals.		
	01.04	Random Signals.		
UNIT-2	<u>INTRODUCTION TO LINEAR SYSTEM:</u>		(05)	
	02.01	Introduction.		
	02.02	Linear System from a physical point of view		
	02.03	Linear System from a Mathematical point of view		
UNIT-3	<u>FOURIER SERIES & TRANSFORMS:</u>		(08)	
	03.01	Fourier series expansion.		
	03.02	Symmetry expansion.		
	03.03	Exponential form of Fourier series.		
	03.04	Fourier Integral & Fourier Transform.		
	03.05	Analysis by Fourier Methods.		
UNIT-4	<u>LAPLACE TRANSFORMS:</u>		[10]	
	04.01	04.01 Introduction, Definition of Laplace transform of a function, Inverse Laplace transform Basic properties of Laplace transform, Laplace transform algebraic and trigonometric functions, Laplace transform of derivatives and integrals. L-transform of periodic function.		
UNIT-5	<u>INVERSE LAPLACE TRANSFORMATIONS:</u>		[09]	
	05.01	Inverse Laplace transform Heaviside expansion theorem, initial and final value theorem, convolution integral, inverse Laplace transform of some irrational function, Application of Laplace transform and Inverse Laplace transform for the solution of differential equations.		
UNIT-6	<u>SAMPLED-DATA SYSTEM & THE Z-TRANSFORMATIONS:</u>		[12]	
	06.01	Introduction.		
	06.02	The Z-transformations.		
	06.03	Z-transformations of some important functions.		
	06.04	The shifting Theorem.		
	06.05	The initial & final value Theorem.		
	06.06	Introductions to difference equations.		
	06.07	Solution of difference equations.		

UNIT-7	MATHEMATICAL MODELLING OF PHYSICAL SYSTEMS:		[09]	
	07.01	System response & transfer function.		
	07.02	Block diagram representations.		
	07.03	Rule for block diagram transformations Signal flow graph.		
	07.04	Mason's gain formula & its applications.		
Total			60	

Books Recommended:

- | | |
|--------------------------------|---------------------------------|
| 1. Analysis of linear systems. | - D. K. Cheng. |
| 2. Circuit & System Analysis. | - A. Paspoulis. |
| 3. Signal & linear system. | - Gabel & Roberts. |
| 4. Communication System. | - Haykins. |
| 5. Signals and Systems, PHI. | - A. Oppenheirn and A. Willsky. |
| 6. Control System Engineering. | - Nagrath & Gopal. |

ELECTIVE - (ANY ONE) - (i) ADVANCED MICROPROCESSOR

Subject Code 1621605A	Theory			No of Period in one session : 60			Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
			CT	:	10		

Rationale :

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction to 16 BIT Microprocessor.	
02	Data and Address-BUS Configuration.	
03	Addressing Modes.	
04	Interrupt Processing.	
05	Peripheral Interfacing Chips.	
06	Architecture of 68000 Motorola processor in detail.	
07	Organisation of Instruction Sets.	
08	Architecture for standard peripheral devices.	
09	I/O Control.	
10	System Design with few industrial examples using 8086 and 68000 processors.	

Contents : Theory			Hrs/week	Marks
UNIT-1	<u>INTRODUCTION TO 16 BIT MICROPROCESSOR:</u>			
	01.01	Intel 8086 Architecture.		
	01.02	Intel 8088 Architecture.		
	01.03	Pipeline Architecture.		
	01.04	Bus interface unit and execution unit.		
UNIT-2	<u>DATA AND ADDRESS-BUS CONFIGURATION:</u>			
	02.01	Memory segmentation.		
	02.02	Memory address generation details.		
	02.03	Logical and Physical address generation.		
	02.04	I/O Port addresses.		
	02.05	Memory mapping.		
	02.06	Data, Code and Stack segmentation.		
UNIT-3	<u>ADDRESSING MODES:</u>			
	03.01	Instruction set in detail and Addressing Modes.		
	03.02	Assembler directives.		
	03.03	Programming examples.		
UNIT-4	<u>INTERRUPT PROCESSING:</u>			
	04.01	Hardware Interrupt.		
	04.02	Software Interrupt.		
	04.03	Internal Interrupt.		
	04.04	Types of Interrupt.		
	04.05	Interrupt enabling and disabling.		
UNIT-5	<u>PERIPHERAL INTERFACING CHIPS:</u>			
	05.01	Intel 8255.		
	05.02	Intel 8253.		
	05.03	Intel 8259.		
	05.04	Intel 8251.		
	05.05	Interfacing of these chips with processor.		
	05.06	Digital interfacing.		
	05.07	Analog interfacing.		
	05.08	Industrial control applications.		
UNIT-6	<u>ARCHITECTURE OF 68000 MOTOROLA PROCESSOR IN DETAIL.</u>			
	06.01	Introduction.		
	06.02	Reference in 68000.		
	06.03	Memory Address.		
	06.04	Instruction formats.		
	06.05	Addressing Modes.		
	06.06	Instruction Sets.		
	06.07	STACK, Read and Write Cycle Timing.		

UNIT-7	ORGANISATION OF INSTRUCTION SETS:			
	07.01	Addressing modes.		
	07.02	Assembly language programming.		
	07.03	Examples for sorting logical operations.		
	07.04	Control loops.		
07.05	Interrupt and exception programming.			
UNIT-8	I/O CONTROL:			
	08.01	I/O control using parallel interface.		
	08.02	I/O control using memory mapped I/O control for data acquisition.		
	08.03	Data output through binary I/O lines.		
Total				

Books Recommended:

- | | |
|----------------------------------------|----------------|
| 1. Intel Manual of 8086 | - |
| 2. Microprocessing and Interfacing. | - Hall |
| 3. 6800 Assembly Lan. Programming. | - Leventhal |
| 4. Microprocessor | - Lui & Gibson |
| 5. Motorola Manufacturing Data Sheets. | - |

ELECTIVE - (ANY ONE) - (ii) ADVANCED INSTRUMENTATION & MEASUREMENT

Subject Code 1621605B	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale :

Objective:

S.No. Topics

Periods

- | | | |
|----|----------------------------------------|--|
| 01 | Sensors. | |
| 02 | Microprocessor based data acquisition. | |
| 03 | Process Control. | |
| 04 | Electronic Graphic Recording Systems. | |

Contents : Theory			Hrs/week	Marks
UNIT-1	<u>SENSORS:</u>			
	01.01	Electrical sensors for : (a) Mechanical acquisition, (b) Hydraulic acquisition, (c) Pneumatic acquisition.		
	01.02	Analog sensors.		
	01.03	Digital sensors.		
UNIT-2	<u>MICROPROCESSOR BASED DATA ACQUISITION:</u>			
	02.01	Instrumentation amplifier.		
	02.02	Multiplexers.		
	02.03	Sample and hold circuit.		
	02.04	D/A Converter.		
	02.05	A/D Converter.		
	02.06	Data acquisition system.		
UNIT-3	<u>PROCESS CONTROL:</u>			
	03.01	Process controller.		
	03.02	Hardware data logging.		
	03.03	Microcomputer as process controller.		
	03.04	Supervisory control.		
	03.05	Direct digital control.		
UNIT-4	<u>ELECTRONIC GRAPHIC RECORDING SYSTEMS:</u>			
	04.01	Introduction.		
	04.02	Balancing arrangement.		
	04.03	XY Recorder.		
	04.04	Types and briefs of permanent recording systems.		

Books Recommended:

- | | |
|------------------------------------------------|------------------|
| 1. Microprocessor with Application in Control. | - Ahson. |
| 2. Microprocessor in Instruments & Control. | - Bibbero |
| 3. Modern Instrumentation System. | - Mani & Others. |

ELECTIVE - (ANY ONE) - (iii) MINING ELECTRONICS

Subject Code 1621605C	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale :

Objective:

S.No.

Topics

Periods

01	Basic Quantity Measurement.
02	Environmental Measurement.
03	Sensors.
04	Detectors.
05	Transport System Monitoring.
06	Surveillance of Electrical System.
07	MIS Systems.

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>BASIC QUANTITY MEASUREMENT:</u>		
	01.01	Measurement of temperature.	
	01.02	Measurement of pressure.	
	01.03	Measurement of humidity.	
	01.04	Measurement of Air Velocity.	
UNIT-2	<u>ENVIRONMENTAL MEASUREMENT:</u>		
	02.01	Introduction.	
	02.02	Monitoring and recording of methane.	
	02.03	Monitoring and recording of carbon mono-oxide.	
	02.04	Measuring of Oxygen and other gas quantities.	
UNIT-3	<u>SENSORS:</u>		
	03.01	Classification of gas sensors.	
	03.02	Solid state sensors.	
	03.03	Gas analysis.	
	03.04	Ionisation chamber.	
UNIT-4	<u>DETECTORS:</u>		
	04.01	Introduction & Classification.	
	04.02	Early detectors of ground fires.	
	04.03	Smoke/fire detectors.	
	04.04	Detection of rock movements.	
	04.05	Detection of change in pressure.	

UNIT-5	<u>TRANSPORT SYSTEM MONITORING:</u>			
	05.01	Introduction & Classification.		
	05.02	Tub transport system.		
	05.03	Conveyer belt transport system.		
	05.04	NDT for wire ropes.		
UNIT-6	<u>SURVEILLANCE OF ELECTRICAL SYSTEM:</u>			
	06.01	Introduction.		
	06.02	Surveillance of underground electrical systems.		
	06.03	Surveillance of ground electrical system.		
	06.04	Surveillance of communication system.		
	06.05	Insulation monitoring.		
	06.06	Fault detection in different section.		
UNIT-7	<u>MIS SYSTEMS:</u>			
	07.01	Introduction to control dispatch system.		
	07.02	Signaling in mines.		
	07.03	Different types of transmitters used in mines.		
	07.04	Different types of receiver used in mines.		
	07.05	Important safely signals used in mines.		
Total				

ELECTIVE - (ANY ONE) - (iv) MEDICAL ELECTRONICS

Subject Code 1621605D	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale :

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Body Skeleton.	
02	Muscle Physiology.	
03	Heart Physiology.	
04	Respiration.	
05	Neuro Physiology.	
06	Recording Techniques.	
07	Measurement & Recording of Non-Electrical Systems.	
08	Electronic Instruments affecting Human Body.	

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>BODY SKELETON:</u>		
	01.01 Nerve Physiology.		
	01.02 Membrane Potential.		
	01.03 Action Potential.		
	01.04 Function of Nerve Junctions.		
	01.05 Functions of Neo-Neural Junctions.		
UNIT-2	<u>MUSCLE PHYSIOLOGY:</u>		
	02.01 Function of Skeleton & Smooth Muscle.		
	02.02 Function of Cardiac Muscle.		
	02.03 Cardiac Rhythmic Contraction.		
UNIT-3	<u>HEART PHYSIOLOGY:</u>		
	03.01 Introduction to Heart function.		
	03.02 Blood flow.		
	03.03 Arterial Pressure.		
	03.04 E C G.		
UNIT-4	<u>RESPIRATION.</u>		
UNIT-5	<u>NEURO PHYSIOLOGY:</u>		
	05.01 Introduction.		
	05.02 Function of Spinal Cord.		
	05.03 Cord Reflexes.		
UNIT-6	<u>RECORDING TECHNIQUES:</u>		
	06.01 Introduction.		
	06.02 Electro-Cardiac Graph.		
	06.03 Electro Mypho Graph.		
	06.04 Electro Encyclo Graph.		

UNIT-7	<u>MEASUREMENT & RECORDING OF NON-ELECTRICAL SYSTEMS:</u>			
	07.01	Measurement & recording of biological parameters.		
	07.02	Bio-Telemetry.		
	07.03	Safety while recording.		
	07.04	Patient monitoring.		
	07.05	Intensive care unit.		
	07.06	Special techniques for measurement of non-electrical parameters.		
UNIT-8	<u>ELECTRONIC INSTRUMENTS AFFECTING HUMAN BODY:</u>			
	08.01	Simulator.		
	08.02	Defibrillator.		
	08.03	Pace maker.		
	08.04	Diathermy.		
	08.05	Blood pumps.		
	08.06	Myo electric control of paralysed muscles.		
Total				

Books Recommended:

- | | |
|--------------------------------------------|----------------------|
| 1. Bio Medical Electronics | - Cromwell & others. |
| 2. Bio Electronic Instrument & Measurement | - Khandpur. |
| 3. Bio Medical Instrument & Measurement | - Cromwell & others. |

ELECTIVE - (ANY ONE) - (v) MICTROWAVE ENGINEERING

Subject Code 1621605E	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale:

Objective:

S.No. Topics

- 01 Microwave Tubes.
- 02 Microwave Semi Conductor Devices.
- 03 Microwave Components and Antennas.
- 04 Microwave Transmission.
- 05 Microwave Measurements.

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>MICROWAVE TUBES:</u>		
	01.01	Introduction.	
	01.02	Microwave frequency band spectrum.	
	01.03	Klystron.	
	01.04	Reflex Klystron.	
	01.05	Travelling Wave tubes. (TWT)	
	01.06	Magnetron.	
UNIT-2	<u>MICROWAVE SEMI CONDUCTOR DEVICES:</u>		
	02.01	Microwave Diodes.	
	02.01.01	Varactor Diodes.	
	02.01.02	Tunnel Diodes.	
	02.01.03	Gunn Diodes.	
	02.01.04	Avalanche effect diodes.	
	02.02	M A S E R.	
UNIT-3	<u>MICROWAVE COMPONENTS AND ANTENNAS:</u>		
	03.01	Coaxial Lines.	
	03.02	Wave guides.	
	03.02.01	Rectangular.	
	03.02.02	Circular.	
	03.03	Wave guide corners and Tees.	
	03.04	Directional couplers.	
	03.05	Attenuators.	
	03.06	Antennas.	
	03.07.01	Parabolic.	
	03.08.02	Horn.	
03.09.03	Slot.		

UNIT-4	<u>MICROWAVE TRANSMISSION:</u>			
	04.01	Maxwells equations.		
	04.02	Modes of propagation in rectangular and circular wave guides.		
	04.03	Transmission through rectangular wave guide.		
	04.04	Cut off frequency and guide wave length.		
04.05	Phase and group velocity, and relation between them.			
UNIT-5	<u>DETECTORS:</u>			
	05.01	Measurement of impedance.		
	05.02	Measurement of frequency.		
	05.03	Voltage standing wave ratio. (VSWR) and its measurement.		
Total				

Books Recommended:

- | | |
|----------------------------------------------|---------------------------|
| 1. Microwave Communication. | - Angelkos & Everhar. |
| 2. Foundation of Microwave Communication. | - Collins. |
| 3. Microwaves. | - Sanjeev Gupta & others. |
| 4. Electromagnetic Waves & Radiating Systems | - Jordan. |
| 5. Microwave Theory & Measurement | - Heylward Packard. |

ADVANCE COMMUNICATION SYSTEMS LAB.

Subject Code 1638606	Practical			No of Period in one session :			Credits 03		
	No. of Periods Per Week			Full Marks				:	50
	L	T	P/S	ESE				:	50
	—	—	06	Internal				:	15
			External			:	35		

Rationale :

Objective:

Contents : Practical		Hrs/week	Marks
UNIT-1	Verify the characteristics of Reflex Klystron		
UNIT-2	Verification of characteristics of Circulator		
UNIT-3	Indirect measurement of frequency using cavity resonator		
UNIT-4	Verification of Characteristics of Photodiode, LED, tunnel diode		
UNIT-5	Application of CRO, for different communication parameters.		
UNIT-6	Operational amplifier as sub tractor, adder, integrator etc.		
UNIT-7	Verification of V – I characteristics of SCR.		
Total			

SIGNAL AND SYSTEM -TW

Subject Code 1621607	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Rationale :

Objective:

Contents : Term Work		Hrs/week	Marks
UNIT-1	Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv) periodic sinusoidal sequences. Plot all the sequences.		
UNIT-2	Find the Fourier transform of a square pulse. Plot its amplitude and phase spectrum.		
UNIT-3	Write a program to convolve two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation.		
UNIT-4	Write a program to find the trigonometric Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings.		
UNIT-5	Write a program to find the trigonometric and exponential Fourier series coefficients of a periodic rectangular signal. Plot the discrete spectrum of the signal.		
UNIT-6	Generate a discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.		
UNIT-7	The signal $x(t)$ is defined as below. The signal is sampled at a sampling rate of 1000 samples per second. Find the power content and power spectral density for this signal. $X(t) = \begin{cases} \cos(2\pi \times 47t) + \cos(2\pi \times 219t), & -10 \leq t \leq 10 \\ 0, & \text{otherwise} \end{cases}$		
UNIT-8	Write a program to find the magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.		
UNIT-9	Write a program to find the response of a low pass filter and high pass filter, when a speech signal is passed through these filters.		
UNIT-10	Write a program to find the autocorrelation and cross correlation of sequences.		
UNIT-11	Generate a uniformly distributed length 1000 random sequence in the range (0,1). Plot the histogram and the probability function for the sequence. Compute the mean and variance of the random signal.		
UNIT-12	Generate a Gaussian distributed length 1000 random sequence. Compute the mean and variance of the random signal by a suitable method.		
UNIT-13	Write a program to generate a random sinusoidal signal and plot four possible realizations of the random signal.		
UNIT-14	Generate a discrete time sequence of $N=1000$ i.i.d uniformly distributed random numbers in the interval (-0.5, 0.5) and compute the autocorrelation of the sequence.		
UNIT-15	Obtain and plot the power spectrum of the output process when a white random process is passed through a filter with specific impulse response.		
Total			

DIGITAL COMMUNICATION -TW

Subject Code 1638608	Term Work			No of Period in one session :			Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	02
	—	—	06	External	:	35	

Contents : Term Work		Hrs/week	Marks
UNIT-1	Observe waveforms of Pulse Amplitude modulation (using natural sampling & flat top sampling).		
UNIT-2	Observe waveforms of Pulse width modulation (using natural sampling & flat top sampling)		
UNIT-3	Observe waveforms of Pulse Position modulation (using natural sampling.)		
UNIT-4	Observe waveforms of Pulse code modulation and demodulation.		
UNIT-5	Observe waveforms of ASK modulation & demodulation.		
UNIT-6	Observe waveforms of FSK modulation & demodulation.		
UNIT-7	Observe waveforms of PSK modulation & demodulation		
Total			

PROJECT WORK AND ITS PRESENTATION IN SEMINAR -TW

Subject Code 1621609	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	30	
	—	—	—	External	:	70	

Rationale :

The Project work and its presentation in seminar is an important subject for a Diploma holder technician. The course is designed to help a students develop confidence, skill in report writing, skill to analyse, design, estimating and costing, deciding a process etc, the course will also help in developing communication skill, skill of quality documentation.

Objective:

A student will be able to:

- Identify a Problem
- Analyse the Problem
- Develop logical approach to solution of a Problem.
- Design of a product
- Make estimate of materials and processes and calculate the cost of production and decide the price of the product.
- Manufacture / assemble /fabricate the product in the workshop.
- Test the product for its quality.
- Prepare a project report (Computer printed / typed)
- Present in the form of seminar.

Contents : Term Work		Hrs/week	Marks
UNIT-1	To make a bridge rectifier.		
UNIT-2	To make/assemble a voltage stabilizer.		
UNIT-3	To make/assemble stabilizer for refrigerator.		
UNIT-4	To make a timer circuit IC 555.		
UNIT-5	Electronic Regulator for Ceiling Fan.		
UNIT-6	To fabricate a circuit for characteristics for NPN/PNP transistors.		
UNIT-7	Bi-stable Multivibrator		
UNIT-8	Half & Full adder, subtractor & Comparator.		
UNIT-9	8:1 Multiplexer.		
UNIT-10	Realising Railway Signaling System.		

REPORT WRITING:

A report must include

Contents : Term Work		Hrs/week	Marks
UNIT-1	Introduction.		
UNIT-2	Design.		
UNIT-3	Estimating of materials.		
UNIT-4	Calculation of cost of the materials.		
UNIT-5	Operation time estimation.		
UNIT-6	Cost of Operation.		
UNIT-7	Process of Manufacture / Assembly / fabrication.		
UNIT-8	List of tools/equipments used with specification.		

OR

A project on live industrial problems that may be—

- Technical
- Human Relation
- Welfare
- Safety
- Any other

The Project Report should consist of :-

Contents : Term Work		Hrs/week	Marks
UNIT-1	Introduction.		
UNIT-2	Problem statement.		
UNIT-3	Background of Industry.		
UNIT-4	Organisational set –up.		
UNIT-5	Plant Lay –out.		
UNIT-6	Reason for selecting a problem.		
UNIT-7	Analysis of Problem.		
UNIT-8	Probable solution.		
UNIT-9	Best solution possible.		
UNIT-10	Any other.		
Total			

Project work/ project report should be presented in the form of a seminar for developing confidence and communication skill among the students.

NOTE:-

Project work will be allotted to the students just in the beginning of the session. Each student will be give a separate work under the supervision of a teacher. Total number of students may be divided among the number of teachers available. The teacher concerned will select separate problem for each student under him and allot it to him at the beginning of the session. The work allotted should be completed with in scheduled time. i e. by the end of the session. Problems selected should preferably conform to the syllabus. If it is outside of the syllabus then it must be within the field of electronics engineering.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for
**VI SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING/
ELECTRICAL & ELECTRONICS ENGINEERING.**

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME								
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03	
2.	Testing & Maintenance of Electrical Machines	1620602	03	03	10	20	70	100	28	40	03	
3.	Power Electronics and Drives	1620603	03	03	10	20	70	100	28	40	03	
4.	Automatic Control System	1620604	03	03	10	20	70	100	28	40	03	
5.	Elective- (Any One)	1620605	03	03	10	20	70	100	28	40	03	
(i)	Electric Traction-II (1620605 A)			(ii) Maintenance and Repairs of Electrical Equipment (1620605 B)				(iii) Microprocessors and Microcontrollers (1620605 C)				
Total :-			15					350	500			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits		
					Internal(A)	External(B)					
6.	Testing & Maintenance of Electrical Machines Lab	1620606	02	03	15	35	50	20	01		
7.	Power Electronics and Drives Lab	1620607	02	03	15	35	50	20	01		
8.	Control System Lab	1620608	02	03	15	35	50	20	01		
9.	Elective- (Any One)	1620609	02	03	15	35	50	20	01		
	(i) Electric Traction-II Lab (1620609 A)		(ii) Maintenance and Repairs of Electrical Equipment Lab (1620609 B)				(iii) Microprocessors and Microcontrollers Lab (1620609 C)				
Total :-			08					200			

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME						
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits		
10.	Industrial Project -TW	1620610	05	07	18	25	10	03		
11.	Professional Practices-VI - TW	1620611	05	07	18	25	10	02		
Total :-			10			50				
Total Periods per week Each of duration One Hour				33	Total Marks = 750			24		

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits 03
	No. of Periods Per Week						
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
				CT	:	20	

CONTENTS: THEORY

	Name of the Topic	Hours	Marks
Unit-01	Overview Of Business Types of Business Service Manufacturing Trade Industrial sectors Introduction to Engineering industry Process industry Textile industry Chemical industry Agro industry Globalization Introduction Advantages & disadvantages w.r.t. India Intellectual Property Rights (I.P.R.)	02	---
Unit-02	Management Process What is Management? Evolution Various definitions Concept of management Levels of management Administration & management Scientific management by F.W.Taylor Principles of Management (14 principles of Henry Fayol) Functions of Management Planning Organizing Directing Controlling	07	10
Unit-03	Organizational Management Organization :- Definition Steps in organization Types of organization Line Line & staff Functional Project Departmentation Centralized & Decentralized Authority & Responsibility Span of Control Forms of ownership Proprietorship Partnership Joint stock Co-operative Society Govt. Sector	07	10

Unit-04	Human Resource Management Personnel Management Introduction Definition Functions Staffing Introduction to HR Planning Recruitment Procedure Personnel- Training & Development Types of training Induction Skill Enhancement Leadership & Motivation Maslow's Theory of Motivation Safety Management Causes of accident Safety precautions Introduction to – Factory Act ESI Act Workmen Compensation Act Industrial Dispute Act	08	14
Unit-05	Financial Management Financial Management- Objectives & Functions Capital Generation & Management Types of Capitals Sources of raising Capital Budgets and accounts Types of Budgets Production Budget (including Variance Report) Labour Budget Introduction to Profit & Loss Account (only concepts) ; Balance Sheet Introduction to – Excise Tax Service Tax Income Tax VAT Custom Duty	08	14
Unit-06	Materials Management Inventory Management (No Numerical) Meaning & Objectives ABC Analysis Economic Order Quantity Introduction & Graphical Representation Purchase Procedure Objects of Purchasing Functions of Purchase Dept. Steps in Purchasing Modern Techniques of Material Management Introductory treatment to JIT / SAP / ERP	08	14

Unit-07	Project Management (No Numerical) Project Management Introduction & Meaning Introduction to CPM & PERT Technique Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', 	08	08
	Total	48	70

Text/Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New Delhi
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	Everest Publication , Pune
Management	Deepak Chandra	Foundation Publishing

TESTING & MAINTENANCE OF ELECTRICAL MACHINES
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620602	Theory						Credits 03	
	No. of Periods Per Week			Full Marks				
	L	T	P/S	ESE	:	70		
	03	—	—	TA	:	10		
	—	—	—	CT	:	20		

CONTENTS: THEORY

	Name of the Topic	Hours	Marks
Unit-01	<p>Safety & Prevention of Accidents: Definition of terminology used in safety; safety, hazard, accident, major accident hazard, responsibility, authority, accountability, monitoring, I.E. Act & statutory regulations for safety of persons & equipments working with electrical installation, Dos & don'ts for substation operators as listed in IS Meaning & causes of electrical accidents factors on which severity of shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration, Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers.</p>	05	06
Unit-02	<p>General Introduction: Objectives of testing significance of I.S.S. concept of tolerance, routine tests, type tests, special tests. Methods of testing a) Direct, b) Indirect, c) Regenerative. Concept of routine, preventive & breakdown maintenance, advantages of preventive maintenance, procedure for developing preventive maintenance schedule, Factors affecting preventive maintenance schedule. Introduction to total productive maintenance.</p>	08	12
Unit-03	<p>Testing & maintenance of rotating machines: Type tests, routine tests & special tests of 1 & 3 phase Induction motors, Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992 Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968 Brake test on DC Series motor.</p>	07	10
Unit-04	<p>Testing & maintenance of Transformers: Listing type test, routine test & special test as per I.S. 2026-1981 Procedure for conducting following tests: Measurement of winding resistance, no load losses, & no load current, Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, separate source voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, Different methods of determining temp rise- back to back test, short circuit test, open delta (delta – delta) test. Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028(part III): 1981, Periodic checks for replacement of oil, silica gel, parallel operation of 1 & 3 phase transformer, load sharing calculations (numerical)</p>	12	12

Unit-05	Testing & maintenance of Insulation: Classification of insulating materials as per I.S. 8504(part III)1994, factors affecting life of insulating materials, measurement of insulation resistance & interpretation of condition of insulating. Methods of measuring temperature of internal parts of windings/machines & applying the correction factor when the machine is hot. Properties of good transformer oil, list the agents which contaminates the insulating oil, understand the procedure of following tests on oil as per I.S. 1692-1978 a) acidity test b) sludge test c) crackle test e) flash point test. Filtration of insulating oil protection of electrical equipments (insulation) during the period of inactivity. Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & Revarnishing Methods of internal heating & vacuum impregnation.	10	14
Unit-06	Installation: Factors involved in designing the machine foundation, Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment. Installation of rotating machines as per I.S. 900-1992. Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment.	06	08
	Total	48	70

Text/Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Electrical Technology Vol I To IV	B. L. Theraja	S. Chand & Co., New Delhi
Operation & Maintenance Of Electrical Machines Vol - I	B. V. S. Rao	Media Promoters & Publisher Ltd. Mumbai
Operation & Maintenance Of Electrical Machines Vol - II	B. V. S. Rao	Media Promoters & Publisher Ltd. Mumbai
Preventive Maintenance Hand Books & Journals	C.J. Hubert	-----
Testing & Maintenance of Electrical Machines	Manoj Sinha	Foundation Publishing

POWER ELECTRONICS AND DRIVES
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620603	Theory						Credits 03		
	No. of Periods Per Week			Full Marks				:	100
	L	T	P/S	ESE				:	70
	03	—	—	TA				:	10
	—	—	—	CT				:	20

CONTENTS: THEORY

	Name of the Topic	Hours	Marks
Unit-01	<p>Power Semiconductor Devices:</p> <p>1.1 Thyristor (SCR)</p> <p>1.2 Construction, Operation and Symbol</p> <p>1.3 V-I Characteristics</p> <p>1.4 Thyristor Turn Methods: Voltage Triggering, Gate Triggering, dv/dt Triggering and Light Triggering.</p> <p>1.5 Gate Control: DC Gate Signal, AC Gate Signal and Pulse.</p> <p>1.6 Thyristor Turn off Process or commutation method.</p> <p>1.7 Thyristor Specifications and Ratings Voltage Ratings, Current Ratings, Power Ratings and Temperature Ratings.</p> <p>1.8 Heat Sinks and Mountings</p> <p>1.9 Thyristor Family: Symbols & V-I Characteristics</p>	06	12
Unit- 2	<p>Converters:</p> <p>2.1 – Introduction</p> <p>2.2 – Single Phase Fully Controlled Half Wave Converter</p> <ul style="list-style-type: none"> - With Resistive Load - With RL Load and Freewheeling Diode. <p>2.3 - Single Phase Fully Controlled Full Wave Converter</p> <ul style="list-style-type: none"> - With Resistive Load - With RL Load. <p>2.4 - Single Phase Fully Controlled Bridge Converter</p> <ul style="list-style-type: none"> - With Resistive Load - With RL Load <p>2.5 – Comparison of 3 ϕ and 1 ϕ Phase Converters.</p> <p>2.6- Effect of Source Impedance on Converter Operation.</p> <p>2.7 – Cycloconverters principle of operation, Input output waveforms. (1-Q only)</p>	08	14

Unit-03	Inverters: 3.1 - Introduction 3.2 – Classification: Line Commutated & Forced Commutated Inverters, Series, Parallel, & Bridge Inverters. 3.3 – Series Inverter - Operation of Basic Series Inverter Circuit - Modified Series Inverter 3.4 – Parallel Inverter - Operation of Basic Parallel Inverter Circuit 3.5 – Single Phase Bridge Inverter - Half Bridge Inverter - Full Bridge Inverter 3.6 - Pulse Width Modulation(PWM) Method: - Single Pulse Width Modulation - Multiple Pulse Width Modulation - Sinusoidal Pulse Width Modulation	08	14
Unit-04	Choppers: 4.1 – Introduction 4.2 – Chopper Principle 4.3 – Control Techniques: - Constant Frequency System - Variable Frequency System 4.4 – Classification of Choppers: Class A, Class B, Class C, Class D and Class E 4.5 - Commutations Methods for Choppers: Auxiliary Commutation, Load Commutation 4.6 – Jones Chopper 4.7 – Step Up Chopper & step down choppers with problems	08	10
Unit-05	Power Electronic Applications: 5.1 – DC Drives: 5.1.1 – Speed control of DC series motor with single phase and three phase half and full controlled converter, step up and step down chopper. 5.2 – AC Drives: 5.2.1 – Speed control of three phase Induction Motor with Variable frequency PWM VSI, Variable frequency square wave VSI, Variable frequency CSI, Variable frequency Variable Voltage, Cycloconverters. 5.3 – Other Applications: - Static Circuit Breakers (DC & AC). - Induction Heating Control. - Di-electric Heating Control. - Electric Welding Control. - Battery Charging Control. - Static Excitation System for Alternators. - Static VAR Compensation System.	18	12
Total		48	70

Text/Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Power Electronics	B. R. Gupta ,V. Singhal	S. K. Kataria & Sons
Power Electronics	Muhammad H. Rashid	Prentice-Hall of India Pvt. Ltd.
Power Electronics	M. D. Singh, K. B. Khanchandani	Tata McGraw-Hill
Fundamentals of Electric Drives	G. K. Dubey	Narosa Publishing House
Electric Drives – Concepts and Applications	V. Subrahmanyam	Tata McGraw-Hill
Power Electronics and Drives	R.N. Dutta	Foundation Publishing

AUTOMATIC CONTROL SYSTEM **(ELECTRICAL ENGINEERING GROUP)**

Subject Code 1620604	Theory						Credits 03	
	No. of Periods Per Week			Full Marks				: 100 : 70 : 10 : 20
	L	T	P/S	ESE				
	03	—	—	TA				
	—	—	—	CT				

Rationale and objectives :-

This course introduces various control mechanisms, modes and derives with are necessary to understand simple control systems in a process plants. With the knowledge of control system components one must here the idea about time and frequency response of the system with the objective to provide a logical understanding of the subject the topics are designed in a semiotic manner.

SL. NO.	TOPIC	PERIODS
1.	Introduction	6
2.	Lap lace Transform	6
3.	Mathematical modeling of physical systems	4
4.	Control system components	7
5.	Root locus Technique	4
6.	Time Response Analysis	6
7.	Concept of stability and Algebraic criteria	6
8.	Frequency Response Analysis	8
9.	Stability in Frequency Domain	8
10.	Introduction to state-space Approach	5
Total-		60 Periods

CONTENTS: THEORY

	Name of the Topic	Hrs/Week	Marks
Unit-01	[1] INTRODUCTION:	[06]	[04]
	1.1 The Control system, open loop and closed loop control		
	1.2 Servomechanism		
	1.3 Control of physical quantity live temperature, flow, liquid lend etc.		
	1.4 Feedback and nonfeedback systems, Regenerative feedback		
Unit-02	[2] LAP LACE TRANSFORM:	[06]	[06]
	2.1 The lap lace transform		
	2.2 The inverse lap lace transform		
	2.3 Properties of Lap lace transform		
	2.4 Solving differential equations by lap lace transform method.		
Unit-03	[3] MATHEMATICAL MODELING OF PHYSICAL SYSTEM:	[04]	[04]
	3.1 Differential equations of physical system		
	3.2 Transfer Function		
Unit-04	[4] CONTROL SYSTEM COMPONENTS:	[07]	[06]
	4.1 Introduction		
	4.2 Controller Components		
	4.3 A.C & D.C Servomotor		
	4.4 Potentiometer, Synchros, Tachometer Amplidyne and Metadyne.		

Unit-05	[5] <u>ROOT LOCUS TECHNIQUE :</u>	[04]	[08]
	5.1 Introduction		
	5.2 The Root locus Technique		
	5.3 Construction of root loci & solution of problems		
Unit-06	[6] <u>TIME RESPONSE ANALYSIS :</u>	[06]	[12]
	6.1 Standard test signals		
	6.2 Time response of first order systems		
	6.3 Time response of second order system		
	6.4 Time response specification		
	6.5 Steady state errors and error constants		
Unit-07	[7] <u>CONCEPT OF STABILITY AND ALGEBRAIC CRITERIA :</u>	[06]	[08]
	7.1 The concept of stability		
	7.2 Necessary conditions for stability		
	7.3 Routh Hurwitz stability criterion & problems		
Unit-08	[8] <u>FREQUENCY RESPONSE ANALYSIS :</u>	[08]	[08]
	8.1 Introduction		
	8.2 Correlation between time response and frequency response.		
	8.3 Bode plots and polar plots of different types of transfer function.		
Unit-09	[9] <u>STABILITY IN FREQUENCY DOMAIN :</u>	[08]	[10]
	9.1 Introduction		
	9.2 Nyquist stability criterion		
	9.3 Assessment of relative stability using nyquist stability Criterion, Phase margin, gain merging.		
	9.4 Closed loop frequency response.		
Unit-10	[10] <u>INTRODUCTION TO STATE SPACE APPROACH :</u>	[05]	[04]
	10.1 Concept of state		
	10.2 State space Variables & models		
	10.3 Controllability and observability		
Total		60	70

Books Recommended :-

1.	Control system engineering	-	I.J Nagrath / M. Gopal
2.	Control system engineering	-	Sushil Das gupta
3.	Control system engineering	-	S. Hassan Saeed –s.k kataria & sons
4.	Control system engineering	-	Nise- Willey
5.	Automatic Control System	-	S.N. Goyal

ELECTIVE - (ANY ONE)-(i) ELECTRIC TRACTION - II
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620605A	Theory						Credits 03	
	No. of Periods Per Week			Full Marks	:	100		
	L	T	P/S	ESE	:	70		
	03	—	—	TA	:	10		
			CT	:	20			

CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	<p>Electric Locomotives:</p> <p>1.1 - Nomenclature used For Electric Locomotives</p> <p>1.2 - Types of Electric Locomotives By Nomenclature.</p> <p>1.3 – AC Locomotive:</p> <p> 1.3.1 - Equipments of AC Electric Locomotive:</p> <p> - Power Circuit Equipments and Auxiliary Circuit Equipments.</p> <p> 1.3.2- Equipments in Power Circuit and their Functions:</p> <p> - Power Circuit Diagram of AC Locomotive: Pantograph, Circuit breaker, Tap Changer Traction Transformer, Rectifier, Smoothing Choke Traction Motor.</p> <p> 1.3.3 - Equipments in Auxiliary Circuit & their Functions: Head Light, Flasher Light, Horn, Marker Light, Batteries, Arno Converter, Blowers, Exhausters Compressors, Selsyn transformer.</p> <p> 1.3.4 – List and Purpose of Different Type of Relays:</p> <p> 1.3.5 – List and Purpose of Different Type of Contactors:</p> <p>1.4 – Three Phase Locomotive.</p> <p> 1.4.1 – Power Circuit of Three Phase Locomotive.</p> <p> 1.4.2 – Power Supply Arrangement for Auxiliary Machines in Three Phase Locomotive.</p>	14	18
Unit-02	<p>Maintenance of Locomotives:</p> <p>2.1 – Locomotive Maintenance</p> <p>2.2 – Need of Maintenance and Policy of Obselence.</p> <p>2.3 – Defects.</p> <p>2.4 – Ideal Maintenance:</p> <p> - Means to Improve the Reliability of Locomotive.</p> <p> - Means to Improve Availability of Locomotive.</p> <p> - Means to Reduce Maintenance Cost.</p> <p> - Maintenance Record.</p> <p> - Training Facility.</p> <p> - Characteristics of Efficient Maintenance.</p> <p>2.5 – Electrical Faults and Their Causes.</p> <p>2.6 – Fault Localisation.</p> <p>2.7 – Necessity of Testing.</p> <p> - Testing Procedure.</p> <p> - Individual Equipment Tests.</p>	10	18

Unit-03	Protection of Electric Locomotive: 3.1 – Introduction. 3.2 – Broad Strategy For Protection. 3.3 – Surge Protection: <ul style="list-style-type: none"> - Direct Lightening Strokes. - Switching Surges: External and Internal. 3.4 – Overload Protection of Main Power Circuit. 3.5 – Earth Fault Protection of Power and Auxiliary Circuit. 3.6 – Protection from Over Voltage and Under Voltage. 3.7 – Differential Current Protection of Traction Circuits. 3.8 – Protection Against High and Low Air Pressure in the Compressed Air Circuit. 3.9 – Temperature Monitoring. 3.10 – Protection of Transformer By Buchholz’s Relay. 3.11 – Monitoring of Ventilation System of Key Locomotive Equipments. 3.12 – Protection Against Accidental Contact with HT Equipment. 3.13 – Protection Against Fire. <ul style="list-style-type: none"> - Fire Prevention Strategy. 	08	14
Unit-04	LEM Propelled Traction: 4.1 – Introduction. 4.2 – Linear Electric Motor (LEM) 4.3 – Linear Induction Based Traction System: <ul style="list-style-type: none"> - Moving Primary Fixed Secondary Single Sided LIM. - Moving Secondary Fixed Primary Single Sided LIM. - Moving Primary Fixed Secondary Double Sided LIM. 4.4 – Strengths/Weaknesses of LIM Propelled Railway Traction: <ul style="list-style-type: none"> - Strengths of LIM Propelled Railway Traction System. - Weaknesses of LIM Propelled Railway Traction System. 4.5 – Practical Possibilities of LIM Propelled Transportation. 4.6 – Inputs/Modifications for Adoption of LIM Propulsion in the Existing System: <ul style="list-style-type: none"> - Track Modification. - Vehicle Modification. - Voltage and Speed Control. 4.7 – LIM Propelled Underground Metro Rail System: <ul style="list-style-type: none"> - Factors Influencing Adoption of LIM for Metro Rail. - International Scenario. 4.8 – Wheel Less Traction: <ul style="list-style-type: none"> - Levitation Schemes. - Present Scenario. 	10	10

Unit-05	Application of Computers in Management of Electric Traction: 5.1 – Introduction. 5.2 – Computer’s Capability Relevant to Electric Traction Management. 5.3 – Areas of Computer Application in Traction System Management: <ul style="list-style-type: none"> - Optimisation of OHE and Power Supply Installation Designs. - Computer Aided Locomotive Designs. - Monitoring of Maximum Demand. - Energy Saving Driving Approach. - Training of Drivers on Simulators. - Aiding Drivers and Maintenance Depot Through On Board Computers - History of Locomotive and OHE Equipment. - Failure Analysis. - Monitoring Execution of Trip Inspection Schedules of Locomotives. - Inventory Control. 5.4 – Possible Other Areas for Computer Controlled Monitoring. 5.5 – Advantages of Use of Computers for Management of Electric Traction System.	06	10
Total		48	70

Text /Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Modern Electric Traction	H. Partab	Dhanpat Rai & Sons
Electric Traction	J. Upadhyay S. N. Mahendra	Allied Publishers Ltd.
Viddut Engine Parichay (In Hindi)	Om Prakash Kesari	S. P. Graphics, Nashik. Phone No. (0253) 2580882
Electric Traction-II	Deepak Kumar	Foundation Publishing

ELECTIVE - (ANY ONE)-(ii) MAINTENANCE AND REPAIRS OF ELECTRICAL EQUIPMENT (ELECTRICAL ENGINEERING GROUP)

Subject Code 1620605B	Theory					Credits 03	
	No. of Periods Per Week			Full Marks	:		100
	L	T	P/S	ESE	:		70
	03	—	—	TA	:		10
			CT	:	20		

CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-1	Introduction Principle different effects of electric currents, materials used in electrical equipments, tools / instruments necessary for repair works, jointing methods, soldering, testing of instruments, Interpretation, location & identification of faults, recording / estimation of materials / components required & their cost, approximate costing of repair of equipment.	08	12
Unit-2	Domestic electrical equipment, Principle, types, construction, operation, testing, fault finding, dismantling, assembly & testing after repairs of following equipments electric Iron all types, electric ovens, electric fans & regulators, water heaters, geysers mixers, food processors, toasters.	16	22
Unit-3	Circuits used for control & regulation of electronic circuits like rectifiers amplifier timer, oscillator, identification of component, component testing, with multimeters replacement of components, microwave & use microwave for heating, laser & laser equipment	08	12
Unit-4	Advanced equipments principle, types, construction, operation, Testing, fault finding, dismantling, assembly & testing after repairs of following equipments- UPS / Inverters, battery chargers, microwaves ovens, air coolers, Washing machines – semi automatic / fully automatic, remote controllers of different equipments, VCD / DVD / ACD players.	16	24
	Total	48	70

Text /Reference Books:

Titles of the Book	Name of Authors	Name of the Publisher
Maintenance and Repairs of Electrical Equipment	Rajiv Kumar	Foundation Publishing

**ELECTIVE - (ANY ONE)-(iii) MICROPROCESSORS AND
MICROCONTROLLERS (ELECTRICAL ENGINEERING GROUP)**

Subject Code 1620605C	Theory					Credits 03	
	No. of Periods Per Week			Full Marks	:		100
	L	T	P/S	ESE	:		70
	03	—	—	TA	:		10
				CT	:		20

CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	Microprocessor 8085 1.1 Evolution of microprocessors 1.2 Architecture of 8085 1.3 Pin diagram 1.4 Control signals 1.5 Multiplexing of address & Data Bus	06	10
Unit-02	8085 Assembly Language Programming 2.1 Programming Model of 8085 2.2 Addressing Modes 2.3 Instruction classification, Instruction format 2.4 Instruction set 2.5 Stacks & subroutines 2.6 Assembly Language programming	08	14
Unit-03	Microcontroller Basics 3.1 Introduction and applications 3.2 Comparison between microcontrollers and microprocessors 3.3 Evolution of microcontrollers 3.4 Commercial microcontroller devices (some important ICs & brief idea)	02	04
Unit-04	8051 Architecture 4.1 Block diagram of 8051 microcontroller 4.2 Registers in 8051 4.3 General purpose or working registers 4.4 Stack Pointer and Program counter 4.5 Special function registers (SFR) 4.6 Program Status word 4.7 Data pointer (DPTR) 4.8 Timer registers 4.9 Ports 4.10 Control registers	05	08
Unit-05	8051 connections, I/O ports and memory organization 5.1 8051 pin description 5.2 8051 connections 5.3 Parallel I/O ports 5.4 Memory organization	05	08
Unit-06	8051 addressing modes and instructions 6.1 8051 addressing modes 6.2 8051 instruction set	08	12
Unit-07	8051 interrupts, timer/counters and serial communication 7.1 Interrupts in 8051 7.2 Initializing 8051 interrupts & their priorities 7.3 Timers and counters, timer counter modes 7.4 Serial communication, serial communication modes	06	10

Unit-08	Applications of microcontrollers 8.1 Square wave and rectangular wave generation 8.2 Pulse generation 8.3 Pulse width modulation 8.4 Frequency counter 8.5 Interfacing small keyboards 8.6 Interfacing LCD display, 8.7 Interfacing D/A and A/D converters 8.8 Interfacing relay 8.9 Interfacing stepper motor 8.10 Interfacing DC motor.	08	14
	Total	48	70

Text /ReferenceBooks		
Titles of the Book	Name of Authors	Name of the Publisher
Microcontrollers theory and applications	Ajay V Deshmukh	TMH, New Delhi
8051 microcontrollers architecture, Programming and Applications	Kenneth J Ayala,	International Thomson publishing, India
Microprocessor & Microcomputer	B. Ram	S. Chand publications
Microprocessor Architecture, Programming, and Applications with the 8085	Ramesh Gaonkar	Penram International Publishing (India) Pvt. Ltd.
Microprocessors and Microcontrollers	S.N. Mathur	Foundation Publishing

TESTING & MAINTENANCE OF ELECTRICAL MACHINES LAB
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620606	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENT: PRACTICAL

Skills to be developed:

Intellectual skills:

1. Select appropriate meters & equipment
2. Recollect Testing & Maintenance procedures.

Motor Skills:

1. Accuracy of Measurement
2. Proper connections
3. Draw characteristics

List of Practical:

- 1) Draw circuit diagram select appropriate meters, connect it to perform routine test on single phase Induction motor
- 2) As per the given circuit diagram perform routine test on three phase Induction motor, & calculate the different parameters
- 3) Select two single phase transformers, perform polarity test, mark its terminals, select appropriate meters & perform back to back test, compare its regulation with direct loading method
- 4) Perform parallel operation of transformer as per I.S.
- 5) Perform parallel operation of alternator as per I.S.
- 6) Carry out OC & SC test on Induction motor, plot circle diagram, & calculate parameters
- 7) Perform brake test on DC series motor & plot characteristic of output against torque, speed, load current as per I. S. list suitable applications.

B) Field work:

- 8) Observe & carry out weekly, monthly & yearly maintenance of motor in your workshop & prepare its report

C) Mini project:

- 9) Prepare trouble-shooting chart for single and three phase transformers
- 10) Prepare trouble-shooting chart for single and three phase motors

POWER ELECTRONICS AND DRIVES LAB
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620607	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual skills:

1. Select appropriate devices and instruments
2. Testing & troubleshooting

Motor Skills:

1. Accuracy of Measurement
2. Proper connections
3. Draw characteristics

List of Practical's:

- (1) To identify the terminals and plot V-I Characteristics of Thyristor.
- (2) To study Full Wave Rectifier Using SCR and UJT.
- (3) To study Parallel Inverter Using SCR.
- (4) To study Bridge Rectifier Using SCR and UJT.
- (5) To study series Inverter Using SCR.
- (6) To study Chopper Using SCR.
- (7) To study Circuit Breaker Using SCR.
- (8) To study Battery Charger Using SCR.
- (9) TO Perform Speed control of DC series motor by static armature voltage control using single phase half/full controlled converter.
- (10) TO Perform speed control of three phase Induction motor using PWM/CSI Inverter. Interpret the speed – torque characteristics. Use the circuit as Variable Voltage Variable Frequency (V. V. V. F.) drive.

CONTROL SYSTEM LAB
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620608	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS : PRACTICAL

	Name of the Topic	Hrs/Week	Marks
Unit-01	Study of D.C. position control servomechanism system.		
Unit-02	Study of Control System Components.		
Unit-03	Transient Response of First Order System.		
Unit-04	Transient Response of Second Order System.		
Unit-05	Frequency Response of Second Order System.		
Unit-06	ON-OFF temperature Control.		
Unit-07	Analogue Computer, Solution of different equation.		
	Total		

ELECTIVE - (ANY ONE)-(i) ELECTRIC TRACTION LAB –II
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620609A	Practical						Credits 01	
	No. of Periods Per Week			Full Marks	:	50		
	L	T	P/S	ESE	:	50		
	—	—	02	Internal	:	15		
	—	—	—	External	:	35		

CONTENTS: PRACTICAL

List of Laboratory Experiments :	
1	Study of Electric AC Locomotives.
2	Study of Relays, Contactors
3	Individual Equipment Testing
4	Overload Protection, Earth Fault Protection of Power and Auxiliary Circuit.
5	Differential Current Protection of Traction Circuits
6	Linear Induction Based Traction System:
7	Computer Aided Locomotive Designs
8	Monitoring Execution of Trip Inspection
9	Use of Computers for Management of Electric Traction

List of Assignments :-

1 **Drawing Sheets:**

(i) Drawing (on half Imperial sheet) for Power Circuit of any type of Electric Locomotive

(ii) Drawing (on half Imperial sheet) for Protection of Electric Locomotive.

(Note: Students should be able to identify, explain the functions of various equipments used in Electric locomotive).

Mini Project:

Collection of information using Internet on any two topics in the contents and submission of printouts

2 **Mini Project:**

Collection of information using Internet on any two topics in the contents and submission of printouts

ELECTIVE - (ANY ONE)-(ii) MAINTENANCE AND REPAIRS OF
ELECTRICAL EQUIPMENT LAB
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Practical			Credits		
	No. of Periods Per Week			Full Marks	:	50
1620609B	L	T	P/S	ESE	:	50
	—	—	02	Internal	:	15
	—	—	—	External	:	35
				01		

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual Skills:

1. Analytical Skills
2. Identification Skills
3. Fault finding Skills

Motor Skills:

1. Measuring Skill
2. Connecting instruments
3. Proper use of instruments, tools for repairs

A) Laboratory Experiences:

Dismantling, assembly, testing, preparation of list of components, parts and their cost for:

- 1) Electric iron all types
- 2) Electric oven
- 3) Electric toasters
- 4) Electric fan (CF, TF, PF, & EF & regulators)
- 5) Water heaters & geysers
- 6) Mixer & food processors
- 7) UPS / Inverters / battery chargers
- 8) Air coolers (portable / desert type)
- 9) Semi automatic & fully automatic washing machine
- 10) VCD / DVD / AVD players
- 11) Microwave Ovens
- 12) All types remote controllers

B) Field work:

- 13) Visit servicing centers of manufacturing companies , write the procedure of servicing of any one of them
- 14) Visit a manufacturing unit & prepare a report based on it.

C) Mini project:

- 15) For given specific application of any two equipments collect literature of different manufacturing company & prepare a comparative chart
- 16) Prepare test reports & bills for servicing of above any two equipments.

Learning Resources:

1. Service Manuals of manufacturers

**ELECTIVE - (ANY ONE)-(iii) MICROPROCESSORS AND
MICROCONTROLLERS LAB
(ELECTRICAL ENGINEERING GROUP)**

Subject Code	Practical			Full Marks	:	50	Credits
	No. of Periods Per Week						
1620609C	L	T	P/S	ESE	:	50	01
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Intellectual Skills:

1. Logical development
2. Programming skills

Motor Skills:

1. Data entry, Error Correction and Execution of assembly language programmes
2. Connection Skills

List of Practicals:

Using microprocessor 8085 kit:

1. Demonstration and study of microprocessor kit
2. Program for addition of and subtraction of two hexadecimal numbers
3. Program for finding largest / smallest number
4. Program for arranging numbers in ascending / descending order
5. Program for 16 bit addition
6. Program for data masking
7. Program for multiplication of two eight bit numbers
8. Program using JMP Instruction
9. Two programs using loop &

Counter Using microcontroller 8051 kit:

1. Demonstration and study of microcontroller kit
2. Demonstration and use of software simulator / assembler
3. Programming examples (any two) – Data transfer instructions
4. Programming examples (any two) – Logical Operations
5. Programming examples (any two) – Jump and Call instructions
6. Demonstration and testing of the following applications (Any four)
 - Keyboard Interface
 - LCD display Interface
 - D/A or A/D converter Interface
 - Relay Interface
 - Stepper motor control
 - DC motor control
 - Any other practical application using microcontroller 8051

INDUSTRIAL PROJECTS -TW
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620610	Term Work						Credits 03	
	No. of Periods Per Week			Full Marks		:		25
	L	T	P/S	Internal		:		07
	—	—	05	External		:		18

Contents : Term Work				Hrs/week	
<ul style="list-style-type: none"> Two hours should be allotted for giving the Instructions for preparing a Project Report. (Refer Guideline Document for Format of Project Report) 					
Project					
<ol style="list-style-type: none"> Design of Illumination Scheme(Up to 20 KW) for Hospital / Shopping Mall/Cinema Theatre/Commercial Complex/Educational Institute/Industrial Complex. Design of Rural Electrification Scheme for small Village, Colony. Case Studies Related to Industries – Operation / Maintenance / Repair and Fault Finding. (Refer Guideline Document). Energy Conservation and Audit. Substation Model (Scaled) Wind Turbine Model (Scaled) Pole Mounted Substation Model (Scaled) Rewinding of Three Phase/Single Phase Induction Motor. Rewinding of Single Phase Transformer. Fabrication of Inverter up to 1000 VA. Fabrication of Battery Charger. Fabrication of Small Wind Energy System for Battery Charging. Fabrication of Solar Panel System for Battery Charging. Microprocessor/ Micro controller Based Projects. PC Based Projects. Simulation Projects. 					
Seminar					
Seminar on any relevant latest technical topic based on latest research, recent trends, new methods and developments in the field of Electrical Engineering / Power Electronics.					
Note: (1) One Project (2) Seminar will be held under Professional Practices.					
Text Books:					
Name of Authors		Titles of the Book	Edition	Name of the Publisher	
IEEE Transactions/Journals					
Electrical India					
IEEMA Journal					
Elecrama					
Technorama					
Urja					
Industrial Automation					
Electronics for You					
Electronics Projects					
Computer World					
Chip					
Any Journal Related to Electrical Engg./ Electronics/ Computer/Information Technology					
2. Website:					
Using any search engine, such as http://www.google.co.in/ the relevant information can be searched on the Internet.					

PROFESSIONAL PRACTICES VI -TW
(ELECTRICAL ENGINEERING GROUP)

Subject Code 1620611	Term Work						Credits 02
	No. of Periods Per Week			Full Marks	:	25	
	L	T	P/S	Internal	:	07	
	—	—	05	External	:	18	

CONTENTS :TERM WORK

Sr. No.	Activity	Hours
Unit-01	Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work. (minimum 3 visits) Following are the suggested type of Industries/ Fields - i) Visit to Load Dispatch Center. ii) Visit to Transformer Repair Workshop. iii) Visit to Electrical Machine Manufacturing Unit. iv) Visit to Industry of Power Electronics Devices. v) Visit to Maintenance Department of Large Industry. vi) Visit to Multi Storied Building. vii) Visit to Loco Shade.	19
Unit-02	<i>The Guest Lecture/s at least two of two hours duration each from field/industry experts, professionals are to be arranged from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work</i> a) New Trends in Power Electronics Devices b) Eco friendly Air Conditioning/Refrigeration c) TQM d) Recent Modifications in IE Rules e) Functioning of Electricity Regulatory Commission f) Fourth Stage of Koyana Hydro Station g) Recent trends in Power Generation	12
Unit-03	Information Search ,data collection and writing a report on the topic a) Collection of data for comparison of Transformer Companies b) Latest trend in Classification of Insulating materials c) Design Considerations for Manufacture of Dry Type Transformers d) State and National Statistics for Power Generation e) Comparison of Cost per unit generated by various methods of Power Generation f) Safety considerations for Generation	13
Unit-04	The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are - a) Role of Electrical Engineer in disaster management. b) Scope of out sourcing of Electrical Engineering services. c) Pollution control.	12
Unit-05	Seminar Presentation The students should select a topic for Seminar based on recent developments in Electrical engineering field, emerging technology etc.	14
	Total	70

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

**Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN ELECTRONICS ENGINEERING**

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	EXAMINATION – SCHEME							Credits
				Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Advance Communication System	1621602	04	03	10	20	70	100	28	40	03
3.	Digital Electronics-II	1621603	04	03	10	20	70	100	28	40	03
4.	Signal System	1621604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1621605	03	03	10	20	70	100	28	40	03
	Elective - (i) Advanced Microprocessor (1621605A)		(ii) Advanced Instrumentation & Measurement (1621605B)		(iii) Mining Electronics (1621605C)		(iv) Medical Electronics (1621605D)		(v) Microwave Engineering (1621605E)		
Total:- 17							350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	EXAMINATION – SCHEME				Credits
					Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	
					Internal (A)	External (B)			
6.	Advance Communication System Lab.	1621606	06	03	15	35	50	20	03
Total:- 06							50		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	EXAMINATION – SCHEME				Credits
				Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	
7.	Signal and System -TW	1621607	04	15	35	50	20	02
8.	Digital Electronics & M.P. -TW	1621608	06	15	35	50	20	02
9.	Project Work & Its presentation in Seminar - TW	1621609	-	30	70	100	40	02
Total:- 10						200		
Total Periods per week Each of duration One Hours = 33						Total Marks = 750		24

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Unit	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentation <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

<p>Unit - 4</p>	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel- Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow's Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to –</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act <p>Industrial Dispute Act</p>	<p style="text-align: center;">08</p>	
<p>Unit - 5</p>	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to –</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	<p style="text-align: center;">08</p>	
<p>Unit - 6</p>	<p>Materials Management</p> <p>6.1. Inventory Management (No Numerical)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	<p style="text-align: center;">08</p>	

Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 ‘S’, & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-		
Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

ADVANCE COMMUNICATION SYSTEM

Subject Code 1621602	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale :

Objective:

Contents : Theory		Hrs/week	Marks
UNIT-1	<p><u>Introduction (Review of Communication System):</u></p> <p>01.01 Reflection and Refraction of Radio Wave</p> <p>01.02 Ground Wave, Space Wave and Sky Wave</p> <p>01.03 Muf, Skip Distance</p> <p>01.04 Fading and Composition of Ionosphere</p> <p>01.05 Modulation (AM, FM, PM), Expression for $e_{AM(t)}$, $e_{FM(t)}$, and $e_{PM(t)}$</p> <p>01.06 Simple Problem based on Formulae.</p>	[12]	
UNIT-2	<p><u>Noise</u></p> <p>02.01 Types of Noise, External Noise , Thermal Noise, Internal Noise and Short Noise</p> <p>02.02 Noise Figure, Noise Figure Measurement and Noise Temperature</p> <p>02.03 Noise in Communication System</p> <p>02.04 Simple Problem based on Noise Measurement</p>	[08]	
UNIT-3	<p><u>Satellite and optical fibre Communication</u></p> <p>03.01 Satellite communication System, Satellite Orbits, Geo Stationary Orbit</p> <p>03.02 Basic Components of Satellite Communication System, History of development of satellite Communication in India</p> <p>03.03 Optical Communication, Basic Fibre Optics System, Its Advantages</p> <p>03.04 Optical Fibre Construction, Modes of Propagation</p> <p>03.05 Numerical Aperture, losses in Optical Fibre, Optical Communication System</p>	[10]	
UNIT-4	<p><u>Radar</u></p> <p>04.01 Introduction, basic radar system, Determination of Range of Radar.</p> <p>04.02 PPI (Plan Position Indicator)</p> <p>04.03 MTI (Moving target Indicator)</p> <p>04.04 Doppler Effect, MTI principles and Application.</p>	[08]	
UNIT-5	<p><u>Basic Information Theory</u></p> <p>05.01 Introduction</p> <p>05.02 Discrete channel, redundancy</p> <p>05.03 Channel Capacity</p> <p>05.04 Hartley-Shannon Law, bandwidth, signal to noise Ratio Simple Numerical Problems</p>	[10]	

UNIT-6	<u>Modern Communication System.</u>	[12]	
06.01	Cellular Mobile Communication, Concept of Cells, Basic Cellular mobile radio system		
06.02	Cell phone, Fascimile (FAX), Important features of Fax machine, Its application		
06.03	VSAT (very small aperture terminal), Radio Paging System Advantages of Pager		
06.04	MODEM, VOD(Video On Demand), IPTV (Internet Protocol Television)		
06.05	Wi-Fi,3G		
Total		[60]	

Books Recommended:

Sl No.	Title	Author	Publisher
1	Electronics Communication System by Kennedy and Davis.	by Kennedy and Davis.	(TMH)
2	Principles of Communication engineering	by Anokh Singh & A.K Chhabra	(S.CHAND)
3	Wireless & Cellular Communication	by Sanjay Sharma	(KATSO)

DIGITAL ELECTRONICS–II

Subject Code 1621603	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	70	
			CT	:	10		
				:	20		

Rationale :

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Multivibrator Circuit.	(08)
02	Linear and Non Linear Wave Shaping Circuits.	(06)
03	Memories.	(12)
04	Input / Output Devices.	(10)
05	A / D and D / A Conversion.	(12)
06	Compact Disks.	(04)
07	Digital Display.	(08)
Total:		(60)

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>MULTIVIBRATOR CIRCUIT:</u> 01.01 Introduction. 01.02 Transistor and Multivibrator circuits. 01.03 F E T based Multivibrator circuits. 01.04 Schmitt Trigger circuit. 01.05 555 IC based above circuits. 01.06 CMOS based Multivibrator Circuits.	[08]	
UNIT-2	<u>LINEAR AND NON LINEAR WAVE SHAPING CIRCUITS:</u> 02.01 Voltage comparater. 02.02 Voltage time base generator. 02.03 Current time base generator.	[06]	
UNIT-3	<u>MEMORIES:</u> 03.01 Classification in different aspects. 03.02 Semi conductor dynamic, static memories. 03.03 Shift register memory unit. 03.04 Magnetic core memories. 03.05 Magnetic tape. 03.06 Paper tapes. 03.07 Read only memories: PROM, EPROM. 03.08 EPROM Eraser. 03.09 Storage capacity.	[10]	

UNIT-4	04.01 Punched Card. 04.02 Paper tape, Magnetic tape, Magnetic drum & recording devices. 04.03 Digital recording devices. 04.04 CRT Terminals. 04.05 Decoder, encoder and Multiplexer. 04.06 Serial and Parallel data transfer. 04.07 U A R T. 04.08 Bi-directional buffer. 04.09 Parity and encoder. 04.10 74150, 74156, 74139, 74155, 74151, 74246, ICs.	[10]	
UNIT-5	<u>A / D AND D / A CONVERSION:</u> 05.01 Introduction. 05.02 Sampling theorem. 05.03 Weighted register D/A Converter. 05.04 R-2R Ladder D/A Converter. 05.05 Inverted ladder D/A converter. 05.06 A/D converter: parallel comparater, successive approx., counting, Dual slope type. 05.07 Sample and hold circuit.	[12]	
UNIT-6	<u>COMPACT DISKS:</u> 06.01 Hard disk. 06.02 CD ROM. 06.03 CCD (charged coupled devices). 06.04 Storage charge.	[04]	
UNIT-7	<u>DIGITAL DISPLAY:</u> 07.01 LED, LCD, Light detectors displays. 07.02 Magnetic bubble display. 07.03 Seven segment display.	[08]	
Total		50	

Books Recommended:

Sl No.	Title	Author	Publisher
1	Digital Principle and Application.	-	Malvino and Leach.
2	Pulse and Digital Circuit.	-	Milman and Taub.
3	Digital Int. Circuits.	-	Taub and Schilling.

SIGNAL SYSTEM

Subject Code 1621604	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale :

Objective:

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>SIGNALS & THEIR REPRESENTATION:</u> 01.01 Basic Continuous time Signals. 01.02 Basic discrete time Signals. 01.03 Linear time invariant Signals. 01.04 Random Signals.	[07]	
UNIT-2	<u>INTRODUCTION TO LINEAR SYSTEM:</u> 02.01 Introduction. 02.02 Linear System from a physical point of view 02.03 Linear System from a Mathematical point of view	[05]	
UNIT-3	<u>FOURIER SERIES & TRANSFORMS:</u> 03.01 Fourier series expansion. 03.02 Symmetry expansion. 03.03 Exponential form of Fourier series. 03.04 Fourier Integral & Fourier Transform. 03.05 Analysis by Fourier Methods.	[08]	
UNIT-4	<u>LAPLACE TRANSFORMS:</u> 04.01 Introduction, Definition of Laplace transform of a function, Inverse Laplace transform Basic properties of Laplace transform, Laplace transform algebraic and trigonometric functions, Laplace transform of derivatives and integrals. L-transform of periodic function.	[10]	
UNIT-5	<u>INVERSE LAPLACE TRANSFORMATIONS:</u> Inverse Laplace transform Heaviside expansion theorem, initial and final value theorem, convolution integral, inverse Laplace transform of some irrational function, Application of Laplace transform and Inverse Laplace transform for the solution of differential equations.	[09]	
UNIT-6	<u>SAMPLED-DATA SYSTEM & THE Z-TRANSFORMATIONS:</u> 06.01 Introduction. 06.02 The Z-transformations. 06.03 Z-transformations of some important functions. 06.04 The shifting Theorem. 06.05 The initial & final value Theorem. 06.06 Introductions to difference equations. 06.07 Solution of difference equations.	[12]	
UNIT-7	<u>MATHEMATICAL MODELLING OF PHYSICAL SYSTEMS:</u> 07.01 System response & transfer function. 07.02 Block diagram representations. 07.03 Rule for block diagram transformations Signal flow graph. 07.04 Mason's gain formula & its applications.	[09]	
Total		60	

Books Recommended:

1.	Analysis of linear systems.	-	D. K. Cheng.
2.	Circuit & System Analysis.	-	A. Paspoulis.
3.	Signal & linear system.	-	Gabel & Roberts.
4.	Communication System.	-	Haykins.
5.	Signals and Systems, PHI.	-	A. Oppenheirn and A. Willsky.
6.	Control System Engineering.	-	Nagrath & Gopal.

ELECTIVE (ANY ONE) -(i) ADVANCED MICROPROCESSOR

Subject Code 1621605A	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale :

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Introduction to 16 BIT Microprocessor.	
02	Data and Address-BUS Configuration.	
03	Addressing Modes.	
04	Interrupt Processing.	
05	Peripheral Interfacing Chips.	
06	Architecture of 68000 Motorola processor in detail.	
07	Organisation of Instruction Sets.	
08	Architecture for standard peripheral devices.	
09	I/O Control.	
10	System Design with few industrial examples using 8086 and 68000 processors.	

CONTENTS : THEORY			Hrs/week	Marks
Unit-1	<u>INTRODUCTION TO 16 BIT MICROPROCESSOR:</u>		[]	
	01.01	Intel 8086 Architecture.		
	01.02	Intel 8088 Architecture.		
	01.03	Pipeline Architecture.		
	01.04	Bus interface unit and execution unit.		
Unit-2	<u>DATA AND ADDRESS-BUS CONFIGURATION:</u>		[]	
	02.01	Memory segmentation.		
	02.02	Memory address generation details.		
	02.03	Logical and Physical address generation.		
	02.04	I/O Port addresses.		
	02.05	Memory mapping.		
	02.06	Data, Code and Stack segmentation.		
Unit-3	<u>ADDRESSING MODES:</u>		[]	
	03.01	Instruction set in detail and Addressing Modes.		
	03.02	Assembler directives.		
	03.03	Programming examples.		
Unit-4	<u>INTERRUPT PROCESSING:</u>		[]	
	04.01	Hardware Interrupt.		
	04.02	Software Interrupt.		
	04.03	Internal Interrupt.		
	04.04	Types of Interrupt.		
	04.05	Interrupt enabling and disabling.		
Unit-5	<u>PERIPHERAL INTERFACING CHIPS:</u>		[]	
	05.01	Intel 8255.		
	05.02	Intel 8253.		
	05.03	Intel 8259.		
	05.04	Intel 8251.		
	05.05	Interfacing of these chips with processor.		
	05.06	Digital interfacing.		
	05.07	Analog interfacing.		
	05.08	Industrial control applications.		

Unit-6	ARCHITECTURE OF 68000 MOTOROLA PROCESSOR IN DETAIL.		[]	
	06.01	Introduction.		
	06.02	Reference in 68000.		
	06.03	Memory Address.		
	06.04	Instruction formats.		
	06.05	Addressing Modes.		
	06.06	Instruction Sets.		
	06.07	STACK, Read and Write Cycle Timing.		
Unit-7	ORGANISATION OF INSTRUCTION SETS:		[]	
	07.01	Addressing modes.		
	07.02	Assembly language programming.		
	07.03	Examples for sorting logical operations.		
	07.04	Control loops.		
	07.05	Interrupt and exception programming.		
Unit-8	I/O CONTROL:		[]	
	08.01	I/O control using parallel interface.		
	08.02	I/O control using memory mapped I/O control for data acquisition.		
	08.03	Data output through binary I/O lines.		

Books Recommended:

1. Intel Manual of 8086 -
2. Microprocessing and Interfacing. - Hall
3. 6800 Assembly Lan. Programming. - Leventhal
4. Microprocessor - Lui & Gibson
5. Motorola Manufacturing Data Sheets. -

ELECTIVE (ANY ONE) -(ii) ADVANCED INSTRUMENTATION & MEASUREMENT

Subject Code 1621605B	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale :

Objective:

S.No. Topics

Periods

- | | | |
|----|----------------------------------------|--|
| 01 | Sensors. | |
| 02 | Microprocessor based data acquisition. | |
| 03 | Process Control. | |
| 04 | Electronic Graphic Recording Systems. | |

CONTENTS : THEORY			Hrs/week	Marks
Units-1	<u>SENSORS:</u>			
	01.01	Electrical sensors for : (a) Mechanical acquisition, (b) Hydraulic acquisition, (c) Pneumatic acquisition.		
	01.02	Analog sensors.		
	01.03	Digital sensors.		
Units-2	<u>MICROPROCESSOR BASED DATA ACQUISITION:</u>			
	02.01	Instrumentation amplifier.		
	02.02	Multiplexers.		
	02.03	Sample and hold circuit.		
	02.04	D/A Converter.		
	02.05	A/D Converter.		
	02.06	Data acquisition system.		
Units-3	<u>PROCESS CONTROL:</u>			
	03.01	Process controller.		
	03.02	Hardware data logging.		
	03.03	Microcomputer as process controller.		
	03.04	Supervisory control.		
	03.05	Direct digital control.		
Units-4	<u>ELECTRONIC GRAPHIC RECORDING SYSTEMS:</u>			
	04.01	Introduction.		
	04.02	Balancing arrangement.		
	04.03	XY Recorder.		
	04.04	Types and briefs of permanent recording systems.		
Total				

Books Recommended:

- | | |
|------------------------------------------------|------------------|
| 1. Microprocessor with Application in Control. | - Ahson. |
| 2. Microprocessor in Instruments & Control. | - Bibbero |
| 3. Modern Instrumentation System. | - Mani & Others. |

ELECTIVE (ANY ONE) -(iii) MINING ELECTRONICS

Subject Code 1621605C	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale :

Objective:

S.No.

Topics

Periods

01	Basic Quantity Measurement.	
02	Environmental Measurement.	
03	Sensors.	
04	Detectors.	
05	Transport System Monitoring.	
06	Surveillance of Electrical System.	
07	MIS Systems.	

CONTENTS : THEORY		Hrs/week	Marks
Unit-1	<u>BASIC QUANTITY MEASUREMENT:</u>		
	01.01	Measurement of temperature.	
	01.02	Measurement of pressure.	
	01.03	Measurement of humidity.	
	01.04	Measurement of Air Velocity.	
Unit-2	<u>ENVIRONMENTAL MEASUREMENT:</u>		
	02.01	Introduction.	
	02.02	Monitoring and recording of methane.	
	02.03	Monitoring and recording of carbon mono-oxide.	
	02.04	Measuring of Oxygen and other gas quantities.	
Unit-3	<u>SENSORS:</u>		
	03.01	Classification of gas sensors.	
	03.02	Solid state sensors.	
	03.03	Gas analysis.	
	03.04	Ionisation chamber.	
Unit-4	<u>DETECTORS:</u>		
	04.01	Introduction & Classification.	
	04.02	Early detectors of ground fires.	
	04.03	Smoke/fire detectors.	
	04.04	Detection of rock movements.	
	04.05	Detection of change in pressure.	
Unit-5	<u>TRANSPORT SYSTEM MONITORING:</u>		
	05.01	Introduction & Classification.	
	05.02	Tub transport system.	

	05.03	Conveyer belt transport system.		
	05.04	NDT for wire ropes.		
Unit-6	<u>SURVEILLANCE OF ELECTRICAL SYSTEM:</u>			
	06.01	Introduction.		
	06.02	Surveillance of underground electrical systems.		
	06.03	Surveillance of ground electrical system.		
	06.04	Surveillance of communication system.		
	06.05	Insulation monitoring.		
	06.06	Fault detection in different section.		
Unit-7	<u>MIS SYSTEMS:</u>			
	07.01	Introduction to control dispatch system.		
	07.02	Signaling in mines.		
	07.03	Different types of transmitters used in mines.		
	07.04	Different types of receiver used in mines.		
	07.05	Important safely signals used in mines.		
Total				

ELECTIVE (ANY ONE) -(iv) MEDICAL ELECTRONICS

Subject Code 1621605D	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	20	

Rationale :

Objective:

<u>S.No.</u>	<u>Topics</u>	<u>Periods</u>
01	Body Skeleton.	
02	Muscle Physiology.	
03	Heart Physiology.	
04	Respiration.	
05	Neuro Physiology.	
06	Recording Techniques.	
07	Measurement & Recording of Non-Electrical Systems.	
08	Electronic Instruments affecting Human Body.	

CONTENTS : THEORY		Hrs/week	Marks
Unit-1	<u>BODY SKELETON:</u>		
	01.01	Nerve Physiology.	
	01.02	Membrane Potential.	
	01.03	Action Potential.	
	01.04	Function of Nerve Junctions.	
	01.05	Functions of Neo-Neural Junctions.	
Unit-2	<u>MUSCLE PHYSIOLOGY:</u>		
	02.01	Function of Skeleton & Smooth Muscle.	
	02.02	Function of Cardiac Muscle.	
	02.03	Cardiac Rhythmic Contraction.	
Unit-3	<u>HEART PHYSIOLOGY:</u>		
	03.01	Introduction to Heart function.	
	03.02	Blood flow.	
	03.03	Arterial Pressure.	
	03.04	E C G.	
Unit-4	<u>RESPIRATION.</u>		
Unit-5	<u>NEURO PHYSIOLOGY:</u>		
	05.01	Introduction.	
	05.02	Function of Spinal Cord.	
	05.03	Cord Reflexes.	
Unit-6	<u>RECORDING TECHNIQUES:</u>		
	06.01	Introduction.	
	06.02	Electro-Cardiac Graph.	
	06.03	Electro Mypho Graph.	
	06.04	Electro Encyclo Graph.	
Total			

Books Recommended:

- | | |
|--------------------------------------------|----------------------|
| 1. Bio Medical Electronics | - Cromwell & others. |
| 2. Bio Electronic Instrument & Measurement | - Khandpur. |
| 3. Bio Medical Instrument & Measurement | - Cromwell & others. |

ELECTIVE (ANY ONE) -(v) MICROWAVE ENGINEERING

Subject Code 1621605E	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale:

Objective:

S.No. Topics

- 01 Microwave Tubes.
- 02 Microwave Semi Conductor Devices.
- 03 Microwave Components and Antennas.
- 04 Microwave Transmission.
- 05 Microwave Measurements.

CONTENTS : THEORY			Hrs/week	Marks
Unit-1	<u>MICROWAVE TUBES:</u>			
	01.01	Introduction.		
	01.02	Microwave frequency band spectrum.		
	01.03	Klystron.		
	01.04	Reflex Klystron.		
	01.05	Travelling Wave tubes.		
	01.06	Magnetron.		
Unit-2	<u>MICROWAVE SEMI CONDUCTOR DEVICES:</u>			
	02.01	Microwave Diodes.		
	02.01.01	Varactor Diodes.		
	02.01.02	Tunnel Diodes.		
	02.01.03	Gunn Diodes.		
	02.01.04	Avalanche effect diodes.		
	02.02	M A S E R.		
Unit-3	<u>MICROWAVE COMPONENTS AND ANTENNAS:</u>			
	03.01	Coaxial Lines.		
	03.02	Wave guides.		
	03.02.01	Rectangular.		
	03.02.02	Circular.		
	03.03	Wave guide corners and Tees.		
	03.04	Directional couplers.		
	03.05	Attenuators.		
	03.06	Antennas.		
	03.07.01	Parabolic.		
	03.08.02	Horn.		
03.09.03	Slot.			

Unit-4	<u>MICROWAVE TRANSMISSION:</u>			
	04.01	Maxwells equations.		
	04.02	Modes of propagation in rectangular and circular wave guides.		
	04.03	Transmission through rectangular wave guide.		
	04.04	Cut off and guide wavelength.		
	04.05	Phase and group velocity.		
Unit-5	<u>DETECTORS:</u>			
	05.01	Measurement of impedance.		
	05.02	Measurement of frequency.		
	05.03	Voltage standing wave ratio.		

Books Recommended:

- | | |
|----------------------------------------------|---------------------------|
| 1. Microwave Communication. | - Angelkos & Everhar. |
| 2. Foundation of Microwave Communication. | - Collins. |
| 3. Microwaves. | - Sanjeev Gupta & others. |
| 4. Electromagnetic Waves & Radiating Systems | - Jordan. |
| 5. Microwave Theory & Measurement | - Heylward Packard. |

ADVANCE COMMUNICATION SYSTEM LAB.

Subject Code 1621606	Practical			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
			External	:	35		

Contents : Practical		Hrs/week	Marks
Unit-1	To observe an AM wave on CRO produced by standard signal generator using internal and external modulation. The depth of modulation is to be measured with the above experiment.		
Unit-2	To generate an amplitude modulated Signal using a square-law modulator and study the spectra of AM wave.		
Unit-3	To generate and study double side band suppressed carrier (DSB-SC) modulated Signal.		
Unit-4	To Study the frequency characteristics of pre-emphasis and de-emphasis.		
Unit-5	To Study time-division multiplexing and demultiplexing technique and observe cross-talk.		
Unit-6	To generate and Study wide band and narrow band noise.		
Unit-7	Observation of dependence of intersymbol Interference (ISI) on bandwidth of the channel and the eye pattern due to noise in the channel.		
Unit-8	To Set-up circuits for pulse code modulation and demodulation and to study the modulator and demodulator with the study of quantization noise.		
Unit-9	To verify the sampling theorem and to observe aliasing effect.		
Unit-10	To Study phase locked characteristics and its application as FM demodulator.		
Unit-11	To generator frequency modulated signal using VCO (Voltage controlled oscillator)		
Unit-12	To study the troubleshooting of monochrome TV receiver with expected faults with their remedy.		
Unit-13	To study the trouble shooting of colour TV receiver with normal defects with their remedy.		
Unit-14	Study of CRO, and its application for measurement of phase, frequency, and amplitude such that it can be used for the communication System.		

SIGNAL AND SYSTEM -TW

Subject Code 1621607	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Rationale :

Objective:

Contents : Term Work		Hrs/week	Marks
UNIT-1	Write a program to generate the discrete sequences (i) unit step (ii) unit impulse (iii) ramp (iv) periodic sinusoidal sequences. Plot all the sequences.		
UNIT-2	Find the Fourier transform of a square pulse. Plot its amplitude and phase spectrum.		
UNIT-3	Write a program to convolve two discrete time sequences. Plot all the sequences. Verify the result by analytical calculation.		
UNIT-4	Write a program to find the trigonometric Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings.		
UNIT-5	Write a program to find the trigonometric and exponential Fourier series coefficients of a periodic rectangular signal. Plot the discrete spectrum of the signal.		
UNIT-6	Generate a discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.		
UNIT-7	The signal $x(t)$ is defined as below. The signal is sampled at a sampling rate of 1000 samples per second. Find the power content and power spectral density for this signal. $X(t) = \begin{cases} \cos(2\pi \times 47t) + \cos(2\pi \times 219t), & \leq t \leq 10 \\ 0, & \text{otherwise} \end{cases}$		
UNIT-8	Write a program to find the magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.		
UNIT-9	Write a program to find the response of a low pass filter and high pass filter, when a speech signal is passed through these filters.		
UNIT-10	Write a program to find the autocorrelation and cross correlation of sequences.		
UNIT-11	Generate a uniformly distributed length 1000 random sequence in the range (0,1). Plot the histogram and the probability function for the sequence. Compute the mean and variance of the random signal.		
UNIT-12	Generate a Gaussian distributed length 1000 random sequence. Compute the mean and variance of the random signal by a suitable method.		
UNIT-13	Write a program to generate a random sinusoidal signal and plot four possible realizations of the random signal.		
UNIT-14	Generate a discrete time sequence of N=1000 i.i.d uniformly distributed random numbers in the interval (-0.5, 0.5) and compute the autocorrelation of the sequence.		
UNIT-15	Obtain and plot the power spectrum of the output process when a white random process is passed through a filter with specific impulse response.		
Total			

DIGITAL ELECTRONICS & MICROPROCESSOR -TW

Subject Code 1621608	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	06	External	:	35	

	Contents : Term Work	Hrs/week	Marks
Unit-1	Operation of Mono stable multivibrator circuit.		
Unit-2	Operation of Bi stable multivibrator circuit.		
Unit-3	Operation of Astable multivibrator circuit.		
Unit-4	Operation of Schmitt trigger circuit.		
Unit-5	Operation of Comparator circuit.		
Unit-6	Operation of Integrator circuit.		
Unit-7	Operation of Blocking Oscillator circuit.		
Unit-8	Operation of Shift registers and counter.		
Unit-9	Operation of EPROM eraser.		
Unit-10	Operation of Multiplexers ICs.		
Unit-11	Operation of D/A converter.		
Unit-12	Operation of A/D converter.		
Unit-13	Operation of R-2R ladder network.		
Unit-14	Operation of Sample and Hold circuit.		
Unit-15	Operations of seven segments display circuit.		
Total			

PROJECT WORK AND ITS PRESENTATION IN SEMINAR -TW

Subject Code 1621609	Term Work			No of Period in one session :			Credits	
	No. of Periods Per Week			Full Marks				02
	L	T	P/S	Internal	:	30		
	—	—	—	External	:	70		

Rationale :

The Project work and its presentation in seminar is an important subject for a Diploma holder technician. The course is designed to help a students develop confidence, skill in report writing, skill to analyse, design, estimating and costing, deciding a process etc, the course will also help in developing communication skill, skill of quality documentation.

Objective:

A student will be able to:

- Identify a Problem
- Analyse the Problem
- Develop logical approach to solution of a Problem.
- Design of a product
- Make estimate of materials and processes and calculate the cost of production and decide the price of the product.
- Manufacture / assemble /fabricate the product in the workshop.
- Test the product for its quality.
- Prepare a project report (Computer printed / typed)
- Present in the form of seminar.

<u>S.No.</u>	<u>Topics</u>
01	To make a bridge rectifier.
02	To make/assemble a voltage stabilizer.
03	To make/assemble stabilizer for refrigerator.
04	To make a timer circuit IC 555.
05	Electronic Regulator for Ceiling Fan.
06	To fabricate a circuit for characteristics for NPN/PNP transistors.
07	Bi-stable Multivibrator
08	Half & Full adder, subtractor & Comparator.
09	8:1 Multiplexer.
10	Realising Railway Signaling System.

REPORT WRITING:

A report must include

Contents : Term Work		Hrs/week	Marks
Unit-1	Introduction.		
Unit-2	Design.		
Unit-3	Estimating of materials.		
Unit-4	Calculation of cost of the materials.		
Unit-5	Operation time estimation.		
Unit-6	Cost of Operation.		
Unit-7	Process of Manufacture / Assembly / fabrication.		
Unit-8	List of tools/equipments used with specification.		
Total			

OR

A project on live industrial problems that may be—

- Technical
- Human Relation
- Welfare
- Safety
- Any other

The Project Report should consist of :-

Unit-1	Introduction.	Hrs/week	Marks
Unit-2	Problem statement.		
Unit-3	Background of Industry.		
Unit-4	Organisational set –up.		
Unit-5	Plant Lay –out.		
Unit-6	Reason for selecting a problem.		
Unit-7	Analysis of Problem.		
Unit-8	Probable solution.		
Unit-9	Best solution possible.		
Unit-10	Any other.		

Project work/ project report should be presented in the form of a seminar for developing confidence and communication skill among the students.

NOTE:-

Project work will be allotted to the students just in the beginning of the session. Each student will be given a separate work under the supervision of a teacher. Total number of students may be divided among the number of teachers available. The teacher concerned will select separate problem for each student under him and allot it to him at the beginning of the session. The work allotted should be completed within scheduled time, i.e. by the end of the session. Problems selected should preferably conform to the syllabus. If it is outside of the syllabus then it must be within the field of electronics engineering.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN INSTRUMENTATION AND CONTROL ENGG.

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Power System II	1640602	03	03	10	20	70	100	28	40	03
3.	Utilization of Electrical Power & Control	1640603	04	03	10	20	70	100	28	40	03
4.	Signal System & Transducer	1640604	04	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1640605	03	03	10	20	70	100	28	40	03
Elective-(i) Modern Communication & its Application(1640605A)		(ii) Advance Instrumentation & Measurement (1621605B)			(iii) Network Theory (1640605C)			(iv) Microwave Engg. (1621605E)			
Total:- 17							350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	
					Internal (A)	External (B)			
6.	Electrical Machine Lab	1640606	04	03	15	35	50	20	02
7.	Electronics Circuit Lab	1640607	04	03	15	35	50	20	03
Total:- 08							100		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits		
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject			
8.	Professional Practice -TW	1640608	04	15	35	50	20	02		
9.	Project Work & its Presentation in Seminar -TW	1621609	04	30	70	100	40	02		
Total:- 08							150			
Total Periods per week Each of duration One Hours = 33							Total Marks = 750	24		

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits 03	
	No. of Periods Per Week			Full Marks		:		100
	L	T	P/S	ESE		:		70
	03	—	—	TA		:		10
	—	—	—	CT		:		20

CONTENTS : THEORY

Unit -1	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentatin <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

Unit - 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel- Training & Development <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow's Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to - <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act 	08	
Unit - 5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget •Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to - <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit - 6	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	

Unit - 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-

Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

POWER SYSTEM – II

Subject Code 1640602	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	10	
					20		

Rationale :-

The whole network of Electrical Power sumptuous right from its generations, transmission & distribution to utilization has important stages of switch gear and circuit breakers. There are occasions of occurring various fault in different stages of the system during operations. There must be remedial approach to rectify such faults through relays.

Objective:-

An Electrical Diploma holder must have the knowledge of functioning of switch gear control system as well as those of relays and faults finding circuits.

The proposed syllabus of Power System-II includes the relevant topics with the objectives of building up the skill of students. This will help them to face the situations when attached with responsibility.

Contents : Theory		Hrs/week	Marks
<u>Part-I</u>			
UNIT-1	<u>SWITCH GEAR:</u>		[07]
	01.01	Introduction of switch gear, classification of circuit breakers. Air circuit breaker, Air blast circuit breaker.	
	01.02	Arc formation in circuit breakers. Models of Arc Extensions.	
	01.03	Insulation requirements of circuit breakers. Causes of failure of its insulations	
	01.04	Features of circuit breakers. Auto Reclosure. Maintenance of circuit breaker.	
UNIT-2	<u>FAULT CLEARING AND C. B. RATINGS:</u>		[08]
	02.01	Sudden short circuit of R-L series circuit problems.	
	02.02	Circuit breaker rating, Breaking Capacity, Making Capacity, Short time current ratings, Rated interrupting time.	
	02.03	Recovery voltage, Restriking voltage, Rate of rise of restriking voltage. Current chopping problems.	
UNIT-3	<u>HRC FUSES AND THEIR APPLICATIONS :</u>		[04]
	03.01	Types of devices with fuse construction of Rewirable and HRC fuses.	
	03.02	Action of HRC fuse. Characteristics of HRC fuse cut off, current Limiters.	
	03.03	Selection of fuse for different applications.	
<u>Part-II</u>			
UNIT-4	<u>FAULT CALCULATIONS:</u>		[08]
	04.01	Types of faults, procedure of fault calculation. Representations of Power System, Per unit method. Advantages of per unit system.	
	04.02	Selection of bases. Determination of base impedance in single and three phase systems.	
	04.03	Problems on fault calculations.	

UNIT-5	<u>REACTORS:</u>		[06]	
	05.01	Construction and use of Reactors.		
	05.02	Different types of Reactors, their advantages and disadvantages.		
	05.03	Methods of locating Reactors. Problems.		
UNIT-6	<u>SYMMETRICAL FAULTS:</u>		[04]	
	07.01	Percentage Reactance and short circuit currents. Problems.		
	07.02	Fault MVA and Fault current. Problems.		
UNIT-7	<u>SYMMETRICAL COMPONENTS:</u>		[04]	
	07.01	Symmetrical Components of 3- ϕ systems.		
	07.03	Problems.		
UNIT-8	<u>UNSYMMETRICAL FAULTS:</u>		[05]	
	08.01	Sequence Impedances, Sequence networks of alternator, Voltage equations.		
	08.02	Single line L-G fault, L-L-G & 3- ϕ fault in alternator.		
	08.03	Zero sequence diagrams of Generators and Transformers.		
	08.04	Problems.		
<u>Part-III</u>				
UNIT-9	<u>INTRODUCTION OF PROTECTIVE RELAYING:</u>		[04]	
	09.01	Introduction, importance and functions of Protective relaying.		
	09.02	Primary and back-up protection.		
	09.03	Selectivity, Relay time, Fault Clearing time, Sensitivity, Stability, Reliability, Trip Circuit (Only Definitions)		
UNIT-10	<u>RELAYS & PROTECTIONS:</u>		[10]	
	10.01	Protection of Alternators, Merz Price Protection		
	10.02	Protection of Transformers, Buchalz Relay (or gas actuated relay)		
	10.03	Bus-bar feeder and transmission, over current protection.		
	10.04	Directional (or over current or Earth fault) Relay		
Total			60	

Books Recommended:-

- | | |
|-----------------------------------------------------------------------|--------------------------|
| 1. Switch Gear and Protections | - Sunil S. Rao |
| 2. Electric Power (Generation, Transmission, Distribution Protection) | - Soni Gupta & Bhatnagar |
| 3. Electric Power (Hindi) | - D. R. Nagpal |

Reference Book :-

- | | |
|-----------------------------------------------------------------------------------|----------------|
| 1. Principles of Power System, S. Chand & Co., New Delhi | - V. K. Mehta |
| 2. Electrical Power System, New Age International Pvt. Ltd. Publishers, New Delhi | - C. L. Wadhwa |

UTILIZATION OF ELECTRICAL POWER & CONTROL

Subject Code 1640603	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Contents : Theory			Hrs/week	Marks
UNIT-1	Electric Heating		[12]	
	01.01	Classification of Electric Heating Methods		
	01.02	Resistance Heating		
	01.03	Resistance oven		
	01.04	Design of Heating elements and control, simple Problems.		
	01.05	Induction Heating		
	01.06	Dielectric Heating		
UNIT-2	Electric Welding		[10]	
	02.01	Electric welding equipments		
	02.02	Requirements of Good weld		
	02.03	Resistance welding- Butt, spot and seam welding		
	02.04	Electric Arc welding – Carbon arc and Metallic arc welding.		
UNIT-3	Illumination		[06]	
	03.01	Incandescent lamps and Gaseous Discharge lamp		
	03.02	Street Lighting		
	03.03	Flood Lighting		
UNIT-4	Special Motors		[08]	
	04.01	Single phase Induction Motor- Capacitor start & Capacitor run motor, Repulsion motor, shaded pole motors.		
	04.02	Schrage Motor.		
UNIT-5	Control Devices for Industrial Motors		[12]	
	05.01	Electric Braking- Rheostatic braking, Plugging and Regenerative braking.		
	05.02	Automatic Regulating Equipment.		
	05.03	Solid state Devices.		
	05.04	Electro-Magnetic Relays.		
	05.05	Protective Devices and Interlocks.		
UNIT-6	Thyristor Control of Electric Motors		[12]	
	06.01	Special Features of thyristor drive motors		
	06.02	Thyristor control of DC series motors		
	06.03	Thyristor control of three phase Induction motors		
	06.04	Thyristor control of three phase synchronous motors		
	06.05	Speed control of single phase Induction motor using Triac.		
Total			60	

Books Recommended:-

1. Utilization and Traction -
2. Utilization of Electric Power & Electric Traction -

Prof. Balvir Singh

J.B. Gupta

SIGNAL SYSTEM AND TRANSDUCER

Subject Code 1640604	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Contents : Theory		Hrs/week	Marks	
UNIT-1	<u>TRANSDUCERS :-</u>	[]		
	1.1			What is transducer?
	1.2			Classification of transducer.
	1.3			Classification based on electrical principle involved.
	1.4			Resistive Position Transducer.
	1.5			Resistive Pressure transducer.
	1.6			Inductive pressure Transducer.
	1.7			Capacitive Pressure Transducer.
	1.8			Self generating inductive transducer, Tachometer, electromagnetic flowmeter.
	1.9			LVDT(Linear Variable Differential Transformer), working advantages and disadvantages.
	1.10			Piezoelectric transducer.
	1.11			Strain Gauge, Gauge factor.
	1.12			Temperature transducer, resistance temperature detector. Thirmistor.
	1.13			Thermocouple.
	1.14			Ultrasonic temperature transducers (field of appl).
	1.15			Photoelectric Transducers.
1.16	Types of microphone. Carbon microphone etc.			
UNIT-2	<u>SIGNALS :-</u>	[]		
	2.1			Introduction to signal.
	2.2			Classification of signals. Continuous signal, Discrete signal, Deterministic and Non-deterministic signal, Periodic and Aperiodic signal, even and odd signal, energy band power signal, simple related problems.
2.3	Unit step-function, Unit Impulse-function, Unit ramp function, Relationship b/w these functions.			
UNIT-3	<u>LAPLACE TRANSFORM (LT):-</u>	[]		
	3.1			Introduction and definition.
	3.2			L.T of elementary functions. i.e $L(e^{at})$, $L(\sin(at))$, $L(\cos(at))$, $L(\sinh at)$, $L(\cosh at)$.
	3.3			Properties of L.T, Linearity property. First shifting property and its application, Change of scale property.
	3.4			Transforms of derivatives and integrals, multiplication by t^n , division by t .
	3.5			Inverse laplace transform, concepts of partial fraction etc. Different methods of finding inverse laplace transforms.
				Convolution theorem and its appl. Use of L.T and I.L.T to differential equations.
				Intial, and final value theorem.

UNIT-4	<u>FOURIER INTEGRAL THEOREM :-</u>		[]	
	4.1	Fourier integral theorem.		
	4.2	Fourier sine and cosine integrals.		
	4.3	Complex form of Fourier integrals.		
	4.4	Fourier transform properties of Fourier transforms, problems etc.		
4.5	Fourier series, EULER'S Formulae. Periodic and non periodic function, condition of for F-expansion. Change of interval, odd, even function etc.			
UNIT-5	<u>Z- TRANSFORMS INTRODUCTION :-</u> <u>Definition.</u> <u>SOME STANDARD Z-TRANSFORMS :-</u> $Z[a^n] = \frac{Z}{Z-a}$ $Z[n^p] = -Z \frac{d}{dz} [n^{p-1}] \quad p, \text{ being +ve integer}$		[]	
	Total			

Some standard results, Problems.

ELECTIVE - (ANY ONE) - (i) MODERN COMMUNICATION & ITS APPLICATION

Subject Code 1640605A	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
			CT	:	10		
					20		

Contents : Theory		Hrs/week	Marks
UNIT-1	Introduction:-	[08]	
	(1.1) Introduction to Elective communication system,		
	(1.2) classification of radio wave,		
	(1.3) Amplitude modulation,		
	(1.4) Frequency modulation,		
	(1.5) Phase modulation.		
(1.6) Related concepts and simple problem.			
UNIT-2	Waveguide:-	[08]	
	(2.1) Introduction to TEM/TE/TM.		
	(2.2) Comparison of wave guide with two wire Transmission line,		
	(2.3) Definition and interpretation of cut off frequency of a wave guide, wave length, phase velocity and group velocity. Simple related problems.		
UNIT-3	Microwave components:-	[04]	
	(3.1) Introduction,		
	(3.2) Construction and working principle of Pin diode, Gunn diode, IMPATT, and TRAPATT diode.		
UNIT-4	Propagation of waves:-	[08]	
	(4.1) Modes of propagation		
	(4.2) Ground wave, sky wave, space wave propagation,		
(4.3) Fading, ionospheric layer, virtual height, skip distance.			
UNIT-5	Satellite communication System:-	[08]	
	(5.1) Introduction to satellite communication system,		
	(5.2) Satellite orbits,		
(5.3) Basic components of satellite communication system, commonly used frequencies in satellite communication in India.			
UNIT-6	Radar System:-	[08]	
	(6.1) Basic Radar system,		
	(6.2) radar range,		
	(6.3) pulsed radar system,		
	(6.4) PPI,		
	(6.5) MTI,		
	(6.6) Doppler effect,		
	(6.7) MTI principle,		
	(6.8) Radar beacons,		
(6.9) LORAN.			
UNIT-7	(7.1) Cellular phones,	[06]	
	(7.2) Basic idea,		
	(7.3) Working Principle,		
	(7.4) Close circuit TV camera,		
	(7.5) Operation and its application.		
Total		50	

Recommended Books :-

- | | | |
|----------------------------------------------------|---|--------------|
| (i) Communication System-Mg Graw Hill. | - | Kenedy |
| (ii) Principles of Communication | - | B.P. Lathi- |
| (iii) Principles of Communication. Kataria & Sons- | - | A.K. Gautam- |

ELECTIVE - (ANY ONE) -(ii) ADVANCED INSTRUMENTATION & MEASUREMENT

Subject Code 1621605B	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale :-

Objective:-

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>SENSORS:</u>	[]	
	01.01 Electrical sensors for : (a) Mechanical acquisition, (b) Hydraulic acquisition, (c) Pneumatic acquisition.		
	01.02 Analog sensors.		
	01.03 Digital sensors.		
UNIT-2	<u>MICROPROCESSOR BASED DATA ACQUISITION:</u>	[]	
	02.01 Instrumentation amplifier.		
	02.02 Multiplexers.		
	02.03 Sample and hold circuit.		
	02.04 D/A Converter.		
	02.05 A/D Converter.		
	02.06 Data acquisition system.		
UNIT-3	<u>PROCESS CONTROL:</u>	[]	
	03.01 Process controller.		
	03.02 Hardware data logging.		
	03.03 Microcomputer as process controller.		
	03.04 Supervisory control.		
	03.05 Direct digital control.		
UNIT-4	<u>ELECTRONIC GRAPHIC RECORDING SYSTEMS:</u>	[]	
	04.01 Introduction.		
	04.02 Balancing arrangement.		
	04.03 XY Recorder.		
	04.04 Types and briefs of permanent recording systems.		
Total			

Books Recommended:-

- | | |
|------------------------------------------------|------------------|
| 1. Microprocessor with Application in Control. | - Ahson. |
| 2. Microprocessor in Instruments & Control. | - Bibbero |
| 3. Modern Instrumentation System. | - Mani & Others. |

ELECTIVE - (ANY ONE) -(iii) NETWORK THEORY

Subject Code 1640605C	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale :-

Objective:-

Contents : Theory			Hrs/week	Marks
UNIT-1	<u>BASIC CIRCUIT ELEMENTS & WAVEFORMS:</u>		[07]	
	01.01	Circuit components		
	01.02	Standard Input Signals		
	01.03	Sinusoidal Signals		
UNIT-2	<u>MESH AND NODE ANALYSIS:</u>		[09]	
	02.01	Kirchoff's Laws.		
	02.02	Source Transformation.		
	02.03	Mesh & Node analysis.		
	02.04	Magnetic coupling.		
UNIT-3	<u>FOURIER SIERIES:</u>		[06]	
	03.01	All forms of Fourier Series including trigonometry, Exponential etc.		
	03.02	Fourier Transform.		
UNIT-4	<u>LAPLACE TRANSFORM & THEIR APPLICATION:</u>		[07]	
	04.01	Introduction.		
	04.02	Laplace transformation.		
	04.03	Application of Laplace transform in the solution of Linear Differential Equation.		
	04.04	Inverse Laplace Transform.		
UNIT-5	<u>RESONANCE:</u>		[03]	
	05.01	Series Resonance		
	05.02	Parallel Resonance		
UNIT-6	<u>TWO-PORT NETWORK:</u>		[12]	
	06.01	Introduction.		
	06.02	Open Circuit Impedance Parameters.		
	06.03	Short Circuit Admittance		
	06.04	Two Port Symmetry		
UNIT-7	<u>PASSIVE NETWORK SYNTHESIS:</u>		[10]	
	07.01	Introduction.		
	07.02	Positive real function.		
	07.03	Two Terminal R-L Network.		
	07.04	Two Terminal R-C Network.		
UNIT-8	<u>INTRODUCTION OF FIRST ORDER & SECOND ORDER SYSTEMS WITH EXAMPLES:</u>		[06]	
Total			60	

Books Recommended:-

- | | |
|---------------------|--------------------|
| 1. Network & System | - D. Roy Choudhury |
| 2. Network & System | - G. K. Mittal |
| 3. Network & System | - Vulkenberg |
| 4. Network & System | - Dacsur & Kuo |

ELECTIVE - (ANY ONE) -(iv) MICROWAVE ENGINEERING

Subject Code 1621605E	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale:-

Objective:-

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>MICROWAVE TUBES:</u>		[]
	01.01	Introduction.	
	01.02	Microwave frequency band spectrum.	
	01.03	Klystron.	
	01.04	Reflex Klystron.	
	01.05	Travelling Wave tubes.	
	01.06	Magnetron.	
UNIT-2	<u>MICROWAVE SEMI CONDUCTOR DEVICES:</u>		[]
	02.01	Microwave Diodes.	
	02.01.01	Varactor Diodes.	
	02.01.02	Tunnel Diodes.	
	02.01.03	Gunn Diodes.	
	02.01.04	Avalanche effect diodes.	
	02.02	M A S E R.	
UNIT-3	<u>MICROWAVE COMPONENTS AND ANTENNAS:</u>		[]
	03.01	Coaxial Lines.	
	03.02	Wave guides.	
	03.02.01	Rectangular.	
	03.02.02	Circular.	
	03.03	Wave guide corners and Tees.	
	03.04	Directional couplers.	
	03.05	Attenuators.	
	03.06	Antennas.	
	03.07.01	Parabolic.	
	03.08.02	Horn.	
03.09.03	Slot.		
UNIT-4	<u>MICROWAVE TRANSMISSION:</u>		[]
	04.01	Maxwells equations.	
	04.02	Modes of propagation in rectangular and circular wave	
	04.03	Transmission through rectangular wave guide.	
	04.04	Cut off and guide wavelength.	
	04.05	Phase and group velocity.	
UNIT-5	<u>DETECTORS:</u>		[]
	05.01	Measurement of impedance.	
	05.02	Measurement of frequency.	
	05.03	Voltage standing wave ratio.	
Total			

Books Recommended:-

- | | |
|----------------------------------------------|---------------------------|
| 1. Microwave Communication. | - Angelkos & Everhar. |
| 2. Foundation of Microwave Communication. | - Collins. |
| 3. Microwaves. | - Sanjeev Gupta & others. |
| 4. Electromagnetic Waves & Radiating Systems | - Jordan. |
| 5. Microwave Theory & Measurement | - Heylward Packard. |

ELECTRICAL MACHINE LAB

Subject Code 1640606	Practical			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
				External	:	35	

RATIONAL:-

The background of theoretical knowledge about Electrical instrument and m/c has been imparted in the theoretical papers.

However, the electrical Diploma holders will require to handle various Electrical Instruments and m/cs in the field whenever they are given change of, so, it is necessary to acquaint the students with the practical aspects handling the Instruments & m/cs to increase their confidence and develop skill of level measurements, data entry, graph reading, analysis of the experimental results etc.

OBJECTIVE :-

The coverage of syllabus is made in such a way that the students will get through knowledge of Handling the m/cs & Instruments. By performing such experiments they will gain confidence to face the problems and rectify them, boldly. The students will develop skills of measuring taking data, their tabulations, plotting graphs, interpreting the data and the graphs to develop analytical skill.

Contents : Practical			Hrs/week	Marks
UNIT-1	TRANSFORMER :		[20]	
	01.01	Determination of turn ratio of a I- \emptyset transformer by voltage and current measurements.		
	01.02	Determination of percentage efficiency and regulation of a I- \emptyset transformer by performing. Open circuit and short circuit test.		
	01.03	Determination of percentage efficiency and regulation curve against increasing percentage output by performing load test on a I- \emptyset Transformer.		
	01.04	Study of a 3- \emptyset auto transformer and a 3- \emptyset induction regulator.		
UNIT-2	INDUCTION MOTOR :		[18]	
	02.01	Determination of Losses and efficiency of a 3- \emptyset induction motor by performing no load test and blocked rotor test.		
	02.02	Determination of torque-slip characteristics of 3- \emptyset induction motor by performing load test.		
	02.03	Study of D.O.L: Starter and Star-Delta Starter.		
	02.04	Study of Autotransformer Starter.		
UNIT-3	ALTERNATORS:		[14]	
	03.01	Determination of open circuit characteristics and short circuit characteristics.		
	03.02	Determination of losses and efficiency by performing load test on 3- \emptyset alternator.		
UNIT-4	SYNCHRONOUS MOTOR:		[08]	
	04.01	Determination of V-curve of a synchronous motor.		
	04.02	Study of a 3- \emptyset synchronous capacitor.		
Total			60	

Book Recommended:-

1. Lab manual on Electric Circuit, T.T.T.I., Madras
 2. Experiments in Electrical Engineering, Khanna Publication
- G.P. Chalotra

ELECTRONICS CIRCUIT LAB

Subject Code 1640607	Practical			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
				External	:	35	

Contents :Practical		Hrs/week	Marks
UNIT-1	Introduction to various meters and instruments to be used-Study of CRO: Phase and Frequency measurements.	[]	
UNIT-2	Measurment of h-parameter of transistor.	[]	
UNIT-3	Frequency response of a CE amplifier	[]	
UNIT-4	Frequency response of direct-coupled amplifier.	[]	
UNIT-5	Frequency response of RC-coupled amplifiers.	[]	
UNIT-6	Charactrisitics of a transformer-coupled amplifier.	[]	
UNIT-7	Calculation of gain input impedance and output impedance in case of caseaded amplifiers.	[]	
UNIT-8	Operation of Push-Pull amplifiers.	[]	
UNIT-9	Operation of Class Camplifier.	[]	
UNIT-10	Characterastic carue of FETS and its study.	[]	
UNIT-11	Operation of Weu Bridge and RC Phase shift oscillator.	[]	
UNIT-12	Veritication of basic operation OP-AMP curves.	[]	
UNIT-13	Use of OP-AMP as Adder and Subratctor.	[]	
UNIT-14	Use of OP-AMP as integrator and differentator.	[]	
UNIT-15	To make a Battery charger for charging the torch battery.	[]	
UNIT-16	To make an automatic Voltage stabilizer.	[]	
UNIT-17	To test the diode and also verify that which one is anode and cathode leads.	[]	
UNIT-18	Tof test transistor in absence of their datas indicated by manufacturer, the base, emitter and collector reads whether is NPN or PNB or PNP transistor.	[]	
UNIT-19	To prepare a battery Eliminator.	[]	
UNIT-20	To measure resistance, voltage and current of an electronic component in a circuit.	[]	
Total			

PROFESSIONAL PRACTICE -TW

Subject Code 1640608	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	50	02
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

CONTENTS :TERM WORK

Sr. No.	Name of the Activity	Hrs/week	Marks
Unit-01	Field Visits The field visits may be arranged in the following areas /industries and submitting the reports of the same by the student as part of the term work. i) Visit to Electric power generation station. ii) Visit to thermal power station/Wind mill/hydel/nuclear power station. iii) Visit to a solar power plant. iv) Visit a Railway station & preparation of complete report on railway Traction system.	18	
Unit-02	Seminar: Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time-10 minutes) Seminar topic i) Embedded system. ii) I.C Fabrication. iii) Wireless communication. iv) Computer security. v) Multimedia Techniques. vi) Any other suitable topic as per students choice.	10	
Unit-03	Group discussion : i) Energy saving in institute. ii) Non-conventional energy sources & their uses. iii) Disaster management. iv) Safety in day to day life. v) Rain water harvesting. vi) Trends in energy conservation. vii) Any current topic.	10	
Unit-04	Lectures organized by concerned teachers in the following areas : i) Interview Techniques. ii) Cyber laws. iii) Nano technology iv) Ethical Hacking. v) Any other suitable topic.	10	
Total		48	

PROJECT WORK AND ITS PRESENTATION IN SEMINAR -TW

Subject Code 1621609	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	100	
	—	—	04	External	:	30	
					70		

Rationale:

The Project work and its presentation in seminar is an important subject for a Diploma holder technician. The course is designed to help a student develop confidence, skill in report writing, skill to analyse, design, estimating and costing, deciding a process etc, the course will also help in developing communication skill, skill of quality documentation.

Objective:

A student will be able to:

- Identify a Problem
- Analyze the Problem
- Develop logical approach to solution of a Problem.
- Design of a product
- Make estimate of materials and processes and calculate the cost of production and decide the price of the product.
- Manufacture / assemble /fabricate the product in the workshop.
- Test the product for its quality.
- Prepare a project report (Computer printed / typed)
- Present in the form of seminar.

S.No.

Topics

- | | |
|----|---------------------------------------------------------------------|
| 01 | To make a bridge rectifier. |
| 02 | To make/assemble a voltage stabilizer. |
| 03 | To make/assemble stabilizer for refrigerator. |
| 04 | To make a timer circuit IC 555. |
| 05 | Electronic Regulator for Ceiling Fan. |
| 06 | To fabricate a circuit for characteristics for NPN/PNP transistors. |
| 07 | Bi-stable Multivibrator |
| 08 | Half & Full adder, subtractor & Comparator. |
| 09 | 8:1 Multiplexer. |
| 10 | Realising Railway Signaling System. |

REPORT WRITING:

A report must include

	Contents :Term Work		Hrs/week	Marks
UNIT-1	01	Introduction.	[]	
UNIT-2	02	Design.	[]	
UNIT-3	03	Estimating of materials.	[]	
UNIT-4	04	Calculation of cost of the materials.	[]	
UNIT-5	05	Operation time estimation.	[]	
UNIT-6	06	Cost of Operation.	[]	
UNIT-7	07	Process of Manufacture / Assembly / fabrication.	[]	
UNIT-8	08	List of tools/equipments used with specification.	[]	
		Total		

OR

A project on live industrial problems that may be—

- Technical
- Human Relation
- Welfare
- Safety
- Any other

The Project Report should consist of :-

Contents :Term Work			Hrs/week	Marks
UNIT-1	01	Introduction.		
UNIT-2	02	Problem statement.		
UNIT-3	03	Background of Industry.		
UNIT-4	04	Organizational set –up.		
UNIT-5	05	Plant Lay –out.		
UNIT-6	06	Reason for selecting a problem.		
UNIT-7	07	Analysis of Problem.		
UNIT-8	08	Probable solution.		
UNIT-9	09	Best solution possible.		
UNIT-10	10	Any other.		
Total				

Project work/ project report should be presented in the form of a seminar for developing confidence and communication skill among the students.

NOTE:-

Project work will be allotted to the students just in the beginning of the session. Each student will be give a separate work under the supervision of a teacher. Total number of students may be divided among the number of teachers available. The teacher concerned will select separate problem for each student under him and allot it to him at the beginning of the session. The work allotted should be completed with in scheduled time. i e. by the end of the session. Problems selected should preferably conform to the syllabus. If it is outside of the syllabus then it must be within the field of electrical engineering.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN LIBRARY & INFORMATION SCIENCE

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test (CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Information Sources	1641602	03	03	10	20	70	100	28	40	03
3.	Advance Library Cataloguing	1641603	04	03	10	20	70	100	28	40	03
4.	Information Processing and Retrieval	1641604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1641605	03	03	10	20	70	100	28	40	03
Elective-(i) Academic Library System (1641605A)			(ii) Research Methodology (1641605B)				(iii) Information users & Needs (1641605C)				
Total:- 16							350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	
					Internal (A)	External (B)			
6.	Advance Library Cataloguing Lab	1641606	04	03	15	35	50	20	02
7.	Information Processing and Retrieval Lab	1641607	06	03	15	35	50	20	02
Total:- 10							100		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits	
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject		
8.	Advance Library Cataloguing -TW	1641608	04	15	35	50	20	02	
9.	Information Processing and Retrieval -TW	1641609	03	15	35	50	20	01	
10.	Project Work & Its presentation in Seminar -TW	1641610	-	15	35	50	20	02	
Total:- 07							150		
Total Periods per week Each of duration One Hours = 33							Total Marks = 750	24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
	—	—	—	CT	:	10	
			20				

CONTENTS : THEORY

	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentatin <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

Unit – 4	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel- Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow's Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to –</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act <p>Industrial Dispute Act</p>	08	
Unit – 5	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to –</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit – 6	<p>Materials Management</p> <p>6.1. Inventory Management (No Numerical)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	
Unit – 7	<p>Project Management (No Numerical)</p> <p>7.1 Project Management</p> <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis <p>7.2 Quality Management</p> <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-

Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

INFORMATION SOURCES

Subject Code 1641602	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
				CT	:	20	

Rational e and Objective

- To understand the different types of information sources.
- To develop familiarity with standard reference source.
- To develop skill of critical evaluation of reference sources.

Contents : Theory		Hrs/week	Marks
UNIT-1	Information Sources-I <ul style="list-style-type: none"> • Concept of information sources • Primary sources of information-Journal, conference, Volume, Patents, research report, thesis and their electronic form. • Evaluation of reference sources. 	[]	
UNIT-2	Information Sources II <ul style="list-style-type: none"> • Secondary Sources of information, Bibliography, Encyclopedia, Dictionary, Year book, Directory, Biographical sources, Text book, index and abstract and their electronic form. 	[]	
UNIT-3	Information Source III <ul style="list-style-type: none"> • Territary source of information- Bibliography and bibliographies and guide to literature and their electronic form. 	[]	
UNIT-4	Information Sources-IV <ul style="list-style-type: none"> • Human Resources • Information Centres • Institutional Information centres • Mass Media • Data base • Web Resources 	[]	
UNIT-5	Information Sources V <ul style="list-style-type: none"> • Web/Internet as a Reference Sources. Browsing of Various Types of reference and information resources and writing a report (taking a sample in each type) about the type of information and its organization. 	[]	
Total			

ADVANCE LIBRARY CATALOGUING

Subject Code 1641603	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	70	
			CT	:	10		
				:	20		

Rational & Objectives:-

For any library and Information Personnel it is necessary to know the holding of his own library. Similarly it is expected that every reader should be made aware of the available resources of the library. For this purpose a clear-cut and up to date catalogue of the library holding is necessary.

Stress has been given on preparation of catalogue according to accepted International code, History of cataloguing, evolution of catalogue codes, suitable codes for an academic, special or research library and public library have been dealt with and practical aspect taken into consideration.

Contents : Theory		Hrs/week	Marks
UNIT-1	Subject cataloguing	[10]	
	01.01 Subject cataloguing: Evolution and purpose	02	
	01.02 Forms of subject catalogue	02	
	01.03 Subject heading problem	02	
	01.04 Study of Sear's list of Subject heading	02	
	01.05 Chain procedure	02	
UNIT-2	Catalogue codes	[10]	
	02.01 Catalogue codes	03	
	02.02 Introduction to classified catalogue codes	03	
	02.03 Structure and basic features of CCC	02	
	02.04 Basic differences between AACR and CCC	02	
UNIT-3	Entries in classified catalogue	[15]	
	03.01 Entries in classified catalogue	10	
	03.02 Part of Entries Ac/ to C.C.C.	05	
UNIT-4	Centralised cataloguing	[05]	
	04.01 Centralised cataloguing	01	
	04.02 Definition and Examples	04	
UNIT-5	Co-operative cataloguing	[05]	
	05.01 Definitions and Example	02	
	05.02 Methods of Co-operation in cataloguing work	02	
	05.03 Difference between co-operative cataloguing and centralized cataloguing	01	
UNIT-6	Union catalogue	[05]	
	06.01 Union catalogue	02	
	06.02 Union catalogue in India	03	
UNIT-7	Canon of cataloguing	[05]	
	07.01 Canon of cataloguing	05	
UNIT-8	ISBD	[05]	
	08.01 ISBD	01	
	08.01.01 ISBD (N)	02	
	08.01.02 ISBD (S)	02	
Total		60	

Book Recommended:-

1.	Theory of cataloguing	-	G Kumar and K Kumar
2.	Suchikaran Ke Sidhyant	-	G Kumar and K Kumar
3.	Cataloguing theory and practice	-	C G Bishwarath
4.	Pustakalaya Suchikaran	-	S S Agrawal

INFORMATION PROCESSING AND RETRIEVAL

Subject Code 1641604	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale and Objective:-

A modern library is not merely a store house of reading materials. It is an institute of Self Learning. It works as an university. Knowledge and skill is needed to recognize, collect, organize and utilize the print and non print documents.

Information Storage and Retrieval and Documentation and Bibliography have been design with the basic point of information Storage and Retrieval and providing theoretical knowledge about application of modern technologies in Documentation Service and Documentation work.

Contents : Theory		Hrs/week	Marks
UNIT-1	INFORMATION STORAGE AND RETRIEVAL SYSTEM:		
	1.1 Introduction to ISR system		
	1.2 Function of Library System		
	1.3 Computerized data bases and CDS/ISIS		
UNIT-2	INDEXING:		
	2.1 Concept and Proess		
	2.2 Indexing Techniques		
	2.3 Pre- coordinate & Post coordinate system		
	2.4 Indexing in Computer		
	2.5 File Generation		
UNIT-3	ABSTRACTING:		
	3.1 Abstracting, Needs & Purposes		
	3.2 Types of Abstracting		
	3.3 Methods of Abstracting		
UNIT-4	INFORMATION RETRIEVAL PROCESS:		
	4.1 Information Retrieval Process		
	4.2 Search Strategies		
	4.3 On line & off line		
	4.4 Manuals & Machine based		
UNIT-5	INTRODUCTION TO THESAURUS:		
	5.1 Thesaurus, Definition		
	5.2 Types of Thesaurus: Role of vocabulary Control		
	5.3 Thesaurus and Information needs		
Total			

Books Recommended for Information Storage & Retrieval – I:-

1.	Hand Book of Library, Archives & Information Centers Vol.-1 to Vol.-12	-	By B. Guha
2.	Information Storage for Common man	-	By S. Banerji
3.	Advances in Librarianship	-	By Khanna
4.	Information Storage for Common man	-	By H.K.Kaul Virgo Publications New Delhi 1992.
5.	Information Storage for Common man	-	By I.K. Ravindra Rao W.E. Limited New Delhi.

ELECTIVE - (ANY ONE) -(i) ACADEMIC LIBRARY SYSTEM

Subject Code 1641605A	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

Rational and objectives:-

Library is the center of any academic setting. While classroom teaching provides a glimpse of knowledge, the libraries disseminate a wide range of knowledge, which are required to attain intellectual heights. Libraries supplement forward the ideas of education; real education can only be achieved through the libraries. Thus the Libraries are the provider of informal education guiding the learners search vast range of Material available. The libraries are gradually being recognized for their Academic services and they are occupying prominent position in education programs, throughout the world.

After reading this subject students will be able to:-

- Understand that library is an integral part of the entire academic system;
- Comprehend that it would promote research learning, problem solving and endless services of education: and
- Ascertain that it is a veritable center of Academic for self-achievement.

Contents : Theory		Hrs/week	Marks
UNIT-1	Academic Library: Role, objective and Functions	[]	
UNIT-2	Role of UGC and other Agencies in Promoting College and university Libraries.	[]	
UNIT-3	Collection Development: Policies and Problems	[]	
UNIT-4	Library Committee: Its role in collection Development	[]	
UNIT-5	Continuing Education Programmes for Academic Library Development	[]	
UNIT-6	Personnel Management in Academic Libraries	[]	
UNIT-7	Financial Management of Academic Library	[]	
UNIT-8	Resource Sharing, Library Networks: objectives and Functions	[]	
UNIT-9	Role of INFLIBNET in Library and Information Resource Sharing	[]	
Total			

Books Recommended for Academic Lib. System: -

1. Saini (Omprakash) Granthalaya evam Samaj	-	Agra: Y. K. Publishers, 1999
2. Tripathi (S. M.) Adhunik Granthalaya Tatva	-	Vyavastha evam Sanchalan ke Mul
3. Saxena (L. S.) Pustakalaya Sangathan tatha vyasthapan Granth Academy, 1998	-	Bhopal: Madhya Pradesh, Hindi
4. Gau (Prabhu Narayan) Putakalaya Vigyan Kosh, Patna: 1962	-	Bihar – Rashtra Bhasa Parishad,

ELECTIVE - (ANY ONE) -(ii) RESEARCH METHODOLOGY

Subject Code 1641605B	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
				CT	:	10	
					20		

Rational and objectives:-

Research Methodology is the demand of present era considering information and knowledge as social wealth; their implications are studies in three different epoch of human history. **Viz** the agrarian the industrial and postindustrial society. Therefore the course of research methodology envisages to prepare a work fee capable to know use and handle information for the benefit of society.

Research methodology is to offer an understanding characteristics and kind of research policy. If this subject has been felt necessary.

Contents : Theory		Hrs/week	Marks
UNIT-1	Research and Research Design	[]	
	— Concept, meaning, need and process of Research		
	— Types of Research; Fundamental and Applied		
	— Research Design, Types of Research Design		
	— Designing research Proposal		
	— Literature search- Print, Non-print and electronic source.		
UNIT-2	Research Methods	[]	
	— Scientific Method		
	— Historical Method		
	— Descriptive Method		
	— Survey Method and case study Method		
— Experimental Method and Delphi Method			
UNIT-3	Data Analysis and Interpretation	[]	
	— Collection of Data by Questionnaire, Interview, observation and sampling		
	— Preservation of Data - tables, charts and graphs.		
	— Interpretation of Data: Frequency Distribution, Measures of central Tendency, Analysis of time series, co-relation studies and Analysis of variance		
— Use of statistical package			
UNIT-4	Bibliometric Studies	[]	
	— Bibliometric Studies: Meaning, scope and parameters.		
	— Bibliometric laws and their Application		
	— Citation Analysis and obsolescence Studies		
	— Trends in Bibliometrics		
— Triformetrics, Scientrometrics and Webometrics			
UNIT-5	Report Writing	[]	
	— Preparation and Writing of Research and Technical Report.		
	— Preparation of Thesis and Dissertation.		
	— Tools for technical writing Style Manuals.		
	— Guide line for Research Reporting.		
Total			

Books Recommended:

- (1) Kothari, C.R. (1979) Quantative Techniques, 2nd Edition, New Delhi, Vikash
- (2) Krishan Kumar (1992), Research Method in Library & Inf. Science, Delhi Har – Anand Publications.
- (3) Dr. Laxmi Narayan, Research Methodology, 2004

ELECTIVE - (ANY ONE) -(iii) INFORMATION USERS & NEEDS

Subject Code 1641605 (C)	Theory			No of Period in one session :			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Course Objective

- To understand the Categories of information users and their information needs.
- To understand the concept, nature and Techniques of user studies.
- To understand the techniques of Library Survey.

Contents : Theory		Hrs/week	Marks
UNIT-1	Information Users <ul style="list-style-type: none"> i. Identification of users. ii. Concept of Need, want, Demand and Requirement. iii. User Categories: Planners, Policy Makers, Managers, R & D Personnel. People at Grass Root. iv. Information Seeking behavior of Different user groups. 	[20]	
UNIT-2	Uses of Information <ul style="list-style-type: none"> i. Use of information in Management activities. ii. Use of information indecision making iii. User of information in R & D iv. Role of information in Raising the standards &Quality of Life v. Technology innovation & Technology Transfer. 	[20]	
UNIT-3	User Studies <ul style="list-style-type: none"> i. Scope and contents of user studies. ii. Studies by Types of Libraries: Different user Groups, Different Discipline. iii. Critical Review of some large scale user studies. 	[20]	
UNIT-4	Methodology of User Studies <ul style="list-style-type: none"> i. Qualitative & Quantitative Paradigm ii. Data Collection Methods iii. Other specific Technique-Scenario Analysis, interaction Analysis, Delphi Method, Repertory Grids. iv. Evaluation of user Survey 		
UNIT-5	User Education <ul style="list-style-type: none"> i. Concept and importance of user Education. ii. Methods of user education. 		
Total			

References-

1. W.H.Newman E.Kirby Warren : The Process of Management Prentice- Hall

ADVANCE LIBRARY CATALOGUING LAB

Subject Code 1641606	Practical			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	04	Internal	:	15	
				External	:	35	

Course & Objectives:-

Preparation of catalogue entries in a library is the main function of this course. Stress is given more on card form of catalogue entry. In the 3rd Semester course design AACR II has been taken in to consideration. Classifying catalogue code is practiced in the 6th Semester of the Diploma Course.

Contents : Practical		Hrs/week	Marks
UNIT-1	Cataloguing of books and periodical with the help of CCC		
UNIT-2	Preparation of main and Added Entries of Documents according to classified catalogue code (CCC) (latest available edition) having the following items.		
	a. Single Personal Author		
	b. Shared Author & Mix Responsibility		
	c. Corporate Author		
	d. Serials		

INFORMATION PROCESSING & RETRIEVAL LAB

Subject Code 1641607	Practical			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Rationale and Objectives

- To learn the advanced information processing Techniques.
- To develop the capability in retrieving the information by applying different search techniques.
- To introduce the information repackaging and Consolidation techniques.
- To develop familiarity with various bibliographic description standards.

Contents : Practical		Hrs/week	Marks
UNIT-1	Classification of documents with Complex subjects according to UDC, DDC and colon classification.	[]	
UNIT-2	Cataloguing of documents involving complicated personal and corporate authorship, complex periodical and Non-Book Materials.	[]	
UNIT-3	Indexing Practices using PRECIS & KWIC etc.	[]	
Total			

ADVANCE LIBRARY CATALOGUING -TW

Subject Code 1641608	Term Work			No of Period in one session :			Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	02
	—	—	04	External	:	35	

Rational & Objective:-

Preparation of catalogue entries in a library is than main function of this course. Stress is given more on card form of catalogue entry. In the 3rd Semester course design AACR II has been taken in to consideration. Classified catalogue code is practiced in the 6th Semester of the Diploma Course.

Contents : Term Work		Hrs/week	Marks
UNIT-1	Cataloguing of books & Periodical according CCC.	[]	
UNIT-2	Cataloguing of at least 50 titles of one's own Library.	[]	
Total			

INFORMATION PROCESSING AND RETRIEVAL -TW

Subject Code 1641609	Term Work			No of Period in one session :			Credits 01
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	03	External	:	35	

Course Objective

- To learn the advanced information processing Technique by applying different search techniques.
- To introduce the information repackaging and consolidation technique.
- To develop familiarity with various bibliographic description standards.

Contents : Term Work		Hrs/week	Marks
UNIT-1	Indexing of Books & periodicals: Indexing Technique: Pre coordinate and post coordinate system	[]	
UNIT-2	Indexing of at least 50 titles of one's Library	[]	
UNIT-3	Indexing in Computer <ul style="list-style-type: none">• File Generation• PRECIS & POPSI	[]	
Total			

The dissertation should be taken up continuously for two week in any annotated library.

PROJECT WORK & ITS PRESENTATION IN SEMINAR-TW

Subject Code 1641610	Term Work			No of Period in one session :			Credits
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal	:	10	02
	—	—	—	External	:	20	

Contents : Term Work		Hrs/week	Marks
UNIT-1	MARC Cataloguing	[]	
UNIT-2	Preservation and Conservation of Book Material and Non-Book Material.	[]	
UNIT-3	Written Report of literature	[]	
UNIT-4	User's Approach	[]	
UNIT-5	To be updated by the Teacher	[]	
Total			

The dissertation should be taken up Continuously for two week in any annotated Library.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for VI SEMESTER DIPLOMA IN MECHANICAL ENGG. (Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Design of Machine Elements	1625602	04	03	10	20	70	100	28	40	04
3.	Industrial Fluid Power	1625603	03	03	10	20	70	100	28	40	03
4.	Production Technology	1625604	03	03	10	20	70	100	28	40	03
5.	Elective-(Any One)	1625605	03	03	10	20	70	100	28	40	03
Elective- (i) Alternate Energy Sources & Management (1625605A)				(ii) Material Handling Systems (1625605B)		(iii) Refrigeration & Air-Conditioning (1625605C)			(iv) CAD-CAM & Automation (1625605D)		
Total :-			16				350	500			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME						
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits	
					Internal(A)	External(B)				
6.	Industrial Fluid Power Lab	1625606	02	03	15	35	50	20	01	
7.	Elective-(Any One) Lab	1625607	03	03	15	35	50	20	01	
Elective- (i) Alternate Energy Sources & Management Lab (1625607A)				(ii) Material Handling Systems Lab (1625607B)		(iii) Refrigeration & Air-Conditioning Lab (1625607C)		(iv) CAD-CAM & Automation Lab (1625607D)		
Total :-			05				100			

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits	
8.	Design of Machine Elements -TW	1625608	03	15	35	50	20	01	
9.	Industrial Project -TW	1625609	06	15	35	50	20	03	
10.	Professional Practices VI -TW	1625610	03	15	35	50	20	02	
Total :-			12			150			
Total Periods per week Each of duration One Hour				33	Total Marks = 750				24

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	<p>Overview Of Business</p> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> • Service • Manufacturing • Trade <p>1.2. Industrial sectors</p> <p>Introduction to</p> <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry <p>1.3 Globalization</p> <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India <p>1.4 Intellectual Property Rights (I.P.R.)</p>	02	02
Unit-02	<p>Management Process</p> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	10

<p>Unit-03</p>	<p>Organizational Management</p> <p>3.1 Organization :-</p> <ul style="list-style-type: none"> • Definition • Steps in organization <p>3.2 Types of organization</p> <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project <p>3.3 Departmentation</p> <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control <p>3.4 Forms of ownership</p> <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	<p>07</p>	<p>10</p>
<p>Unit-04</p>	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel- Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow's Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to -</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act • Industrial Dispute Act 	<p>08</p>	<p>14</p>

Unit-05	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to - <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	14
Unit-06	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	14
Unit-07	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	06
	TOTAL	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Industrial Engg & Management	Dr. O.P. Khanna	Dhanpal Rai & sons New Delhi
Business Administration & Management	Dr. S.C. Saksena	Sahitya Bhavan Agra
The process of Management	W.H. Newman E.Kirby Warren Andrew R. McGill	Prentice- Hall
Industrial Management	Rustom S. Davar	Khanna Publication
Industrial Organisation & Management	Banga & Sharma	Khanna Publication
Industrial Management	Jhamb & Bokil	Everest Publication , Pune
Management	Deepak Chandra	Foundation Publishing

DESIGN OF MACHINE ELEMENTS
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625602	Theory						Credits 04	
	No. of Periods Per Week			Full Marks				
	L	T	P/S	ESE	:	100		
	04	—	—	TA	:	10		
	—	—	—	CT	:	20		

CONTENTS: THEORY

	Name of the Topic	Hours	Marks
Unit-01	<p>Introduction to Design</p> <p>1.1 Machine Design philosophy and Procedures</p> <p>1.2 General Considerations in Machine Design</p> <p>1.3 Fundamentals:- Types of loads, concepts of stress, Strain, Stress – Strain Diagram for Ductile and Brittle Materials, Types of Stresses such as Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion, Principle Stresses (Simple Numerical)</p> <p>1.4 Creep strain and Creep Curve</p> <p>1.5 Fatigue, S-N curve, Endurance Limit.</p> <p>1.6 Factor of Safety and Factors governing selection of factor of Safety.</p> <p>1.7 Stress Concentration – Causes & Remedies</p> <p>1.8 Converting actual load or torque into design load or torque using design factors like velocity factor, factor of safety & service factor.</p> <p>1.9 Properties of Engineering materials, Designation of materials as per IS and introduction to International standards & advantages of standardization, use of design data book, use of standards in design and preferred numbers series.</p> <p>1.10 Theories of Elastic Failures – Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory.</p>	10	12
Unit-02	<p>Design of simple machine parts</p> <p>1.11 Cotter Joint, Knuckle Joint, Turnbuckle</p> <p>1.12 Design of Levers:- Hand/Foot Lever & Bell Crank Lever</p> <p>1.13 Design of C – Clamp, Off-set links, Overhang Crank, Arm of Pulley</p>	08	10
Unit-03	<p>Design of Shafts, Keys and Couplings and Spur Gears</p> <p>1.14 <i>Types of Shafts, Shaft materials, Standard Sizes, Design of Shafts (Hollow and Solid) using strength and rigidity criteria, ASME code of design for line shafts supported between bearings with one or two pulleys in between or one overhung pulley.</i></p> <p>1.14 Design of Sunk Keys, Effect of Keyways on strength of shaft.</p> <p>1.15 Design of Couplings – Muff Coupling, Protected type Flange Coupling, Bush-pin type flexible coupling.</p> <p>1.16 Spur gear design considerations. Lewis equation for static beam strength of spur gear teeth. Power transmission capacity of spur gears in bending.</p>	12	14
Unit-04	<p>Design of Power Screws</p> <p>1.17 Thread Profiles used for power Screws, relative merits and demerits of each, Torque required to overcome thread friction, self locking and overhauling property, efficiency of power screws, types of stresses induced.</p> <p>1.18 Design of Screw Jack, Toggle Jack.</p>	10	10

Unit-05	Design of springs 1.19 Classification and Applications of Springs, Spring – terminology, materials and specifications. 1.20 Stresses in springs, Wahl’s correction factor, Deflection of springs, Energy stored in springs. 1.21 Design of Helical tension and compression springs subjected to uniform applied loads like I.C. engine valves, weighing balance, railway buffers and governor springs. 1.22 Leaf springs – construction and application	07	07
Unit-06	Design of Fasteners 1.23 Stresses in Screwed fasteners, bolts of Uniform Strength. 1.24 Design of Bolted Joints subjected to eccentric loading. 1.25 Design of parallel and transverse fillet welds, axially loaded symmetrical section, Merits and demerits of screwed and welded joints	07	09
Unit-07	Antifriction Bearings 1.26 Classification of Bearings – Sliding contact & rolling contact. 1.27 Terminology of Ball bearings – life load relationship, basic static load rating and basic dynamic load rating, limiting speed. Selection of ball bearings using manufacturer’s catalogue.	05	04
Unit-08	Ergonomics & Aesthetic consideration in design 1.28 Ergonomics of Design – Man –Machine relationship. Design of Equipment for control, environment & safety. 1.29 Aesthetic considerations regarding shape, size, color & surface finish.	05	04
	Total	64	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Introduction to Machine Design	V.B.Bhandari	Tata Mc- Graw Hill
Machine Design	R.K.Jain	Khanna Publication
Machine design	Pandya & Shah	Dhanpat Rai & Son
Mechanical Engg. Design	Joseph Edward Shigley	Mc- Graw Hill
Design Data Book	PSG Coimbtore	PSG Coimbtore
Hand Book of Properties of Engineering Materials & Design Data for Machine Elements	Abdulla Shariff	Dhanpat Rai & Sons
Theory and Problems of Machine Design	Hall, Holowenko, Laughlin	Mc- Graw Hill
Design of Machine Elements	D.P. Mandal	Foundation Publishing

1. IS/ International Codes

- a) IS 4218: 1967 ISO Metric Threads
- b) IS 2693: 1964 Cast Iron Flexible Couplings
- c) IS 2292: 1963 Taper keys & Keyways
- d) IS 2293: 1963 Gib Head Keys & Keyways
- e) IS 2389: 1963 Bolts, Screws, Nuts & Lock Nuts

2. IS 4694: 1968 Square threads

- g) IS 808: 1967 Structural Steel

3. SKF Catalogue for Bearings

2. SOFTWARE

- 1) Think 3 CAD Software developed by acebrain.
- 2) E-Yantra Software, developed by FEAST.

Machine Elements in Mechanical Design	Robert L.Mott,Jong Tang	Pearson
Mechanical Design of Machine Elements and Machines	Jack A. Collins, Henry R. Busby	Willey Publications

INDUSTRIAL FLUID POWER
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625603	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
—	—	—	CT	:	20		

CONTENTS: THEORY

	Name of the topic	Hours	Marks
Unit-01	Introduction to oil hydraulic systems : 1.1 Practical applications of hydraulic systems. 1.2 General layout of oil hydraulic systems. 1.3 Merits and limitations of oil hydraulic systems.	03	04
Unit-02	Components of Hydraulic systems : 2.1 Pumps – Vane pump, gear pump, Gerotor pump, screw pump, piston Pump. 2.2 Valves – Construction, working and symbols of Pressure control valves – pressure relief valve, pressure reducing, pressure unloading Direction control valves – Poppet valve, spool valve, 3/2, 4/2 D.C. valves, Sequence valves. Flow control valves – pressure compensated, non pressure compensated flow control valve.	22	08
	2.3 Actuators- Construction, working and symbols of Rotary Actuators - Hydraulic motors. Linear Actuators - Cylinders - single acting, double acting.		04
	2.4 Accessories – Pipes, Hoses, fittings, Oil filters, Seals and gaskets, Accumulators. (Types, construction, working principle and symbols of all components)		06
Unit-03	Hydraulic Circuits : 3.1 Meter in, Meter out circuits 3.2 Bleed off circuit 3.3 Sequencing circuit 3.4 Hydraulic circuits for Milling machine, Shaper machine, Motion synchronization circuit.	07	06
Unit-04	Introduction to pneumatic Systems : 4.1 Applications of pneumatic system 4.2 General layout of pneumatic system 4.3 Merits and limitations of pneumatic systems	04	06
Unit-05	Components of pneumatic system : 5.1 Compressor – Reciprocating & Rotary compressors. 5.2 Control Valves – Pressure regulating valves, Flow Control valves, Direction Control Valves.	22	04
	5.3 Actuators – Rotary - Air motors, Types, construction, working principle Linear- Cylinders- Types, construction & working principle.		06
	5.4 Accessories – Pipes, Hoses, Fittings, FRL unit (Types, construction, working principle and symbols of all components)		06
Unit-06	Pneumatic Circuits Speed control circuits. Sequencing circuits.	06	06
	Total	64	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Industrial Hydraulics	Pippenger Hicks	McGraw Hill International
Oil Hydraulic system- Principle and maintenance	Majumdar S.R	Tata McGraw Hill
Pneumatics Systems Principles and Maintenance	Majumdar S.R	Tata McGraw Hill
Hydraulics and Pneumatics	Stewart	Taraporewala Publication
Industrial Fluid Power	S. Laxmikant	Foundation Publishing

2. Catalogues:

Various system components' manufacturers' Catalogues.

3. CDs:

CDs developed by various system components' manufacturers.

Industrial fluid power	Charles Hedges	Womack Educational Publications
Industrial hydraulic control	Peter Rhoner	Prentice Hall

PRODUCTION TECHNOLOGY
(MECHANICAL ENGINEERING GROUP)

Subject Code 1625604	Theory						Credits
	No. of Periods Per Week			Full Marks			100
	L	T	P/S	ESE	:	70	03
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	<p>Production System Production - Definition , Types of production systems Productivity - Importance , Measurement of Productivity , Techniques of improving productivity Elements of cost- Fixed cost, Variable Cost. Break even analysis, Calculation of Break even point.</p>	06	06
Unit-02	<p>Plant location, Plant layout and Material Handling Plant Location - Importance of Site Selection, Factors affecting Site Selection, Government Policies, and relaxation for Backward Areas. Plant Layout - Objectives, types, design principles, characteristics of Plant Layout, Symptoms of Bad Plant Layout. Group technology , Cellular layout, Material handling – Need, Principles and Types of material handling devices – conveyors , Hoist & cranes , forklift truck, trolleys, Pipes, Automated Guided Vehicles (AGV's) Selection of Material Handling systems</p>	08	08
Unit-03	<p>Process Planning : Planning of Processes from raw material to finished product, Factors affecting Process Planning, Deciding sequence of operations, Operation Sheet, Combined operations, Determination of Inspection Stages. Selection of Machine techniques of assembly planning, Types of assembly. Plant Capacity, Machine Capacity, Plant Efficiency. Numerical not to be asked,</p>	08	08
Unit-04	<p>Production Planning and Control : Routing, Sequencing [n job 2 machines], Scheduling, Dispatching, Meaning of Control, Progressive Control, Gantt chart. Concept of Line balancing,</p>	05	06
Unit-05	<p>Work Study : Method Study- Objectives, Procedure, Selection of work. Recording Techniques - Process Charts – Outline process chart, Flow process chart, Two Hand process chart, Multiple activity chart, Flow diagram, String diagram, Travel chart. Micro motion study-Critical Examination, Principles of Motion Economy. Concept of ergonomics and workplace layout. Work Measurement - Objectives, procedure , Time Study, Time Study Equipments. Stop Watch Time Study, Standard Time, Work Sampling, Analytical Estimating, Predetermined Motion Time Study, Allowances, Calculation of Standard Time, Concept of Merit Rating.</p>	14	14
Unit-06	<p>Inventory Control : Methods of Inventory Management, Inventory Cost relationship, Deciding Economic Batch Quantity, EOQ Model, Calculation of EOQ, Concepts of discounts. Introduction of Material Requirement Planning, Stores Function – Storage systems – One bin , Two bin system, Material issue request (MIR), bin card.</p>	09	12
Unit-07	<p>Jigs and Fixtures : Introduction. Difference between jig and fixture Different components of Jig/ fixture 3-2-1 principle of location. Types of locators and clamping devices. General principles of jig/fixture design. Types of jigs and fixtures.</p>	06	06

Unit-08	Modern Trends : Just In Time manufacturing – Pull and push types of manufacturing systems, Waste reduction, 5'S', inventory reduction, single piece production systems. Concept of continuous improvement (Kaizen) – DMIAC cycle, Brain storming. Poka Yoke. Concept of Rapid Prototyping Concept of Flexible manufacturing system	08	10
	Total	64	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Industrial Management	L.C. Jhamb	Everest
Production System, Planning, Analysis & Control	James C. Rigs	N.Y.Wiley & Sons
Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai & Sons
Work Study	ILO	ILO Geneva
Jigs & Fixtures	P. H. Joshi	--
Production Engineering	P.C. Sharma	--
Introduction to Jigs and Fixtures Design	Kempster	--
Modern Production and Operations Management	Baffna , Sarin	--
Total productive maintenance	Terry Wireman	Industrial press inc.
Toyota production system	Taiichi ohno	Productivity Press
Production Technology	R.N.Pandey, S.P. Goyal	Foundation Publishing

ELECTIVE - (ANY ONE) – (i) ALTERNATE ENERGY SOURCES AND MANAGEMENT (MECHENICAL ENGINEERING GROUP)

Subject Code 1625605A	Theory						Credits
	No. of Periods Per Week			Full Marks		:	100
	L	T	P/S	ESE		:	70
	03	—	—	TA		:	10
	—	—	—	CT		:	20

Contents :Theory		Hrs/week	
Chapter	Name of the Topic	Hours	Marks
01	Introduction to Energy Sources 1.1 Introduction. 1.2 Major sources of energy: Renewable and Non-renewable. 1.3 Primary and secondary energy sources. 1.4 Energy Scenario: - Prospects of alternate energy sources. - Need of Alternate energy sources.	06	06
02	Solar Energy 2.1 Principle of conversion of solar energy into heat and electricity 2.2 Solar Radiation: Solar Radiations at earth's surface Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle 2.3 Applications of Solar energy: - - Construction and working of typical flat plate collector and solar concentrating collectors and their applications, advantages and limitations - Space heating and cooling. - Photovoltaic electric conversion. - Solar distillation, Solar cooking and furnace. - Solar pumping and Green House. Agriculture and Industrial process heat. (no derivations and numericals)	08	10
03	Wind Energy 3.1 Basic Principle of wind energy conversion. 3.2 Power in wind, Available wind power formulation, Power coefficient, Maximum power 3.3 Main considerations in selecting a site for wind mills. 3.4 Advantages and limitations of wind energy conversion. 3.5 Classification of wind mills 3.6 Construction and working of horizontal and vertical axis wind mills, their comparison 3.7 Main applications of wind energy for power generation and pumping.	06	08
04	Energy from Biomass 4.1 Common species recommended for biomass. 4.2 Methods for obtaining energy from biomass 4.3 Thermal classification of biomass a) Gasified, b) Fixed bed and fluidized 4.4 Application of gasifier 4.5 Biodiesel production and application 4.6 Agriculture waste as a biomass 4.7 Biomass digester 4.8 Comparison of Biomass with conventional fuels	08	10

05	Energy Conservation & Management:- 5.1 Global and Indian energy market 5.2 Energy scenario in various sectors and Indian economy 5.3 Need and importance of energy conservation and management 5.4 Concept of Payback period, Return on investment (ROI), Life cycle cost, Sankey diagrams, specific energy consumption.	04	08
06	Energy Conservation Techniques 6.1 Distribution of energy consumption 6.2 Principles of energy conservation. 6.3 Energy audit 6.4 Types of audit 6.5 Methods of energy conservation 6.6 Cogeneration and its application 6.7 Combined cycle system 6.8 Concept of energy management 6.9 Study of different energy management techniques like <ul style="list-style-type: none"> - Analysis of input - Reuse and recycling of waste - Energy education - Conservative technique and energy audit 	08	14
07	Economic approach of Energy Conservation 7.1 Costing of utilities like steam, compressed air, electricity and water. 7.2 Ways of improving boiler efficiency 7.3 Thermal insulation, Critical thickness of insulation 7.4 Waste heat recovery systems, their applications, criteria for installing unit. 7.5 An introductory approach of energy conservation in compressed air, refrigeration, air conditioning, pumps and fans.	08	14
Total		48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Non conventional energy Resources	Dr B.H.Khan	Tata McGraw Hill
Non conventional energy sources	G. D. Rai	Khanna publication
Solar energy	S. P. Sukhatme	Tata McGraw Hill
Solar energy	H. P. Garg	Tata McGraw Hill
Power plant engineering	Arrora Domkundwar	Dhanpat Rai & co.
India- The energy sector	P.H. Henderson	University Press
Industrial energy conservation	D. A. Ray	Pergaman Press
Energy management handbook	W. C. Turner	Wiley Press
Non-conventional energy source	K. M. Mittal	-
Energy resource management	Krupal Singh Jogi	Sarup and sons
Energy Resources and Systems	Ghosh, Tushar K., Prelas, Mark	Springer
Alternate Energy Sources & Management	-	-

2. Cassettes/CD/websites:

1. CDs developed by National Power Training Institute, (Under the ministry of Power, Government of India)
Opposite VNIT, South Ambazari road, Nagpur
2. Website of Bureau of Energy and Efficiency. (www.bee-india.nic.in)
3. Website for Akshay Urja News Bulletin. (www.mnes.nic.in)

ELECTIVE - (ANY ONE) – (ii) MATERIAL HANDLING SYSTEMS
(MECH. ENGG. GROUP)

Subject Code 1625605B	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS: THEORY

<p>Notes: 1) Design aspects of material handling equipment are to be ignored. 2) No derivations & mathematical treatment.</p>			
Chapter	Name of the topic	Hrs/week	Marks
Unit-01	<p>Introduction to Material Handling System Main types of material handling equipments & their applications, types of load to be handled, types of movements, methods of stacking, loading & unloading systems, principles of material handling systems.</p>	04	06
Unit-02	<p>Hoisting Machinery & Equipments 2.1 Construction, working & maintenance of different types of hoists such as lever operated hoist , portable hand chain hoist, differential hoists, worm geared and spur geared hoists, electric & pneumatic hoists, jumper. 2.2 Construction, working & maintenance of different types of cranes such as rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes, floating cranes & cranes traveling on guide rails. 2.3 Construction, working & maintenance of elevating equipments such as stackers, industrial lifts, freight elevators, passenger lifts, and mast type's elevators, vertical skip hoist elevators.</p>	12	18
Unit-03	<p>Conveying Machinery 3.1 Construction, working & maintenance of traction type conveyors such as belt conveyors, chain conveyors, bucket elevators, escalators. 3.2 Construction, working & maintenance of traction less type conveyors such as gravity type conveyors, vibrating & oscillating conveyors, screw conveyors, pneumatic & hydraulic conveyors, hoppers gates & feeders.</p>	06	08
Unit-04	<p>Surface Transportation Equipment 4.1 Construction, function, working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV- Automatic Guided vehicle, industrial Trailers. 4.2 Construction, function, working of cross handling equipment such as winches, capstans, Turntables, Transfer tables, monorail conveyors.</p>	08	10
Unit-05	<p>Components of material handling systems 5.1 Flexible hoisting appliances such as welded load chains, roller chains, hemp ropes, steel wire ropes, fastening methods of wire & chains, eye bolts ,lifting tackles lifting & rigging practices. 5.2 Load handling attachments. a) Various types of hooks-forged, triangular eye hooks, appliances for suspending hooks, b) Crane grab for unit & piece loads c) Electric lifting magnet, vacuum lifter. d) Grabbing attachment for loose materials e) Crane attachment for handling liquids / molten metals 5.3 : Arresting gear & Brakes. a) Arresting gear – construction & working b) Construction & use of electromagnetic shoe brakes Thruster operated shoe brakes, control brakes.</p>	08	10

Unit-06	Mechanism used in material handling equipment 6.1 Steady state motion, starting & stopping of motion in following mechanisms. Hoisting mechanism - Lifting Mechanism - Traveling Mechanism - Slewing Mechanism - Rope & chain operated Cross- Traverse Mechanism.	06	10
Unit-07	Selection of material handling equipment Factors affecting choice of material handling equipment such as type of loads, hourly capacity of the unit, direction & length of travel, methods of stocking at initial, final & intermediate points, nature of production process involved, specific load conditions & economics of material handling system.	04	08
	Total	48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Material handling equipment	N. Rundenko	Peace Publisher, Moscow
Material handling equipment	M. P. Alexandrov	MIR Publisher, Moscow
Material handling	Y. I. Oberman	MIR Publisher, Moscow
Material handling equipment	R. B. Chowdary & G. R. N. Tagore	Khanna Publisher, Delhi
Material handling (Principles & Practice)	Allegrì T. H.	CBS Publisher, Delhi
Plant layout & materials handling	Apple j. M	JohnWiley Publishers.
Material handling Hand book	Bolz and others	--
Encyclopedia of materials handling	Daylas R. W. Pergaman, Berlin	--
Material handling	Immer J. R.	Mc Graw Hill, New York
Material handling equipment	Parameswaran M. A.	C.D.C. in Mechanical Engg., I.I.T., Chennai
Material Handling Cyclopedia	Roy V. Wright, John G. Little, Robert C. Augur	Kessinger Publishing
Manufacturing facilities design and material handling	Matthew P. Stephens	
Material Handling System	-	-

**ELECTIVE - (ANY ONE) – (iii) REFRIGERATION AND AIR
CONDITIONING (MECH. ENGG. GROUP)**

Subject Code 1625605C	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

Contents: Theory			
Cha	Name of the Topic	Hrs/week	Marks
Unit-01	<p>Basics of Refrigeration</p> <p>1.1 Definition of refrigeration.</p> <p>1.2 Necessity of refrigeration</p> <p>1.3 Methods of refrigeration:- Ice refrigeration Refrigeration by expansion of air Refrigeration by throttling of gas Vapour refrigeration system Steam jet refrigeration system Non conventional methods of refrigeration like Vortex tube, Pulse tube refrigeration, solar refrigeration</p> <p>1.4 Concept of heat engine, heat pump and refrigerator.</p> <p>1.5 Unit of refrigeration, C.O.P. and refrigerating effect.</p> <p>1.6 Major application areas of R.A.C. like domestic, commercial and industrial.</p>	06	08
Unit-02	<p>Refrigeration Cycles</p> <p>2.1 Reversed Carnot Cycle and its representation on PV and TS diagram.</p> <p>2.2 Air Refrigeration Cycles: - - Bell Coleman air refrigerator, it's representation on PV and TS diagram, types and applications like air craft refrigeration using simple air cooling system.. - (Simple numerical on Reversed Carnot cycle.)</p> <p>2.3 Vapour Compression Cycle (V.C.C):- -principle, components, Representation on P-H and T-S diagram, effects of wet compression, dry compression, calculation of COP, Effect of superheating, under cooling, suction pressure and discharge pressure, Actual V.C.C., (simple numerical), Methods of improving COP (no description). - Introduction to multistage V.C.C., its necessity, advantages.</p> <p>2.4 Vapour Absorption system :- - Principle, components and working of aqua- ammonia system (simple & practical) Li-Br Absorption System Electrolux Refrigeration System, Desirable properties of Refrigerant and absorbent used in Vapour Absorption System.</p> <p>Comparison of above Refrigeration Cycles.</p>	10	14
Unit-03	<p>Refrigerants</p> <p>3.1 Classification of refrigerants.</p> <p>3.2 Desirable properties of refrigerants.</p> <p>3.3 Nomenclature of refrigerants.</p> <p>3.4 Selection of refrigerant for specific applications.</p> <p>3.5 Concept of Green House Effect, Ozone depletion, Global warming.</p> <p>3.6 Eco-friendly refrigerants like R-134a, hydrocarbon refrigerants etc.</p>	04	06

Unit-04	<p>Equipment selection</p> <p>4.1 Components of Vapour Compression Refrigeration System</p> <p>4.1.1 Compressors:</p> <ul style="list-style-type: none"> - Classification, Construction and working of open type, hermetic, centrifugal, rotary, screw and scroll compressor and their applications. <p>4.1.2 Condensers:</p> <ul style="list-style-type: none"> - Classification, description of air cooled and water cooled condensers, comparison and applications - Evaporative condensers. <p>4.1.3 Expansion devices:</p> <ul style="list-style-type: none"> - Types: - Capillary tube, automatic, thermostatic and their applications <p>4.1.4 Evaporators and chillers: -</p> <ul style="list-style-type: none"> - Classification of evaporators Construction and working of Bare tube, Plate surface, finned, shell and tube, flooded and dry expansion evaporator - Capacity of evaporator and their applications - Classification of chillers - Construction and working of dry expansion Chillers and flooded chillers and their applications. <p>4.2 Selection criteria for Vapour compression refrigeration system components for the following applications: Water coolers, ice plants, cold storage, domestic refrigerator</p>	10	14
Unit-05	<p>Psychrometry</p> <p>5.1 Definition and necessity of air conditioning.</p> <p>5.2 Properties of Air, Dalton's law of partial pressure</p> <p>5.3 Psychrometric chart</p> <p>5.4 Psychrometric processes, Bypass Factor, ADP, concept of SHF, RSHF, ERSHF, GSHF</p> <p>5.5 Adiabatic mixing of Air streams</p> <p>5.6 Simple numerical using Psychrometric chart</p> <p>5.7 Equipments used for Air- conditioning like humidifier, dehumidifier, filter, heating and cooling coils.</p>	06	08
Unit-06	<p>Comfort conditions and cooling load calculations</p> <p>6.1 Thermal exchange of body with environment</p> <p>6.2 Factors affecting human comfort</p> <p>6.3 Effective temp. and comfort chart</p> <p>6.4 Components of cooling load- sensible heat gain and latent heat gain sources</p>	04	06
Unit-07	<p>Air- conditioning systems</p> <p>7.1 Classification of A.C. systems</p> <p>7.2 Industrial and commercial A.C. systems</p> <p>7.3 Summer, winter and year round A.C. systems</p> <p>7.4 Central and unitary A.C. systems</p> <p>7.5 Application areas of A.C. systems</p>	04	08
Unit-08	<p>Air distribution systems</p> <p>8.1 Duct systems: -</p> <ul style="list-style-type: none"> - Closed perimeter system, extended plenum system, radial duct system, duct materials, requirement of duct materials, losses in ducts <p>8.2 Fans and Blowers: -</p> <ul style="list-style-type: none"> - Types, working of fans and blowers <p>8.3 Air distribution outlets: -</p> <ul style="list-style-type: none"> - Supply outlets, return outlets, grills, diffusers <p>8.4 Insulation: -</p> <ul style="list-style-type: none"> - Purpose, properties of insulating material, types of insulating materials, methods of applying insulation. 	04	06
	Total	48	70

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Refrigeration and Air Conditioning	R.S.Khurmi	S.Chand and Co
Refrigeration and Air Conditioning	Arora and Domkundwar	Dhanpat Rai and Sons
Refrigeration and Air Conditioning	Manohar Prasad	New Age Publications
Refrigeration and Air Conditioning	P.N.Ananthanarayanan	Tata McGraw Hill
Principles of Refrigeration	Roy Dossat	Pearson Education
Commercial Refrigeration	Edwin P. Anderson	Taraporevala Sons & Co
Refrigeration and Air Conditioning	Ahmadul Ameen	Prentice Hall-India
Refrigeration and Air Conditioning	C.P.Arora	Tata McGraw Hill
Refrigeration & Air-Conditioning	Biswajet Ranjan / Anand Pal	Foundation Publishing

2. IS/International Codes/Publications:

- a) ISHRAE handbooks
- b) Manohar Prasad: Refrigeration and Air Conditioning hand book, New Age Publications.

ELECTIVE - (ANY ONE) – (iv) CAD-CAM & AUTOMATION
(MECH. ENGG. GROUP)

Subject Code 1625605D	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

Content s: Theory			
Chapter	Name of the Topic	Hrs/week	Marks
Unit-01	Introduction to CAD/CAM Computers in industrial manufacturing. Product Cycle, CAD/CAM CAD/CAM hardware:- basic structure, CPU, Memory, I/O devices, Storage devices and system configuration.	06	10
Unit-02	Geometric Modelling Requirement of geometric modelling, Types of geometric models. Geometric construction method-sweep, solid modelling- Primitives & Boolean operations, free formed surfaces (Classification of surface only) (No numerical treatment)	10	14
Unit-03	Introduction to computer numerical Control Introduction - NC, CNC, DNC, Advantages of CNC, The coordinate system in CNC, Motion control system - point to point, straight line, Continuous path (Contouring). Application of CNC.	05	08
Unit-04	Part programming Fundamentals, manual part programming, NC –Words, Programming format, part programming, use of subroutines and do loops, computer aided part programming (APT).	12	14
Unit-05	Industrial Robotics Introduction, physical configuration, basic robot motions, technical features such as - work volume, precision and speed of movement, weight carrying capacity, drive system, End effectors, robot sensors. Application – Material transfer, machine loading, welding, spray coating,	09	14
Unit-06	Automation Basic elements of automated system, advanced automation functions, levels of automation. Flexible manufacturing system :-Introduction, FMS equipment, FMS application, Introduction to CIM	06	10
Total		48	70

Text / Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
CAD/CAM Principles and Applications	P.N.Rao	Tata McGraw-Hill
CAD/CAM/CIM	RadhaKrishna P. & Subramanyam	Wiley EasternLtd
CNC Machine	B.S.Pabla and M.Adithan	New age International(P)Ltd
Computer Aided design and manufacturing	Groover M.P. & Zimmers Jr	Prentice hall of India
Computer Aided design and manufacturing	Lalit narayan,M. Rao	PHI
CAD-CAM & Automation	S.M. Kiran / S.P. Singh	Foundation Publishing

INDUSTRIAL FLUID POWER LAB
(MECH. ENGG. GROUP)

Subject Code 1625606	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	02	TA	:	15	
	—	—	—	CT	:	35	

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual skills:

1. Prepare simple hydraulic & pneumatic circuits.
2. Compare the performance of hydraulic & pneumatic systems.
3. Identify the faults & suggest remedies in hydraulic & pneumatic circuits.
4. Select proper circuit considering its application

Motor skills:

1. Connect different components as per given drawing
2. Perform repairing and replacement of defective components in the circuit

Draw the hydraulic and pneumatic circuits using symbols

List of Practical:

- 1) Demonstration of meter in and meter out circuit.
- 2) Demonstration of sequencing circuit.
- 3) Demonstration of hydraulic circuit for shaper machine.
- 4) Demonstration of pneumatic circuit for speed control of double acting cylinders.
- 5) Demonstration of pneumatic circuit for speed control of pneumatic motor.
- 6) Study of trouble shooting procedures of various hydraulic and pneumatic circuits.
- 7) Selection of circuit components for simple hydraulic and pneumatic circuits.

Mini Projects:

- 1) Survey of oil used for hydraulic circuits -specifications, manufacturer's names, costs etc.
- 2) Study of any one mobile hydraulic system like in earth moving equipments and its detailed report.

OR

Study of any one stationary hydraulic system, like in any machine tool and its detailed report.

ELECTIVE - (ANY ONE) – (i) ALTERNATE ENERGY SOURCES & MANAGEMENT LAB (MECH. ENGG. GROUP)

Subject Code 1625607A	Practical						Credits 01	
	No. of Periods Per Week			Full Marks	:	50		
	L	T	P/S	ESE	:	50		
	—	—	03	Internal	:	15		
	—	—	—	External	:	35		

CONTENTS: PRACTICAL

1	<ul style="list-style-type: none"> To collect information about global and Indian energy market.
2	<ul style="list-style-type: none"> To perform an experiment on solar flat plate collector used for water heating.
3	<ul style="list-style-type: none"> To study construction and working of photo voltaic cell.
4	<ul style="list-style-type: none"> To study construction, working and maintenance of solar cooker.
5	<ul style="list-style-type: none"> Visit to plant of solar heating system for hotel/hostel/railway station etc.
6	<ul style="list-style-type: none"> To study construction and working of horizontal axis wind mill or to visit a nearest wind farm.
7	<ul style="list-style-type: none"> To visit a biomass/ biogas plant of municipal waste or else where.
8	<ul style="list-style-type: none"> Perform energy audit for workshop/Office/Home/SSI unit.
9	<ul style="list-style-type: none"> Study of various waste heat recovery devices.

ELECTIVE - (ANY ONE) – (II) MATERIAL HANDLING SYSTEMS LAB
(MECH. ENGG. GROUP)

Subject Code 1625607B	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	03	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual Skills

- 2- Understand the working principle of equipment/devices.
- 3- Identify & name major component of material handling device.
- 4- Understand role of material handling equipment in the industrial process.
- 5- Understand & appreciate safety instrumentation for equipment.

Motors skills

- 1) Identify & select the material handling devices for a given application.
- 2) Operate the working model of material handling equipment.
- 3) Ability to implement preventive maintenance schedule of material handling devices.

List of Practical:

- 1) Study & demonstration of any one type of conveyor – belt, Screw, pneumatic, hydraulic.
- 2) Study and demonstration of any one type of crane (working model or actual).
- 3) Study and demonstration of fork lift truck (using electric drive or diesel engine) Or hoisting equipment.
- 4) Study of preventive maintenance schedule of any one major material handling equipment using operation manual.
- 5) Visit to coal handling plant of thermal power plant or cement industry to observe working of different types of bulk material handling devices (at least three equipments). Write report of the visit.

OR

Visit to steel industry or automobile manufacturing unit or sugar industry to observe different types of roller conveyors, Bucket elevators, overhead cranes load handling attachments, electric lifting magnet (at least 3 equipments). Write report of the visit

List of Practice Oriented Projects:

Note: Select any one mini project from following and submit report of the same (min. 5 pages)

1. Collect and write detail specifications of any two major material handling devices.
2. Collect and write information about manufacturer, Cost, Capacity range, availability, application of any one material handling equipment from the following.
 - a) Hoisting equipment.
 - b) Conveying equipment.
 - c) Surface transportation equipment.
3. Collect photographs of ten different types of cranes used in industries. Write name and specific utility of each.
4. Collect photographs of ten different types of conveyers used in industries. Write name and specific utility of each
5. Write name of material handling devices and their utility after visiting any big industry near by area
6. Using internet collects and writes information about six major manufacturer of material handling equipment
7. Write report about testing of overhead crane for its lifting capacity.

**ELECTIVE - (ANY ONE) – (III) REFRIGERATION & AIR-
CONDITIONING LAB (MECH. ENGG. GROUP)**

Subject Code 1625607C	Practical			Full Marks			Credits 01
	No. of Periods Per Week						
	L	T	P/S	ESE			
	—	—	03	Internal			
	—	—	—	External			
			50	:	50		
			15	:	15		
			35	:	35		

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual skills:

1. Identify various components of refrigeration and air conditioning equipment
2. Analyse cooling load based on application.
3. Interpret psychometric chart to find various properties of air.
4. Observe working of test rigs and calculate coefficient of performance.

Motor skills:

1. Handle various tools used for refrigeration and air conditioning plant maintenance
2. Use of temperature, pressure, energy measuring devices
3. Draw the layout of central Air conditioning plant
4. Perform cooling load calculations for different air conditioning applications
5. Select and use of different types of insulating material and setting procedures for applying insulations

List of Practical:

1. Trial on water cooler test rig.
2. Trial on ice plant test rig.
3. Visit to cold storage
4. Demonstration of domestic refrigerator in View of construction, operation and controls used.
5. Demonstration of various controls like L.P./H.P. cut outs, thermostat, overload protector, solenoid valve used in RAC.
6. Identification of components of 'hermetically sealed compressor'.
7. Visit to repair and maintenance workshop in view of use of various tools and charging procedure.
8. Cooling load calculations for cabin, classrooms, laboratory, canteen and dairy plant, milk storage, small freezers (minimum one).
9. Trial on A.C. test rig.
10. Visit to central A.C. plant in view of ducting system, insulation system and Air distribution system (e.g. frozen food industry/ice- cream industry/mushroom plants/textile industries).
11. Trouble shooting of domestic refrigerator/window air- Conditioner.

ELECTIVE - (ANY ONE) – (IV) CAD-CAM & AUTOMATION LAB
(MECH. ENGG. GROUP)

Subject Code 1625607D	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	ESE	:	50	
	—	—	03	Internal	:	15	
	—	—	—	External	:	35	
—	—	—					

CONTENTS: PRACTICAL

Skills to be developed:

Intellectual Skills:

1. Interpret the various features in the menu of solid modeling package.
2. Synthesize various parts or components in an assembly.
3. Prepare cnc programmes for various jobs.
4. Understand the concept of finite element method.
5. Prepare a report of visits.

Motor skills:

1. Operate a turning center and a machining center.
2. Operate and use solid modeling packages for drawing of assemblies.
3. Draw sketches of assemblies for converting into solid models.
4. Handle various tools used in cnc.

List of Practical's:

1. Two assignments on CAD for 2D drafting (Using AutoCAD)
2. Two assignments on CAD for 3D Modeling. (Using any 3-D Modeling software like CATIA, ProE, Solid works etc.)
3. Manufacturing one turning and one Milling component on CNC.
4. At least four assignments on part programming using subroutines do loops for turning and milling component.
5. Report writing on visit to industry having CNC machine.
6. Report writing on visit to industry having robot Application.
7. Report writing on visit to Industry having Automation in manufacturing.

DESIGN OF MACHINE ELEMENTS -TW
(MECH. ENGG. GROUP)

Subject Code 1625608	Term Work						Credits 01	
	No. of Periods Per Week			Full Marks	:	50		
	L	T	P/S	Internal	:	15		
	—	—	03	External	:	35		

CONTENTS: TERM WORK

Term Work Skills to be developed:

Intellectual skills:

1. Understand the basic philosophy and fundamentals of Machine Design.
2. Apply and use the basic knowledge of earlier subjects like mechanical Engineering, materials, strength of materials and theory of machines.
3. Analyse and evaluate the loads, forces, stresses involved in components and subassemblies and decide the dimensions.
4. Understand the modes of failures of m/c components and decide the design criteria and equations.
5. Understand the concept of standardization and selecting standard components.
6. Understand the methods of computer aided design practices.

Motor skills:

1. Draw the components assembly as per the designed dimensions.
2. Modify drawings and design as per requirement.
3. Use the different design software.
4. Use different design data books and IS codes.

S.No	List of Assignments / Term Work :
1	Assignment on selection of materials for given applications [at least five applications should be covered] using design data book. List the mechanical properties of material selected. 2 Hrs
2	Problems on design of simple machine parts like Cotter Joint, Knuckle Joint, Bell Crank Lever, Turn Buckle, Off – Set link, Arm of Pulley (One example on each component) with free hand sketches. 6 Hrs
3	Design Project No. 1 Observe the system where transmission of power takes place through shaft, Keys, coupling, pulley and belt drive. Get the required information regarding power transmitted (power output by motor or engine etc.). By selecting suitable materials, design the shaft, key and coupling. Also select suitable Ball Bearing from Manufacturer's catalogue. Prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also prepare bill of materials. (Activity should be completed in a group of five to six students) 6 Hrs
4	Design Project No. 2 Observe the System where transmission of power takes place through power Screws. (e.g. Lead screw of lathe, feed screws of machine tools, Clamping screws, Toggle Jack screw, etc.) Get the required information regarding effort, clamping force, etc., and selecting suitable materials design screw, nut and different simple components in assembly. Prepare design report and assembly drawing indicating overall dimensions, tolerances and surface finish. Also prepare bill of materials. (Activity should be completed in a group of five to six students) 4 Hrs
5	Assignments on design of Helical Springs, Screwed joints, Welded joints [one each] with free hand sketches. 2 Hrs
6	CAD Drawing for project No 1 or 2 should be prepared in practical and print out should be attached along with respective drawing sheets 8 Hrs
7	Survey of Prime movers – Electric motors / I.C. Engines available in the market along with specifications suitable for your design project. Survey report should be prepared with the relevant catalogue. 4 Hrs

INDUSTRIAL PROJECT - TW
(MECH. ENGG. GROUP)

Subject Code 1625609	Term Work			Credits		
	No. of Periods Per Week			Full Marks	:	50
	L	T	P/S	Internal	:	15
	—	—	06	External	:	35

CONTENTS : TERM WORK

Part A-Project

A) batch of maximum 4 students will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Student is expected to apply the knowledge & skills acquired. Batch may select any one problem/project work from following categories.

- B) Fabrication of small machine / devices/ test rigs/ material handling devices/ jig & fixtures/ demonstration models, etc. Report involving aspects of drawing, process sheets, costing, Installation, commissioning & testing should be prepared and submitted.
Design & fabrication of mechanisms, machines, Devices, etc. Report involving aspects of designing & fabricating should be prepared & submitted .
- c) Development of computer program for designing and /or drawing of machine components, Simulation of movement & operation, 3D modeling, pick & place robots etc.
- d) Industry sponsored projects- project related with solving the problems identified by industry should be selected. One person / engineer from industry is expected to work as co- guide along with guide from institution.
- e) Literature survey based projects: Project related with collection tabulation, classification, analysis & presentation of the information. Topic selected must be related with latest technological developments in mechanical or mechatronics field, and should not be a part of diploma curriculum. Report should be of min 60 pages.
- f) Investigative projects- Project related with investigations of causes for change in performance or structure of machine or component under different constraints through experimentation and data analysis.
- g) Maintenance based projects: The institute may have some machine/ equipment/ system which are lying idle due to lack of maintenance. Students may select the specific machines/equipment/system. Overhaul it, repair it and bring it to working condition. The systematic procedure for maintenance to be followed and the report of the activity are submitted.
- h) Industrial engineering based project: Project based on work study, method study, methods improvement, leading to productivity improvement, data collection, data analysis and data interpretation be undertaken.
- i) Low cost automation projects: Project based on hydraulic/pneumatic circuits resulting into low cost automated equipment useful in the identified areas.
- j) Innovative/ Creative projects – Projects related with design, develop & implementation of new concept for some identified useful activity using PLC, robotics, non-conventional energy sources, CIM , mechatronics, etc.
- k) Environmental management systems projects: Projects related with pollution control, Solid waste management, liquid waste management, Industrial hygiene, etc, Working model or case study should be undertaken.
- l) Market research/ survey based projects: Projected related with identification of extent of demand, sales forecasting, Comparative study of marketing strategies, Comparative study of channels of distribution, Impact of variables on sales volume, etc. The project involves extensive survey & market research activities information to be collected through various mechanisms/tools & report is prepared.
- m) Project based on use of appropriate technology particularly benefiting rural society or economically weaker section.

- n) Project can be selected other than the area specified above. Project should provide viable and feasible solution to the problem identified. Report should be of min 50 pages.

Part B- Seminar

Every student will prepare & deliver the seminar. Evaluation of seminar will be carried out by panel of at least three teaching staff from mechanical/ production /automobile department.

1. Selection of topic for the seminar should be finalized in consultation with teacher guide allotted for the batch to which student belongs.
2. Seminar report should be of min.10 & max. 20 pages & it should be certified by guide teacher and head of the department
3. for presentation of seminar, following guide lines are expected to be followed:-
 - a) Time for presentation of seminar: 7 to 10 minutes /student.
 - b) Time for question/answer : 2 to 3 minutes /student
 - c) Evaluation of seminar should be as follows:-
 - Presentation: 15 marks
 - Use of A. V. aids: 05 marks
 - Question /answer: 05 marks
 - Total: 25 marks
 - d) use of audio visual aids or power point presentation is desirable.
4. Topic of the seminar should not be from diploma curriculum
5. Seminar can be on project selected by batch.

Skills To Be Developed:

Intellectual Skills

1. Design the related machine components & mechanism.
2. Convert innovative or creative idea into reality.
3. Understand & interpret drawings & mechanisms
4. Select the viable, feasible & optimum alternative from different alternatives.

Motors skills

1. Use of skills learnt in workshop practical.
2. Assemble parts or components to form machine or mechanisms.
3. Classify & analyze the information collected.
4. Implement the solution of problem effectively.

Notes: 1) Project group size: Maximum 4 students

2) Project report will be of minimum 40 pages unless otherwise specified.

3) Project diary should be maintained by each student.

Text/ Reference Books:		
Titles of the Book	Name of Authors	Name of the Publisher
Project management & team work	Karl Smith	Tata- Mc Graw Hill
Project management	Clifford gray & Erik Lasson	Tata- Mc Graw Hill

2. Magazines:

1. Invention intelligence magazine
2. Popular mechanics Journals/ Magazines

PROFESSIONAL PRACTICES VI - TW
(MECH. +CIVIL ENGG. GROUP)

Subject Code 1625610	Term Work					Credits 02	
	No. of Periods Per Week			Full Marks	:		50
	L	T	P/S	Internal	:		15
	—	—	03	External	:		35

CONTENTS : TERM WORK		Hrs/week
Serial No.	Activities	Hours
Unit-01	<p>Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. Two industrial visits may be arranged in the following areas / industries to observe - Material Handling System, quality control charts / production record / layout flow systems / Facilities / Hydraulic & pneumatic systems / Working of Boilers and steam engineering applications.</p> <p>i) Auto / Electronic equipment manufacturing industry. ii) Cement / Sugar / Chemical / Textile / Steel rolling mills / extrusion industries. iii) Material handling in mines or ports. iv) Earth Moving Equipment Maintenance Shop.</p>	17
Unit-02	<p><i>Lectures by Professional / Industrial Expert be organized from any of the following areas (four lectures of two hour duration) student shall submit the report on each lectur:</i></p> <p>a) Battery and its charging system b) Electronic ignition system c) micro processor based instrumentation in Automobiles d) Earth moving machines. e) Tractors f) Excavators. g) Fork lift truck. h) Road- roller. i) Automated Guided Vehicles (AGV) j) Career opportunities in Service stations, Marketing, Surveyor, Insurance, R&D, call centers, CAD, NDT, Railways, Defense, Aeronautics, Marine, Software development, Information Technology k) Continuing education / Open university Programs, l) Air compressor technology 2) Tribological Aspects in automobiles / machine tools</p>	15
Unit-03	<p>Group Discussion : (Two topics) The students shall discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic for group discussions may be selected by the faculty members. Some of the suggested topics are</p> <p>i) Solar Vehicles / Electric Vehicles. ii) Auto Vehicles – Comparison. iii) Two stroke versus four stroke engines iv) Recycling of plastics and other waste material v) Attributes of product design vi) Creativity and innovativeness vii) Energy conservation in institutes viii) Value engineering ix) Revolution in communication technology x) Pneumatic tools and equipments xi) Wear mechanisms</p>	10

Unit-04	<p>Student Activities : The students in a group of 3 to 4 will perform ANY THREE of the following activities (other similar activities to be considered), and write a report as a part of term work.</p> <p>Activity :</p> <p>i) Collecting internal communication forms. ii) Collecting Failure data for automobile / machines / equipments. iii) Study of Hydraulic system for any one application like – dumpers, Earth moving equipment, Auto service station.</p>	16
	<p>iv) Survey of oils used for hydraulic circuits – specifications, properties, costs, manufacturers names etc. v) Study any one type of CNC machining center and prepare report on tooling and tool holding devices vi) Using finite element method analyse stresses in a cantilever beam. Write all the steps involved with brief description. vii) For a given job write a sequence of operations performed by automated manufacturing system. Draw a block diagram of control system to perform above operations viii) Survey of types of bearings involving information about construction working principles, mounting, lubrication, materials, advantages, limitations and cost. ix) Prepare a trouble shooting chart for any refrigeration system and suggest remedial measures to avoid failures x) For a drilling or milling operations on a simple machine component, draw a jig or fixtures showing various features like locating clamping, fool proofing etc. xi) Compare non traditional methods on the basis of working principles, accuracy , MRR, Applications and limitations a) EBM b) PAM C)AJM d)WJM Xii) For a given job involving 3 to 4 operations suggest to prepare a report</p>	
Unit-05	<p>Seminar :- Seminar on any advanced technical topic to be presented by individual student in a batch of 20 students. A separate topic be selected by an individual student</p>	12
	Total	70

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN MODERN OFFICE PRACTICE
(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME							Credits
				Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	
1.	Management	1600601	03	03	10	20	70	100	28	40	03
2.	Commercial Arithmetic & Business Statistics	1626602	04	03	10	20	70	100	28	40	03
3.	Interpersonal Communication (Eng. + Hindi)	1626603	04	03	10	20	70	100	28	40	03
4.	Computer Application, MS Office & Tally	1626604	04	03	10	20	70	100	28	40	04
5.	Elective (Any One)	1626605	04	03	10	20	70	100	28	40	03
	Elective-(i) Auditing (1626605A)		(ii) Management of small Enterprises (1626605B)			(iii) Public Sector Enterprises (1626605C)			(iv) Insurance (1626605D)		
Total:- 19								350	500		

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME					Credits	
				Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)		Pass Marks in the Subject
						Internal (A)	External (B)			
6.	Computer Application, Ms Office & Tally Lab	1626606	06	03	15	35	50	20	02	
7.	Stenography Lab-II	1626607	03	03	15	35	50	20	02	
Total:- 09							100			

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION – SCHEME				Credits
				Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	
8.	Management -TW	1626608	02	15	35	50	20	01
9.	Computer Application, MS OFFICE & Tally Lab -TW	1626609	03	15	35	50	20	01
10.	Project work and its presentation in Seminar - TW	1626610	-	15	35	50	20	02
Total:- 05						150		
Total Periods per week Each of duration One Hours = 33						Total Marks = 750	24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory						Credits
	No. of Periods Per Week			Full Marks			03
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	70	
	—	—	—	CT	:	10	
			CT	:	20		

	CONTENTS :THEORY	Hrs/week	Marks
Unit -1	<p>Overview Of Business</p> <p>1.1. Types of Business</p> <ul style="list-style-type: none"> • Service • Manufacturing • Trade <p>1.2. Industrial sectors Introduction to</p> <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry <p>1.3 Globalization</p> <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	[02]	
Unit -2	<p>Management Process</p> <p>2.1 What is Management?</p> <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor <p>2.2 Principles of Management (14 principles of Henry Fayol)</p> <p>2.3 Functions of Management</p> <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	[07]	
Unit – 3	<p>Organizational Management</p> <p>3.1 Organization :-</p> <ul style="list-style-type: none"> • Definition • Steps in organization <p>3.2 Types of organization</p> <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project <p>3.3 Departmentation</p> <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control <p>3.4 Forms of ownership</p> <ul style="list-style-type: none"> • Proprietorship • Partnership • Joint stock • Co-operative Society • Govt. Sector 	[07]	

Unit – 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel– Training & Development <ul style="list-style-type: none"> • Types of training <ul style="list-style-type: none"> ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow’s Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to – <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act	[08]	
Unit – 5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets <ul style="list-style-type: none"> ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to – <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	[08]	
Unit – 6	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	[08]	
Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle Quality Assurance • Introduction to TQM, Kaizen, 5 ‘S’, & 6 Sigma 	[08]	
Total	48		

Text/ Reference Books:-		
Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

COMMERCIAL ARITHMETIC & BUSINESS STATISTICS

Subject Code 1626602	Theory			No of Period in one session :			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale:-

For an efficient & successful office-operator the basic Knowledge & Arithmetic & Statistics seems to have become essential in the modern age. The ability to understand and evaluate numerical data is a basic skill required for office operators. In office operation, they may have become across many such activities where they have to deal with calculations and statistical data. They may be required to classify and tabulate data properly to keep a good record of wages, leaves etc. Of the employees, to analyse and interpret data, to calculate wages, interest rates, depreciation, profit & Loss etc. A successful office operator must have a good deal of training to find out some basic information inherent in a set of data.

An office operator may also be required to prepare various reports such as annual report of companies, status reports etc. They should have training in preparing good reports.

Commercial Arithmetic is being introduced to develop skill of quick calculations. This skill is very much expected from an office operator.

Objectives :

The student will be able to

- Understand the procedures of short-cut methods of Calculation.
- Develop Skill of multiplication/Division etc. quickly with accuracy.
- Develop Skill of finding exchange rate relations.
- Define the terms associated with statistics
- Develop to calculate by the table of mine values.
- Calculate Standard Deviation
- Develop Skill data collection, classification and interpretation.
- Measure control tendencies and partition values
- Measure dispersion
- Develop skill to use log tables & calculator for calculations of wages, interest rates, depreciations & profit & loss etc.
- Know the procedure of report writing and presentation.
- Develop skill of good report writing
- Know the procedure of report writing bibliography.

Contents : Theory		Hrs/week	Marks
UNIT-1	Commercial Arithmetic.	[]	
	Some general principles and Contracted Contracted methods of calculation		
	01.01 Approximation		
	01.02 Decimalization		
	01.03 Contracted method of multiplication		
	01.04 Contracted method of division		
	01.05 Table of nine values		
	01.06 Chain rule		
	01.07 Discount, commission & brokerage.		
UNIT-2	Introduction to statistics	[]	
	02.01 Meaning & definition of statistics		
	02.02 Scope of statistics		
	02.03 Functions of statistics		
	02.04 Laminations of statistics.		
UNIT-3	Collection of Data.	[]	
	03.01 Meaning of Primary & Secondary data		
	03.02 Sources of Primary data		
	03.03 Editing of Primary data		

UNIT-4	Classification and Tabulation of Data	[]	
	04.01 Meaning of Classification & Tabulation		
	04.02 Various stopes of classification & tabulations of data		
UNIT-5	Diagrammatic and graphic presentation of data.	[]	
	05.01. Meaning and importance of diagrams & graphs.		
	05.02. Various diagrams & their user.		
	05.03. Various graphs & their uses.		
UNIT-6	Measurement of Central tendency and Partition values	[]	
	06.01 Meaning of Central tendency		
	06.02 Arithmetic mean		
	06.03 Medium		
	06.04 Mode		
	06.05 Geometric mean		
	06.06 Harmonic mean		
	06.07 Quartile, Octile, Decile, Percentile.		
UNIT-7	Measures of dispersion	[]	
	07.01 Meaning of dispersion		
	07.02 Range		
	07.03 Mean Deviation		
	07.04 From mean		
	07.05 From Median		
	07.06 From Mode		
	07.07 Standard Deviation		
UNIT-8	Use of Log-table & Calculator	[]	
	08.01 Calculation of wages		
	08.02 Calculation of interest rates		
	08.03 Calculation of Depreciation		
	08.04 Calculation of profit & Loss		
UNIT-9	Report writing	[]	
	09.01 Purpose of report		
	09.02 Characteristics of a good report		
	09.03 Rule of charts in report		
	09.04 Preparation of annual reports of companies, status Reports and survey reports.		
	09.05 Preparing Bibliography		

Books Recommended:-

(1)	Commercial Arithmetic & Elementary Statistics	-	By S.K. Singh
(2)	Basic Statistics	-	By A.M. Goon & M.K. Gupta
(3)	Fundamentals of Statistics	-	By D.N. Elhams
(4)	Statistical methods	-	By C.B. Gupta
(5)	Statistics	-	By Dr. Mukund Lal

INTERPERSONAL COMMUNICATION (ENG. + HINDI)

Subject Code 1626603	Theory			No of Period in one session :			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
				CT	:	20	

English

Introducing IPC Skill as apart of MOP Diploma Course.

By the end of this course students will be able to-

- Define and identify elements and functions of Interpersonal Communication.
- Define and identify the process and function of perception, Self-Concept.
- Able to communication ideas and feelings.
- Develop and use interpersonal Communication language and managing conflict Skills.

Contents : Theory		Hrs/week	Marks
Unit-1	1. Fundamentals of Interpersonal Communication. i) The communication Process. ii) Functions of Comm. iii) Models of Comm.		
Unit-2	2. Perception Process i) Definition ii) Perception & Comm. iii) Self-Concept		
Unit-3	3. Verbal Comm. i) Language and Perception ii) Connotation iii) Denotation iv) IPC Language Skill		
Unit-4	4. Non-Verbal Comm. i) Time ii) Proxemics iii) Haptics iv) Kinesics v) Paralanguage.		
Unit-5	5. Communication of Ideas and feelings. i) Self-disclosure ii) Describe Feelings iii) Cerdeting iv) Criticism		
Unit-6	6. Listening and Feedback Skills.		
Unit-7	7. Interpersonal Com in Public Settings. i) Monologue and Dialogue ii) Conversational Competence iii) Co-ordinated Management of meaning iv) Interpersonal Comm. In the work place v) Interpersonal Contlict in the Work Place. vi) Types of Contlict vii) Managing Contlict viii) Guidelines of managing Contlict Methods of Instruction Class discussion Small Group Activities Student's Presentation Role Playing . Use of Library.		

Hindi
पारस्परिक संप्रेषण कौशल

पारस्परिक संप्रेषण कौशल का प्रशिक्षण प्राप्त कर अपने व्यक्तित्व का विकास कर सकें। अपने व्यवसायिक जीवन व्यक्तित्व विकास में प्रभावशाली पारस्परिक संप्रेषण कौशल की महत्ता के आलोक में मॉडर्न आफिस प्रैक्टिस डिप्लोमा पाठ्यक्रम के अन्तर्गत Interpersonal Communication Skill Hindi (पारस्परिक संप्रेषण कौशल) को सम्मिलित किया जा रहा है। इस विषय का अध्ययन करने के पश्चात छात्र निम्न में सक्षम होंगे :-

- पारस्परिक संप्रेषण कौशल को परिभाषित एवं चिन्हित कर सकेंगे।
- अवधारण की प्रक्रिया एवं कार्य को रेखांकित कर सकेंगे।
- कार्य स्थल पर अपने भावों एवं विचारों को परस्पर कुशलता से संप्रेषित कर सकेंगे।
- पारस्परिक संप्रेषण भाषा का विकास एवं उपयोग कर सकेंगे।
- साक्षात्कार में अथवा समूह में अपने विचारों की अभिव्यक्ति में सक्षम होंगे।
- वैचारिक प्रतिरोध अथवा टकराव का समुचित प्रबंधन कर सकेंगे।

Contents :Theory		Hrs/week	Marks
Unit-1	पारस्परिक संप्रेषण के मूल तत्व i. संप्रेषण की प्रक्रिया ii. संप्रेषण की प्रक्रिया iii. संप्रेषण के स्वरूप		
Unit-2	अवधारणा की प्रक्रिया i. परिभाषा ii. अवधारण एवं संप्रेषण iii. आम अवधारण		
Unit-3	भाषिक संप्रेषण i. भाषा एवं अवधारणा ii. संकेतांक iii. निदेशन		
Unit-4	गैर भाषिक संप्रेषण i. शारीरिक भाषा द्वारा संप्रेषण (भावानुभूति संप्रेषण) ii. भाषेतर संप्रेषण		
Unit-5	भावानुभूति संप्रेषण i. आम स्पष्टता ii. विश्वसनीयता iii. आलोचना		
Unit-6	श्रवण एवं अनुश्रवण कौशल		
Unit-7	कार्यस्थल पर पारस्परिक संप्रेषण i. एकालाप एवं वार्तालाप ii. विमर्श क्षमता iii. अर्थ समन्वयन प्रबंधन iv. कार्यस्थल पर पारस्परिक संप्रेषण कौशल v. कार्याचल पर वैचारिक टकराव vi. वैचारिक टकराव के प्रकार vii. वैचारिक टकराव प्रबंधन viii. वैचारिक टकराव प्रबंधन हेतु निर्देश		

COMPUTER APPLICATION, MS-OFFICE & TALLY

Subject Code 1626604	Theory			No of Period in one session :			Credits 4
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	70	
				CT	:	10	

Contents :Theory		Hrs/week	Marks
UNIT-1	M.S. Word - Introduction, what is a word Processor Getting started with word Processor - Word Processing Terminology, Editing Document - Find and Replace - Formatting the Document - Printing and Getting Help - Spell check - Inserting Graphics in word - Mail Merge	[]	
UNIT-2	M.S. Excel - Introduction M.S. Excel Basics, Editing cell contents - Command for worksheet / workbook - Some useful functions - Formatting Data - Charts in M.S. Excel - Printing worksheet / charts	[]	
UNIT-3	M.S. PowerPoint - Introduction to presentation Graphics - Steps to a PowerPoint presentation - Presentation Tips - Physical Aspects of a presentation - Creating New Slides - Editing and formatting a slide - Adding illustration to slides - Creating Slides shows	[]	
UNIT-4	Tally - <u>Basics of Accounting</u> Types of Accounts, Golden Rules of Accounting, Accounting Principles, Concepts and Conventions, Double Entry System of Book Keeping, Mode of Accounting, Financial Statements, Transactions, Recording Transactions - <u>Fundamentals of Tally. ERP 9</u> <ul style="list-style-type: none"> • Getting Functional with Tally. ERP 9 • Creation/ Setting up of Company in Tally. ERP 9 - <u>Accounting Masters in Tally. ERP 9</u> <ul style="list-style-type: none"> • F11: Features • F12 : Configurations • Setting up Account Heads - <u>Inventory in Tally. ERP 9</u> <ul style="list-style-type: none"> • Stock Groups • Stock Categories • Godowns/Locations • Units of Measure • Stock Items • Creating Inventory Masters for National Traders - <u>Voucher Entry in Tally. ERP 9</u> <ul style="list-style-type: none"> • Accounting Vouchers • Inventory Vouchers • Invoicing - <u>Value Added Tax (VAT)</u> <ul style="list-style-type: none"> • Configuring VAT in Tally. ERP 9 • Creating Masters • Entering Transactions 		

	<ul style="list-style-type: none"> • Accounting for Return of Goods • Rate Difference in Purchase/Sales • Accounting for Interstate Transactions • Exempt Transactions under VAT • Purchases from Unregistered Dealers • Claiming ITC on Capital Goods • Inter-State Branch Transfers • VAT Reports • VAT for Composite Dealers - <u>Central Sales Tax (CST)</u> <ul style="list-style-type: none"> • Basics of Central Sales Tax (CST) • Enabling CST in Tally. ERP 9 • Recording Interstate Transactions in Tally. ERP 9 • Payment of CST • CST Reports - <u>Technological Advantages of Tally. ERP 9</u> <ul style="list-style-type: none"> • Tally Vault • Security Control • Tally Audit • Backup and Restore • Split Company Data • Export and Import of Data • ODBC Connectivity • Web Enabled, Print Preview and Online Help • Printing of Reports and Cheques - <u>Tax Deducted at Source</u> <ul style="list-style-type: none"> • Basic concepts of TDS • Configuring TDS in Tally. ERP 9 • Creation of Masters • Processing Transactions • TDS Reports - <u>Tax Collected at Source</u> <ul style="list-style-type: none"> • Basic Concepts of TCS • Configuring Tally. ERP 9 for TCS • Creating Masters • Entering Transactions • TCS Reports 		
	Total		

Books Recommended: -

M.S. Office – 2000 – BPB Publication

M.S. Office – XP

ELECTIVE - (ANY ONE) (i) AUDITING

Subject Code 1626605A	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale:-

Contents :Theory		Hrs/week	Marks
UNIT-1	AUDIT:	[06]	
	01.01 Definition of Audit		
	01.02 Objectives of an Audit		
	01.03 Advantages of an Audit		
UNIT-2	TYPES OF AUDIT:	[12]	
	02.01 Continuous Audit		
	02.02 Interim Audit		
	02.03 Concepts of Propriety Audit		
	02.04 Cost Audit		
	02.05 Management Audit		
	02.06 Performance Audit		
UNIT-3	COMMENCEMENT OF NEW AUDIT:	[04]	
	03.01 Audit Programme		
	03.02 Audit Workings Papers		
UNIT-4	INTERNAL CHECK & INTERNAL CONTROL:	[08]	
	04.01 Meaning of Importance of Internal Check		
	04.02 Meaning of Importance of Internal Control		
	04.03 Difference between Internal Check & Internal Audit		
	04.04 Internal Check as regards Cash Books, Sales, Purchases and Payment of Wages.		
UNIT-5	VOUCHING:	[06]	
	05.01 Test Checking		
	05.02 Routine Checking		
	05.03 Vouching of Cash Transactions, Trading Transactions and Impersonal Ledger		
UNIT-6	VERIFICATION OF VALUATION OF ASSETS AND LIABILITIES:	[04]	
	06.01 Different types of Assets, their valuation and verification		
	06.02 Different liabilities, their valuation and verification		
UNIT-7	DEPRECIATION, RESERVE AND PROVISION:	[04]	
	07.01 Meaning and Types of Depreciation, Reserve and Provision		
	07.02 Auditors duties as regards Depreciation, Reserve and Provision		
UNIT-8	AUDIT OF PARTNERSHIP FIRM:	[04]	
	08.01 Auditors duty in the reorganisation arising out of admission, retirement and Death of a partner.		
	08.02 Auditors duty in the event of dissolution		
UNIT-9	AUDIT OF JOINT STOCK COMPANY:	[02]	
	Auditors Qualification, duties, responsibilities, powers and liabilities		
UNIT-10	GOVERNMENT ACCOUNTS AND THEIR AUDIT:	[10]	
	Objectives of Government Audit		
	Distinction between Audit of Govt. Accounts and Commercial Concerns.		
	Conduct of Audit of Govt. Companies.		
	Audit of Govt. Owned units.		
Total		60	

Book Recommended:-

1.	Practical Auditing	-	B.N. Tondon
2.	auditing	-	M.C. Shukla
3.	practical Approach to Auditing	-	D.K. Choudhary and K. Bhattacharya
4.	auditing Principle Practice Problems	-	Jagdish Prakash
5.	principles of Auditing	-	R.P. Maheshwar
6.	Refresher Course in Auditing (Question and Answers)	-	

**ELECTIVE - (ANY ONE) (ii) MANAGEMENT OF
SMALL ENTERPRISES**

Subject Code 1626605B	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale :-

Contents :Theory		Hrs/week	Marks
UNIT-1	ENTREPRENEUR:	[04]	
	01.01 Meaning and Concept		
	01.02 Qualities of an Entrepreneur		
UNIT-2	CLASSIFICATION OF INDUSTRIES :	[10]	
	02.01 Small Scale Industries		
	02.02 Medium Scale Industries		
	02.03 Large Scale Industries		
	02.04 Ancillary Industries		
	02.05 Cottage Industries		
UNIT-3	LEGAL FRAME WORK :	[04]	
	03.01 Organisation Structure		
	03.02 Rules and regulations of Local Bodies, State Government to be Complied with by Small Scale Industries.		
UNIT-4	FINANCE :	[10]	
	04.01 Means of Financing		
	04.02 Capital Structure		
	04.03 Working Capital		
	04.04 Capital Management		
	04.05 Industrial Assistance		
UNIT-5	MARKETING :	[12]	
	05.01 Marketing Methods		
	05.02 Pricing Policy		
	05.03 Channels of Distribution		
	05.04 Advertisement		
	05.05 Sales Management		
UNIT-6	CONCESSIONS AND RELIEFS GRANTED BY VERIOUS AGENCIES :	[02]	
UNIT-7	BUSINESS RISK AND COVERAGE :	[08]	
	07.01 Principles of Insurance		
	07.02 Insurable and Non Insurable Risk		
	07.03 Elementary idea about types of Insurance – Fire, Life, Marine and Burglary		
	07.04 Third party and Insurance		
UNIT-8	INDUSTRIAL POLLUTION :	[10]	
	Meaning		
	Industrial Pollution and their effects		
	Remedial Measures		
Total		60	

Books Recommended :-

1. Problems and Prospects of Small Basant Desai Scale Industry
2. Organisation and Management of Basant Desai Small Scale Industry.

ELECTIVE - (ANY ONE) (iii) PUBLIC SECTOR ENTERPRISES

Subject Code 1626605C	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale :-

Contents :Theory		Hrs/week	Marks
UNIT-1	STATE INTERVENTION IN ECONOMIC ACTIVITIES:	[06]	
	01. 01 History of the Govt. Enterprises in India		
	01. 02 Reason for State Participation		
	01. 03 Public enterprises and economic development		
UNIT-2	STRUCTURE OF PUBLIC ENTERPRISES IN INDIA :	[06]	
	02. 01 Nature, scope and size of Public Sector enterprises		
	02. 02 Employment in public sector		
	03. 03 Functional and organizational classification of public enterprises		
UNIT-3	EFFICIENCY OF PUBLIC ENTERPRISES:	[08]	
	03. 01 Public enterprise and regional development		
	03. 02 Economic and social benefits of public enterprises		
	03. 03 Its efficiency and criticism		
UNIT-4	GROWTH OF PUBLIC ENTERPRISES IN INDIA	[06]	
	04. 01 State ownership of industry		
	04. 02 Industrial Policy of the Govt. Of India since 1947		
	04. 03 Present Position		
UNIT-5	FORMS OF ORGANISATION:	[10]	
	05. 01 Departmental		
	05. 02 Public Corporation		
	05. 03 Company form		
	05. 04 Public Utility, meaning, characteristic, merits and demerits		
	05. 05 Critical evaluation, choice of the form of organization		
UNIT-6	THE AUTONOMY OF PUBLIC ENTERPRISES:	[10]	
	06. 01 Public Accountability meaning		
	06. 02 Objectives		
	06. 03 Views of the Expert Committees		
	06. 04 Parliamentary Control		
	06. 05 Methods and Procedure		
UNIT-7	THE MANAGEMENT IN PULIC ENTERPRISES:	[08]	
	07. 01 Composition of the Board of Directions		
	07. 02 Managing Director and other executive officers		
	07. 03 Their duties and responsibilities		
UNIT-8	MANAGEMENT DEVELOPMENT IN PUBLIC ENTERPRISES:	[06]	
	08. 01 Management education and training		
	08. 02 Management, research and development		
Total		60	

ELECTIVE - (ANY ONE) (iv) INSURANCE

Subject Code 1626605D	Theory			No of Period in one session : 60			Credits 3
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Objective of Rationale:

A Diploma holder Technician in Secretarial Practice or modern office practice has to come across many activities where the knowledge of in Insurance is required for efficient performance of their duties

- The student will be able to define & understand the different activity of Insurance
- Understand Primary function of Insurance Co.
- Develop the knowledge of Insurance and precedent prevalent.

	Contents : Theory	Hrs/week	Marks
UNIT-1	Insurance ---- Introduction Origin Need Types (govt. & private)	[]	
UNIT-2	Importance Theory of Insurance Different Theories Simple contract law, warranties, Indemnity difference between simple contract and Insurance contract.	[]	
UNIT-3	Life Insurance Essentials of life Insurance contract procedure of purchase a life Insurance policy	[]	
UNIT-4	Types of Insurance policies and their conditions Kind of policies <ul style="list-style-type: none"> - Whole life policies - Endowment policies - Term policy - Group Insurance - Money Back Policy - Annuity 	[]	
UNIT-5	Basis of Calculation of Premium for different schemes by using mortality table	[]	
UNIT-6	Fire Insurance Essentials of Fire contract, physicals & moral Hazards, standard Fire policies. Kinds of Fire policies.	[]	
UNIT-7	Marine Insurance Essentials of marine contract, warranties kinds of marine policies with their conditions	[]	
UNIT-8	Miscellaneous Insurances Motor Insurance Fidelity guarantees Insurance personal Accident Insurance and group Insurances.	[]	
Total			

Books Recommended: -

(1)	Element of Bima	—	Balchand Srivastava
(2)	Bima	—	Dr Rang Nanth Pandey & Chandan
(3)	Bima	—	Dr Anand Kumar & Dr Shova Kumari
(4)	Bima	—	Dr Kanta Prasad

COMPUTER APPLICATION, MS-OFFICE & TALLY LAB

Subject Code 1626606	Practical			No of Period in one session : 60			Credits 2
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
			External	:	35		

Contents :Practical		Hrs/week	Marks
UNIT-1	M.S. Word - Introduction, what is a word Processor Getting started with word Processor - Word Processing Terminology, Editing Document - Find and Replace - Formatting the Document - Printing and Getting Help - Spell check - Inserting Graphics in word - Mail Merge	[]	
UNIT-2	M.S. Excel - Introduction M.S. Excel Basics, Editing cell contents - Command for worksheet / workbook - Some useful functions - Formatting Data - Charts in M.S. Excel - Printing worksheet / charts	[]	
UNIT-3	M.S. PowerPoint - Introduction to presentation Graphics - Steps to a PowerPoint presentation - Presentation Tips - Physical Aspects of a presentation - Creating New Slides - Editing and formatting a slide - Adding illustration to slides - Creating Slides shows	[]	
UNIT-4	Tally - Basics of Accounting Types of Accounts, Golden Rules of Accounting, Accounting Principles, Concepts and Conventions, Double Entry System of Book Keeping, Mode of Accounting, Financial Statements, Transactions, Recording Transactions - Fundamentals of Tally. ERP 9 <ul style="list-style-type: none"> • Getting Functional with Tally. ERP 9 • Creation/ Setting up of Company in Tally. ERP 9 - Accounting Masters in Tally. ERP 9 <ul style="list-style-type: none"> • F11: Features • F12 : Configurations • Setting up Account Heads - Inventory in Tally. ERP 9 <ul style="list-style-type: none"> • Stock Groups • Stock Categories • Godowns/Locations • Units of Measure • Stock Items • Creating Inventory Masters for National Traders - Voucher Entry in Tally. ERP 9 <ul style="list-style-type: none"> • Accounting Vouchers • Inventory Vouchers • Invoicing - Value Added Tax (VAT) <ul style="list-style-type: none"> • Configuring VAT in Tally. ERP 9 • Creating Masters • Entering Transactions 		

	<ul style="list-style-type: none"> • Accounting for Return of Goods • Rate Difference in Purchase/Sales • Accounting for Interstate Transactions • Exempt Transactions under VAT • Purchases from Unregistered Dealers • Claiming ITC on Capital Goods • Inter-State Branch Transfers • VAT Reports • VAT for Composite Dealers <p>- <u>Central Sales Tax (CST)</u></p> <ul style="list-style-type: none"> • Basics of Central Sales Tax (CST) • Enabling CST in Tally. ERP 9 • Recording Interstate Transactions in Tally. ERP 9 • Payment of CST • CST Reports <p>- <u>Technological Advantages of Tally. ERP 9</u></p> <ul style="list-style-type: none"> • Tally Vault • Security Control • Tally Audit • Backup and Restore • Split Company Data • Export and Inport of Data • ODBC Connectivity • Web Enabled, Print Preview and Online Help • Printing of Reports and Cheques <p>- <u>Tax Deducted at Source</u></p> <ul style="list-style-type: none"> • Basic concepts of TDS • Configuring TDS in Tally. ERP 9 • Creation of Masters • Processing Transactions • TDS Reports <p>- <u>Tax Collected at Source</u></p> <ul style="list-style-type: none"> • Basic Concepts of TCS • Configuring Tally. ERP 9 for TCS • Creating Masters • Entering Transactions • TCS Reports 		
	Total		

Books Recommended :-

M.S. Office – 2000 – BPB Publication

M.S. Office – XP

STENOGRAPHY LAB -II

Subject Code 1626607	Practical			No of Period in one session : 60			Credits 2
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Contents : Practical

The main aim of diploma holders is to perform secretarial duties for and on behalf of the boss. Therefore, one must be well conversant with relevant sources of information and be alert and active with detailed knowledge to perform assignment as per direction of the office.

Units-1	Introduction		
Units-2	Circle 's' and 'Z', Hook and Loop - Large circle of 'SW' 'SS' and 'SZ' - ST and STR loops - Initial Hooks to straight strokes and curves. - Circles and loops preceding, initial hooks. - N and F/V hooks of Final hooks		
Units-3	Shun hook		
Units-4	Alternative forms of FR and VR		
Units-5	Prefixes		
Units-6	Suffixes		
Total			

ATTAINMENT OF SPEED:-

At the end of semester the students should be able to take down dictation at a minimum speed of 30 words per minute.

Assignment

1. Practicing sitting posture including the position of note-book and holding open/pencil.
2. Practice of consonants with special attention to their formation, length, angle, size, direction, thickness, etc. joining of strokes.
3. Repeated practice of using vowels and exercises from the text books.
4. Practice of using grammalogues, punctuation marks, phrases, diphthongs, triphones.
5. Class work-Reading and dictation along with transcription regularly
6. Home work-Reading and copying work (every day throughout they Year)
7. Practice of using circles and loops.

BOOK PRESCRIBED

1. Pitman shorthand Instructor and Key by sir Issac Pitman.

RECOMMENDED BOOKS

1. Pitman's shorthand-New course by Sir Issac; Pitman's Publications, London.
2. Pitman's shorthand Dictionary by Pitman; Pitman's Publications, London.
3. Graded Exercises in shorthand by Pitman; Journal.
4. Workbook for shorthand, Dictation and Corerrespondence by Dr. G.D., Bist; Vishishit Prakashan, C4B/66, Janakpur, New Delhi.

5. Shorthand Quiz (Question/Answers) by G.D. Bisat; Vishishit Prakashan, C4B/66 Janakpur, New Delhi.
6. Model speed Dictations (Subject wise Volumes by Dr. G.D.Bist; Vishishit Prakashan, C45B/66 Jankpur, New Delhi.
7. Shorthand Instruction with Key by Pitman, Sir Issac.
8. Shorthand Made Easy for Beginners by Kuthiala O.P; Pitman Publications.
9. Shorthand Transcription by Sir Kailash Chander; F-35, East of Kailash, New Delhi.
10. Shorthand Reading and Dictation Exercises by Pss Publications, New Delhi

आशुलिपि (हिन्दी)

छात्रों के लिए अनिवार्य है कि वे आशुलिपि में अच्छी गति के साथ कुशलता प्राप्त करें ताकि कार्यालय में उनका प्रदर्शन प्रभावशाली हो।

हिन्दी आशुलिपि का बुनियादी प्रशिक्षण।

1. उपसर्ग
2. प्रत्यय।
3. आशुलिपि में वाक्यांशों का महत्व एवं प्रयोग।

अभ्यास

- I. पाठ्य पुस्तक श्रुति लेख एवं पस्तक पठन से अभ्यास।
- II. गति का अभ्यास
- III. गद्यांश का अभ्यास।
- IV. गति बढ़ाने के नियम

Recommended Book

1. पिटमैन प्रणाली – हिन्दी संकेत लिपि
2. मानक आशुलिपि– केन्द्रीय हिन्दी प्रशिक्षण संस्थान, राजभाषा संस्थान, गृह मंत्रालय

MANAGEMENT -TW

Subject Code 1626608	Term Work			No of Period in one session : 60			Credits 2
	No. of Periods Per Week			Full Marks	:	50	
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Rationale:

The paper has been introduced to achieve dual purpose for the students.

Firstly, this course provides the basics of management and secondly it also prepares the student to undertake independent venture by becoming an entrepreneur.

This makes them conversant with their duties and responsibility to make them successful in their career building.

Objectives:

With the input provided in this paper, the students will be able to :-

- Acquire basic knowledge of management.
- Understand the area of management such as human resources, marketing, finance and commercial aspect.
- Understand the benefit of becoming an entrepreneur.
- Handle a project efficiently and in dependently.

To prepare a Project Report on any of the followings:

<u>S.No.</u>	<u>Topics</u>
01	Project Identification and formulation Report.
02	Project Profile/Pre-feasibility Report.
03	Techno-economical Feasibility Report (TEFR).
04	Market Survey Report.

CONTENTS

S.NO. TOPICS

TOPIC – 01 : PROJECT IDENTIFICATION AND FORMULATION REPORT:

- ◆ Introduction.
- ◆ Collection of Data.
- ◆ Compilation of Data.
- ◆ Analysis and Assimilation of Data.
- ◆ Product Selection.
- ◆ Report Finalisation and Report Writing.

TOPIC - 02 : PROJECT PROFILE/PRE-FEASIBILITY REPORT :

- ◆ Introduction of the product.
- ◆ Market.
- ◆ Man Power (Personnel Required).
- ◆ Manufacturing Process.
- ◆ Plant and Machinery.
- ◆ Cost of Project.
- ◆ Means of Finance.
- ◆ Cost of Production.
- ◆ Annual Turnover.
- ◆ Profit.
- ◆ Profit on Investment.

TOPIC – 03: TECHNO-ECONOMICAL FEASIBILITY REPORT (TEFR).

- ◆ Introduction on product.
- ◆ Market Prospects and Marketing.
- ◆ Location.
- ◆ Manufacturing Programme and Annual Turnover.
- ◆ Manufacturing Process.
- ◆ Cost of Project.
- ◆ Means of Finance.
- ◆ Requirement of Raw materials, Consumables, Utilities and Working Capital.
- ◆ Organisational Structure, Management and Man Power.
- ◆ Project Implementation Schedule.
- ◆ Profitability and Cash Flow.

TOPIC - 04 : MARKET SURVEY REPORT:

- ◆ Data Collection & Processing through Primary & Secondary Sources- Questionnaire method, e-mail, by post, by phone.
- ◆ Present Status.
- ◆ Growth of the Industry.
- ◆ Import and Export.
- ◆ Present market Demand.
- ◆ Forecast.
- ◆ Future Prospect/Scope.
- ◆ Market Segmentation.

Books Recommended:

1. Essential of Management, Tata McGraw Hill, - Herald Koonz & Cyril O' Donnel.
Publishing Company Ltd., New Delhi.
2. Business Organisation and Management, S. C. Chand - M. C. Shukla
and Company (Pvt.) Ltd., Ram Nagar, New Delhi
3. Managerial Economics, Sultan Chand & Sons, New - R. L. Vashney & K. L. Maheshwari
Delhi
4. Project Appraisal and Follow up, Govind Prakashan, - D. P. Sharda
Mumbai.
5. Modern Marketing Management, Progressive - Dr. Rustam S. Davar
Corporation Pvt. Ltd., P51, Mahatma Gandhi Road,
Bombay-400 001
6. A hand book for new entrepreneurs (with special - Entrepreneurship Development Institute
reference to science and technology target group) of India, 83-A, Swastic Society
Navrangpura, Ahmedabad, PIN-380 009.
7. Student discipline - Published by I.S.T.E. Mysore
8. Communication Skill - Published by I.S.T.E. Mysore
9. Decision Making - Published by I.S.T.E. Mysore
10. Pollution Control in Industry - Published by I.S.T.E. Mysore
11. S.S.M. in Environmental Engineering - Published by I.S.T.E. Mysore
12. Leadership in Organisation - Published by I.S.T.E. Mysore

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 13. Small Enterprise Management | - Published by I.S.T.E. Mysore |
| 14. Motivation | - Published by I.S.T.E. Mysore |
| 15. Fundamentals of Environmental Pollution | - Krishnan and Kannan |
| 16. Enviromental Engineering, T.T.T.I., Madras | - Tata Mcgraw Hill |
| 17. Motivation I.I.T. Kanpur | - Published by I.S.T.E. Mysore |
| 18. Mine Management | - V.N. Singh, Bangle Prining Press Ranchi |
| 19. Hand book on Project Appraisal and follow up, Govind
Prakashan, 204, Saraswati Kunj, 90, S. V. Road,
Goregoan, Bombay-400 062. | - D. P. Sarda |
| 20. Bihar Industrial Policy | - Government of Bihar, Department of
Industries. |
| 21. Entrepreneurship Guide | - Bihar State Financial Corporation, Fraser
Road, Patna-800 001. |
| 22. Management Economics, S. Chand & Sons, 4792/23,
Dariaganj, New Delhi-110 002. | - R. L. Varshney & G. L. Maheshwari |
| 23. Management Principles & Practices, S. Chand & Sons,
4792/23, Dariaganj, New Delhi-110002. | - L. Prasad & S. S. Gulshan |

COMPUTER APPLICATION, MS-OFFICE & TALLY LAB -TW

Subject Code 1626609	Term Work			No of Period in one session : 60			Credits 2
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Contents :Term Work		Hrs/week	Marks
UNIT-1	M.S. Word - Introduction, what is a word Processor Getting started with word Processor - Word Processing Terminology, Editing Document - Find and Replace - Formatting the Document - Printing and Getting Help - Spell check - Inserting Graphics in word - Mail Merge	[]	
UNIT-2	M.S. Excel - Introduction M.S. Excel Basics, Editing cell contents - Command for worksheet / workbook - Some useful functions - Formatting Data - Charts in M.S. Excel - Printing worksheet / charts	[]	
UNIT-3	M.S. PowerPoint - Introduction to presentation Graphics - Steps to a PowerPoint presentation - Presentation Tips - Physical Aspects of a presentation - Creating New Slides - Editing and formatting a slide - Adding illustration to slides - Creating Slides shows	[]	
UNIT-4	Tally - <u>Basics of Accounting</u> Types of Accounts, Golden Rules of Accounting, Accounting Principles, Concepts and Conventions, Double Entry System of Book Keeping, Mode of Accounting, Financial Statements, Transactions, Recording Transactions - <u>Fundamentals of Tally. ERP 9</u> <ul style="list-style-type: none"> • Getting Functional with Tally. ERP 9 • Creation/ Setting up of Company in Tally. ERP 9 - <u>Accounting Masters in Tally. ERP 9</u> <ul style="list-style-type: none"> • F11: Features • F12 : Configurations • Setting up Account Heads - <u>Inventory in Tally. ERP 9</u> <ul style="list-style-type: none"> • Stock Groups • Stock Categories • Godowns/Locations • Units of Measure • Stock Items • Creating Inventory Masters for National Traders - <u>Voucher Entry in Tally. ERP 9</u> <ul style="list-style-type: none"> • Accounting Vouchers • Inventory Vouchers • Invoicing - <u>Value Added Tax (VAT)</u> <ul style="list-style-type: none"> • Configuring VAT in Tally. ERP 9 • Creating Masters • Entering Transactions 		

	<ul style="list-style-type: none"> • Accounting for Return of Goods • Rate Difference in Purchase/Sales • Accounting for Interstate Transactions • Exempt Transactions under VAT • Purchases from Unregistered Dealers • Claiming ITC on Capital Goods • Inter-State Branch Transfers • VAT Reports • VAT for Composite Dealers <p>- <u>Central Sales Tax (CST)</u></p> <ul style="list-style-type: none"> • Basics of Central Sales Tax (CST) • Enabling CST in Tally. ERP 9 • Recording Interstate Transactions in Tally. ERP 9 • Payment of CST • CST Reports <p>- <u>Technological Advantages of Tally. ERP 9</u></p> <ul style="list-style-type: none"> • Tally Vault • Security Control • Tally Audit • Backup and Restore • Split Company Data • Export and Inport of Data • ODBC Connectivity • Web Enabled, Print Preview and Online Help • Printing of Reports and Cheques <p>- <u>Tax Deducted at Source</u></p> <ul style="list-style-type: none"> • Basic concepts of TDS • Configuring TDS in Tally. ERP 9 • Creation of Masters • Processing Transactions • TDS Reports <p>- <u>Tax Collected at Source</u></p> <ul style="list-style-type: none"> • Basic Concepts of TCS • Configuring Tally. ERP 9 for TCS • Creating Masters • Entering Transactions • TCS Reports 		
	Total		

Books Recommended :-

M.S. Office – 2000 – BPB Publication

M.S. Office – XP

PROJECT WORK AND ITS PRESENTATION IN SEMINAR-TW

Subject Code 1626610	Term Work			No of Period in one session :			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	30	
	—	—	—	External	:	70	

Rationale:-

The Project work and seminar is important to fulfill the academic requirement for the diploma course in Modern Office Practice. This course is designed to help a student in developing self confidence, skill report writing, skill in analysis designing estimating, costing are deciding a process, etc. The course will also help the student in developing communication skills and yearning to learn the process. The students will develop the skill of Quality documentation which is an important activity for a diploma holder modern office practitioner.

Objective:

The students will be able to

- ❖ Select a problem from a business concert/industry.
- ❖ Analyses the problem
- ❖ Develop Logical approach to solution of a problem
- ❖ Develop analytical ability
- ❖ Acquire a better understanding, with specification in the problem given.
- ❖ Acquire a practical exposure
- ❖ Arrive at the most effective and suitable solution to the problems/assignments.

Contents :

A project prepared by the students will be concerning with following topics should be approved by the teacher/guide as well as by the organization on which the project report will be prepared.

Contents :Term Work		Hrs/week	Marks
UNIT-1	Union Problem	[]	
UNIT-2	Administrative Problem	[]	
UNIT-3	Personal Problem	[]	
UNIT-4	Canteen Problem	[]	
UNIT-5	Wage/Incentive Problem	[]	
UNIT-6	Human Relation	[]	
UNIT-7	Welfare etc.	[]	
Total			

The Project report should be designed in the following fashion:-

	(i)	Title of the topic on the problem taken		
	(ii)	Approval sheet (certificate given by the guide of the project work)		
	(iii)	Acknowledgement		
	(iv)	Introduction to the topic/problem taken.		
	(v)	Objectives		
	(vi)	Hypothesis		
	(vii)	Methodology		
	(viii)	Data Collection		
	(ix)	Analysis and preparation of data collected		
	(x)	Conclusion/Suggestions		
	(xi)	Bibliography		

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN PRINTING TECHNOLOGY

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	EXAMINATION – SCHEME							Credits	
				Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject		
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03	
2.	Binding & Finishing – II	1627602	04	03	10	20	70	100	28	40	03	
3.	Printing Process – II	1627603	04	03	10	20	70	100	28	40	03	
4.	Accountancy, Costing & Estimating	1627604	04	03	10	20	70	100	28	40	03	
5.	Elective (Any One)	1627605	04	03	10	20	70	100	28	40	03	
Elective- (i) Advance Pre-Press (1627605A)				(ii) Advance Press-Work (1627605B)				(iii) Advance Printer's Science (1627605C)				
Total:- 19								350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	EXAMINATION – SCHEME				Credits	
					Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject		
					Internal (A)	External (B)				
6.	Pre-Press Lab	1627606	06	03	15	35	50	20	03	
7.	Printing Process Lab - II	1627607	04	03	15	35	50	20	02	
Total:- 10								100		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	EXAMINATION – SCHEME				Credits		
				Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject			
8.	Elective (Any One) -TW	1627608	04	15	35	50	20	02		
Elective- (i) Advance Pre-Press (1627608A) -TW			(ii) Advance Press-work (1627608B) -TW			(iii) Advance printer's Science (1627608C) -TW				
9.	Project Work & Its presentation in Seminar-TW	1627609	-	30	70	100	40	02		
Total:- 04								150		
Total Periods per week Each of duration One Hours = 33							Total Marks = 750	24		

MANAGEMENT (COMMON)

Subject Code 1600601	Theory					Credits 03	
	No. of Periods Per Week			Full Marks			100
	L	T	P/S	ESE	:		70
	03	—	—	TA	:		10
	—	—	—	CT	:		20

CONTENTS : THEORY

Unit	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business <ul style="list-style-type: none"> 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process <ul style="list-style-type: none"> 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W. Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management <ul style="list-style-type: none"> 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentatin <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

Unit – 4	Human Resource Management 4.1 Personnel Management <ul style="list-style-type: none"> • Introduction • Definition • Functions 4.2 Staffing <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure 4.3 Personnel– Training & Development <ul style="list-style-type: none"> • Types of training <ul style="list-style-type: none"> ➤ Induction ➤ Skill Enhancement 4.4 Leadership & Motivation <ul style="list-style-type: none"> • Maslow’s Theory of Motivation 4.5 Safety Management <ul style="list-style-type: none"> • Causes of accident • Safety precautions 4.6 Introduction to – <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act Industrial Dispute Act	08	
Unit – 5	Financial Management 5.1. Financial Management- Objectives & Functions 5.2. Capital Generation & Management <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital 5.3. Budgets and accounts <ul style="list-style-type: none"> • Types of Budgets <ul style="list-style-type: none"> ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet 5.4 Introduction to – <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	08	
Unit – 6	Materials Management 6.1. Inventory Management (No Numerical) <ul style="list-style-type: none"> • Meaning & Objectives 6.2 ABC Analysis 6.3 Economic Order Quantity <ul style="list-style-type: none"> • Introduction & Graphical Representation 6.4 Purchase Procedure <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing 6.5 Modern Techniques of Material Management <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	08	

Unit – 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 ‘S’, & 6 Sigma	08	
	Total	48	

Text/ Reference Books:-

Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

BINDING & FINISHING II

Subject Code 1627602	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale & Objective:-

This core subject deals with the special binding systems and automatic binding system, Advancements in binding process in taking place portion in a press. Therefore, knowledge of this subject is very essential.

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>ACCOUNT BOOKBINDING:</u> Account book and paper, sewing, pasting spine gluing, spilt boards, tacketting, spring back, cuttings and attaching the boards, covering, full leather.	[05]	
UNIT-2	<u>BANDING:</u> Single, Double, Double Straight, Russia.	[05]	
UNIT-3	<u>ACCOUNT BOOK FINISHING:</u>	[05]	
UNIT-4	<u>PUBLISHERS BINDING:</u> Folding, Binding, Gathering, Sewing, Spine Gluing, Trimming, Edge Decoration, Rounding and Booking.	[05]	
UNIT-5	<u>ALTERNATIVE:</u> Forwarding techniques, board cutting and cloth cutting cover decoration casing in, Pressing.	[05]	
UNIT-6	<u>BOOK, REPAIRING WORK:</u> Pulling a book, Removing old groove, dry and net cleaning washing mending.	[05]	
UNIT-7	<u>LOOSE-LEAF MECHANISM AND MECHANICAL SYSTEMS OF BINDING:</u> Inter-screw, ring metal, universal metal, end lock metal, prong metal, metal back ledger. Covering loose leaf mechanisms.	[05]	
UNIT-8	<u>MECHANICAL BINDING:</u>	[05]	
UNIT-9	<u>AUTOMATION IN BINDERY:</u> Folding machine, binding machine, gathering machine, wire stitching machine, thread stitching and looping machine, three-knife book trimmers, continuous trimmers book back gluing machine. Rounding and backing machine, back-lining machine. Lining up and head binding machine, case-making machine, automatic case making machine, back forming machine, casing-in machine, processing machine, types and suitability of machines for various classes to work.	[05]	
UNIT-10	<u>MATERIALS CONSUMPTION AND CALCULATION:</u> Calculation of paper, calculation of boards, estimating covering materials.	[05]	
UNIT-11	<u>ESTIMATING:</u> Thread, tape, coard, stitching wire and adhesives.	[05]	
UNIT-12	<u>PRODUCTION CONTROL:</u> Production control departmental planning and layout, modern production techniques and work-flow sequence.	[05]	
Total		60	

PRINTING PROCESS – II

Subject Code 1627603	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale & Objective:-

It is a core subject of printing technology, It is essential for students to learn about the basics of various printing processes. Process photography, techniques of printing surface preparation and printing machines.

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>INTRODUCTION TO DIFFERENT PRINTING SURFACE. :</u>	[15]	
	01.01 Introduction to 'Preparing a composed surface'.		
	01.02 Introduction to 'Photoengraved surface' (Block making).		
	01.03 Introduction to 'Offset Plate-making'.		
	01.04 Introduction to 'Gravure Surface'.		
	01.05 Introduction to 'Screen-making'.		
UNIT-2	<u>INTRODUCTION TO LETTERPRESS PRINTING MACHINE:</u>	[10]	
	Classification features and uses of letterpress machines. Merits and demerits.		
UNIT-3	<u>INTRODUCTION TO OFFSET PRINTING MACHINES & GRAVURE PRINTING MACHINE:</u>	[15]	
	Classification, features, uses, merits and demerits.		
UNIT-4	<u>INTRODUCTION TO SCREEN-PRINTING:</u>	[10]	
UNIT-5	<u>DIFFERENT KINDS OF ROLLERS:</u>	[10]	
Total		60	

ACCOUNTANCY, COSTING & ESTIMATING

Subject Code 1627604	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale & Objective:-

All productive activities in an industry are motivated by profit in an industry are motivated by profit. An accountant analyses the financial aspect of a business to give a correct picture as to whether it is running on profit or at a loss, as well as how that profit has been made or that loss sustained.

People in printing management should be able to do this evaluation with a view to enhancing the profit or eliminating the loose of an organisation.

Costing and Estimating:- Printing supervisors, owners of printing supervisors, owners of printing presses and so on have to study costing for the purpose of cost recovery and cost control. The study of a scientific system of costing will give them proper guidance as to how the maximum utilization of the resources of the factory can be achieved and do away with waste of time and money.

In an extremely competitive market, scientific estimating can guarantee the meaningful survival of a printing organisation by enabling it to forecast correctly and judiciously the estimated cost of jobs, the overhead expenditure of a business, and the amount of profit to be made from each job.

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>ACCOUNTANCY:</u> Definition, object of accountancy, double entry system, explanation of terms, first principles of double entry.	[05]	
<u>COSTING AND ESTIMATING</u>			
UNIT-2	<u>BASIC OBJECTS OF COSTING IN PRODUCTION PROCESS:</u> Job and Process costing, Fixed & Variable Cost, Time-rate and work rate Costing and Estimating System.	[05]	
UNIT-3	<u>ELEMENT OF COST:</u> Recovery of Labour Cost, materials, out work and overhead Expenses.	[05]	
UNIT-4	<u>COST SHEET :</u> Cost Accounting, Cost Control in Printing..	[05]	
UNIT-5	<u>ESTIMATING FOR PRINTING:</u> Outline of British Printing Industries federation system of Costing.	[05]	
UNIT-6	<u>ESTIMATING LABOUR OPERATION WORK RATE AND TIME-RATE SYSTEM:</u> Changeable operation in printing, their production standard and rates.	[05]	
UNIT-7	<u>ESTIMATING MATERIALS AND OUTWORK.</u> Over head expenses.	[05]	
UNIT-8	<ul style="list-style-type: none"> • Quality of a good estimator • Good copy & Bad copy in printing. 	[05]	
UNIT-9	<ul style="list-style-type: none"> • Definition of Break- Even point • Algebraical & Graphical representation of Break- Even point. 	[05]	

UNIT-10	<ul style="list-style-type: none"> • Definition of Pricing • Different factors of Pricing. • Brief overview on Bin Card, job Ticket, Purchase Requisition and Depreciation. 	[05]	
UNIT-11	<ul style="list-style-type: none"> • SPANKS method to find out ink Coverage in Printing. • Casting off calculation by En method. 	[05]	
UNIT-12	<ul style="list-style-type: none"> • Calculation of Kg of a Ream for a known GSM and size of a stock and to estimate cost from it. • To find out the fixed cost of a printing machine for known initial cost, interest %, depreciation%, insurance% etc. 	[05]	
Total		60	

ELECTIVE - (ANY ONE) (i) ADVANCE PRE-PRESS

Subject Code 1627605A	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale & Objective:-

Pre-press is the most sensitive area in the printing trade. The final quality of a Printing mainly depends upon the state of the pre-press technology. Image setting, scanning and advance plate making techniques are the key areas here which need special attention.

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>PLATE MAKING CHEMISTRY:</u> Surface chemistry of oleophilic image areas; hydrophilic non-image areas; effects of chemical changes; combination exposure and multiple exposure.	[10]	
UNIT-2	<u>COATING AND PROCESSING:</u> Wipe on, deep etch processes; presensitised plates; PVA and bimetal process; copperised, aluminium deepetch plates; operations by automatic plate processors, Different light sources; characteristics of light sensitive coating materials; other related equipments.	[10]	
UNIT-3	<u>SCANNING:</u> Basic principles; black and white scanner; laser screening; optical system; Screen Angle; colour removal, scanner operated vignette, Colour correction, Sharpness, Sizing, Resolution, Digital Retouching; saving picture files.	[10]	
UNIT-4	<u>OPERATING PROCEDURE:</u> Cylinder cleaning; transparency mounting; multiple transparency mounting; cylinder Changing setting vertical resolution; setting exposure; select units; formal and colour; scanning.	[10]	
UNIT-5	<u>PAGE MAKE UP TECHNIQUES:</u> Text files and graphic files; integration and editing; interactive graphic techniques; positioning; scaler and guide; lines for drawing and positioning; menu driven software attire of packagemaker; colour separation in DTP; computer graphics; graphic card; word processing; software; laser printers.	[10]	
UNIT-6	<u>OFFSET PRINTING MACHINE:</u> Plate making techniques for printing, Plastic plates, Metal plates, Direct image plates, PS plates, Wipe on plates, Punch register system.	[10]	
Total		60	

ELECTIVE - (ANY ONE) (ii) ADVANCE PRESS WORK

Subject Code 1627605B	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
				CT	:	20	

Rationale & Objective:-

For faster printing works and works of huge quantities such as Newspapers, magazine etc. Web-fed machines are required. These machines are also suitable for multi-colour works. This subject deals with the one rational features of Web-fed presses of relief printing, Planographic Printing and intaglio printing. Knowledge of this subject is very essential for a diploma holder.

Contents : Theory			Hrs/week	Marks
UNIT-1	<u>WEB-FED PRINTING MACHINES FOR RELIEF PRINTING PROCESS:</u>		[15]	
	1.1	Letterpress rotary machines-various types, units, feeding system, tension, control, delivery system, sheeters, inking system, registration control system, automatic pasters. Automatic detectors.		
	1.2	Flexographic printing machine feeding and delivery system sheeters, ink setting, two-colour registration control, make-ready techniques, printing faults and remedies.		
UNIT-2	<u>WEB-OFFSET SINGLE OR MULTI-COLOUR MACHINES:</u>		[15]	
	2.1	Various types and sizes, feeding and delivery systems, inking and dampening system web tension control, web detectors, registration control, auto-pasters, printing unit.		
	2.2	Conversion units for in line operations numbering, perforation, punching.		
	2.3	Drying of printed sheets-various methods.		
	2.4	Various types of plate and blanket used, make-ready operations.		
UNIT-3	<u>GRAVURE PRINTING:</u>		[15]	
	3.1	Sheet and web-fed presses-classification, construction.		
	3.2	Mounting of cylinders, minor corrections on cylinders, pre-proofing.		
	3.3	Presswork operation.		
	3.4	Automatic controls and detectors.		
	3.5	Gravure printing faults and remedies.		
UNIT-4	<u>SCREEN PRINTING:</u>		[15]	
	4.1	Frames and other materials used.		
	4.2	Stencil system.		
	4.3	Screen cleaning.		
	4.4	Dry equipments.		
	4.5	Inks, solvents minners, cieahers and retarders.		
Total			60	

ELECTIVE - (ANY ONE) (iii) ADVANCE PRINTER'S SCIENCE

Subject Code 1627605C	Theory			No of Period in one session : 60			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
			CT	:	20		

Rationale & Objective:-

The student will learn the scientific approach to the different printing materials. He will also learn about the testing of material for quality control. The subject will make the student to learn about the chemical reactions involved in the various stages of Reproduction Photography, Surface Preparation, Presswork etc.

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>INTRODUCTION:</u> Definition of quality; scope of quality control, its meaning a purpose; setting up quality control programmes.	[10]	
UNIT-2	<u>MATERIAL CONTROL:</u> Working out specification and laying standards for materials to be used in printing. inspection and testing of all incoming materials as a part of quality control; developing check list for inspection of materials.	[15]	
UNIT-3	<u>PRINTING/PHOTOGRAPHIC MATERIALS:</u> Basic ingredient of light sensitive emulsion and their function; developers, ingredients and their functions, different developer their suitability, chemical for after treatment; characteristics of Printing inks for different printing processes.	[15]	
UNIT-4	<u>SUBSTRATES:</u> Metals and metal foils used in printing; their physical and chemical properties; physical & chemical properties of monomers; polymers.	[10]	
UNIT-5	<u>MATERIAL MANAGEMENT:</u> Procurement of printing materials; determination of specification for quality; buying procedure; inventory control; storage of paper, board, ink & other materials.	[10]	
Total		60	

PRE-PRESS LAB

Subject Code 1627606	Practical			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Contents : Practical		Hrs/week	Marks
UNIT-1	Scanning of Line original.	[10]	
UNIT-2	Scanning of Halftone & colour originals.	[10]	
UNIT-3	Setting and uses of text files and graphic files.	[10]	
UNIT-4	Editing of text matter.	[10]	
UNIT-5	Preparation of text matter with the combination of graphics.	[10]	
	Total :	50	

PRINTING PROCESS LAB -II

Subject Code 1627607	Practical			No of Period in one session : 60			Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	02
	—	—	04	External	:	35	

Contents : Practical		Hrs/week	Marks
UNIT-1	Composing by hand process for one column text matter in the Lab	[10]	
UNIT-2	Composing by hand process for Poetry work in the Lab	[10]	
UNIT-3	Making of Engraved line block in the Lab.	[10]	
UNIT-4	Preparing Surface Plate-making for offset Printing in the Lab.	[10]	
UNIT-5	Making direct Screen Plate by direct making process in the Lab.	[10]	
UNIT-6	Making ready of a BAW single colour work on Sheet fed offset printing Machine in Lab.	[10]	
Total :		60	

ELECTIVE - (ANY ONE) - (i) ADVANCE PRE-PRESS - TW

Subject Code 1627608A	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Contents : Term Work		Hrs/week	Marks
UNIT-1	Preparation of offset plates with the help of combination and multiple exposure system.	[]	
UNIT-2	Preparation of colour scanned positive from the bromide prints and colour transparencies.	[]	
UNIT-3	Setting and preparation of image colour correction by the table top scanner.	[]	
UNIT-4	Preparation an making of a flexo plate.	[]	
UNIT-5	Setting and uses of text files and graphic files.	[]	
UNIT-6	Editing of text matter.	[]	
UNIT-7	Preparation of text matter with the combination of graphics.	[]	
UNIT-8	Use of a laser printer and its maintenance.	[]	
Total :		[60]	

ELECTIVE - (ANY ONE) - (ii) ADVANCE PRESS WORK - TW

Subject Code 1627608B	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	50	
	—	—	04	External	:	15	
						35	

Contents : Term Work		Hrs/week	Marks
UNIT-1	Simple Imposition Scheme.	[]	
UNIT-2	Setting feeders for various thickness and sizes for sheet and web printing of single and multi-colour webs.	[]	
UNIT-3	Mounting of plates, Blanket.	[]	
UNIT-4	Setting of Ink & water, Register control on Printing machine, Setting Delivery system.	[]	
UNIT-5	Setting feeders, printing of single and multi-colour works, mounting cylinder, setting ink, register control on Gravure Printing machine.	[]	
UNIT-6	Make ready and printing of line & halftone, one and multi-colour work.	[]	
UNIT-7	Preventive maintenance of printing machine.	[]	
	Total :	[60]	

ELECTIVE- (ANY ONE) (iii) ADVANCE PRINTER'S SCIENCE - TW

Subject Code 1627608C	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	15	
	—	—	04	External	:	35	

Contents : Term Work		Hrs/week	Marks
UNIT-1	Testing printing ink for opacity, drying bleeding emulsification.	[]	
UNIT-2	Testing paper and board for Printing.	[]	
UNIT-3	Test relating to folding, creasing, bursting, tensile strengths.	[]	
UNIT-4	Dying & bleeding test.	[]	
UNIT-5	Quality check for film & chemicals.	[]	
Total :		[60]	

PROJECT WORK AND ITS PRESENTATION IN SEMINAR -TW

Subject Code 1627609	Term Work			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	30	
	—	—	—	External	:	70	

Rationale :

The project work and seminar is an important subject for a diploma holder technician. The course is designed to help a student develop Self Confidence. Skill in report writing to analyse design, estimating and costing, deciding a process etc, the course will also help in developing communication skill and learning to learn the process in a student. The student will develop the skill of quality documentation is an important activity for a diploma holder technician.

Objective:

The student will be able to:

- Select a problem from industry.
- Analyse the Problem.
- Develop logical approach to solution of a Problem.
- Design of a product.
- Make estimation of materials, operation and calculate cost of the product.
- Manufacture/fabricate the product in the workshop.
- Test the product to check for failure.
- Prepare a project report (Typed / Computer printed).
- Present in the form of a Seminar.

A student is required to make report in any one of department :-

Contents :Term Work			Hrs/week	Marks
UNIT-1		Costing Estimating Department.	[]	
UNIT-2		Pre-Press work	[]	
	(a)	Composing.	[]	
	(b)	Scanning.	[]	
	(c)	Process Camera.	[]	
	(d)	Imagesetting.	[]	
	(e)	Processing.	[]	
UNIT-3		Platemaking.	[]	
		Press Work	[]	
	(a)	Preventive maintenance.	[]	
	(b)	Printing.	[]	
	Finishing.	[]		

REPORT PRESENTATION:-

A report must include:

UNIT-1	An introduction to industrial training.	[]	
UNIT-2	Printing – An art.	[]	
UNIT-3	Organisation/Institution details.	[]	
UNIT-4	Specification.	[]	
UNIT-5	Raw material and their source of supply.	[]	
UNIT-6	Handling of Records for costing & estimating purposes.	[]	
UNIT-7	Maintenance of records for costing & estimating purposes.	[]	
UNIT-8	A study in working of various department.	[]	
UNIT-9	Operation of various machine & equipment.	[]	
UNIT-10	Quality control	[]	

SEMINARS :-

The Project Report should consist of :-

UNIT-1	Introduction.	[]	
UNIT-2	Problem statement.	[]	
UNIT-3	Background of Industry.	[]	
UNIT-4	Organisational setup.	[]	
UNIT-5	General Environment of problem.	[]	
UNIT-6	New technology.	[]	
UNIT-7	Quality control.	[]	
UNIT-8	Department functioning.	[]	
UNIT-9	Reason.	[]	
UNIT-10	Solution.	[]	
UNIT-11	Any other suggestion.	[]	
Total			

NOTE:-

Project work in ideal condition should be done individually. If it is not possible then it can be done in a group of not more than five students.

STATE BOARD OF TECHNICAL EDUCATION, BIHAR
Scheme of Teaching and Examinations for
VI SEMESTER DIPLOMA IN TEXTILE ENGINEERING

(Effective from Session 2016-17 Batch)

THEORY

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	EXAMINATION – SCHEME							Credits
				Hours of Exam.	Teacher's Assessment (TA) Marks (A)	Class Test(CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	
1.	Management (Common)	1600601	03	03	10	20	70	100	28	40	03
2.	Textile Chemistry – II	1628602	03	03	10	20	70	100	28	40	03
3.	Textile Testing & Quality Control	1628603	03	03	10	20	70	100	28	40	03
4.	Processing of Synthetic & their Blends	1628604	03	03	10	20	70	100	28	40	03
5.	Elective (Any One)	1628605	03	03	10	20	70	100	28	40	03
Elective- (i) Nonwoven & Knitting (1628605A)			(ii) Sericulture & Silk Technology (1628605B)		(iii) Technical Textiles (1628605C)		(iv) Computer Aided Textile Design (1628605D)				
Total:- 15							350	500			

PRACTICAL

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per Week	Hours of Exam.	EXAMINATION – SCHEME				Credits
					Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	
					Internal (A)	External (B)			
6.	Textile Chemistry Lab. – II	1628606	06	03	15	35	50	20	02
7.	Textile Testing Lab. – II	1628607	06	03	15	35	50	20	02
Total:- 12							100		

TERM WORK

Sr. No.	SUBJECTS	SUBJECT CODE	TEACHING SCHEME Periods per week	EXAMINATION – SCHEME				Credits
				Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	
8.	Textile Chemistry II -TW	1628608	03	07	18	25	10	01
9.	Textile Testing– II -TW	1628609	03	07	18	25	10	01
10.	Project Work & Its Presentation in Seminar - TW	1628610	-	30	70	100	40	03
Total:- 06						150		
Total Periods per week Each of duration One Hours = 33						Total Marks = 750	24	

MANAGEMENT (COMMON)

Subject Code 1600601	Theory					Credits	
	No. of Periods Per Week			Full Marks		:	100
	L	T	P/S	ESE		:	70
	03	—	—	TA		:	10
	—	—	—	CT		:	20
03							

CONTENTS ; THEORY

Unit -1	Name of the Topics	Hrs/week	Marks
Unit -1	Overview Of Business 1.1. Types of Business <ul style="list-style-type: none"> • Service • Manufacturing • Trade 1.2. Industrial sectors Introduction to <ul style="list-style-type: none"> • Engineering industry • Process industry • Textile industry • Chemical industry • Agro industry 1.3 Globalization <ul style="list-style-type: none"> • Introduction • Advantages & disadvantages w.r.t. India • 1.4 Intellectual Property Rights (I.P.R.) 	02	
Unit -2	Management Process 2.1 What is Management? <ul style="list-style-type: none"> • Evolution • Various definitions • Concept of management • Levels of management • Administration & management • Scientific management by F.W.Taylor 2.2 Principles of Management (14 principles of Henry Fayol) 2.3 Functions of Management <ul style="list-style-type: none"> • Planning • Organizing • Directing • Controlling 	07	
Unit - 3	Organizational Management 3.1 Organization :- <ul style="list-style-type: none"> • Definition • Steps in organization 3.2 Types of organization <ul style="list-style-type: none"> • Line • Line & staff • Functional • Project 3.3 Departmentatin <ul style="list-style-type: none"> • Centralized & Decentralized • Authority & Responsibility • Span of Control 3.4 Forms of ownership <ul style="list-style-type: none"> • Propriotership • Partnership • Joint stock • Co-operative Society • Govt. Sector 	07	

<p>Unit – 4</p>	<p>Human Resource Management</p> <p>4.1 Personnel Management</p> <ul style="list-style-type: none"> • Introduction • Definition • Functions <p>4.2 Staffing</p> <ul style="list-style-type: none"> • Introduction to HR Planning • Recruitment Procedure <p>4.3 Personnel– Training & Development</p> <ul style="list-style-type: none"> • Types of training ➤ Induction ➤ Skill Enhancement <p>4.4 Leadership & Motivation</p> <ul style="list-style-type: none"> • Maslow’s Theory of Motivation <p>4.5 Safety Management</p> <ul style="list-style-type: none"> • Causes of accident • Safety precautions <p>4.6 Introduction to –</p> <ul style="list-style-type: none"> • Factory Act • ESI Act • Workmen Compensation Act <p>Industrial Dispute Act</p>	<p style="text-align: center;">08</p>	
<p>Unit – 5</p>	<p>Financial Management</p> <p>5.1. Financial Management- Objectives & Functions</p> <p>5.2. Capital Generation & Management</p> <ul style="list-style-type: none"> • Types of Capitals • Sources of raising Capital <p>5.3. Budgets and accounts</p> <ul style="list-style-type: none"> • Types of Budgets ➤ Production Budget (including Variance Report) ➤ Labour Budget • Introduction to Profit & Loss Account (only concepts) ; Balance Sheet <p>5.4 Introduction to –</p> <ul style="list-style-type: none"> • Excise Tax • Service Tax • Income Tax • VAT • Custom Duty 	<p style="text-align: center;">08</p>	
<p>Unit – 6</p>	<p>Materials Management</p> <p>6.1. Inventory Management (No Numerical)</p> <ul style="list-style-type: none"> • Meaning & Objectives <p>6.2 ABC Analysis</p> <p>6.3 Economic Order Quantity</p> <ul style="list-style-type: none"> • Introduction & Graphical Representation <p>6.4 Purchase Procedure</p> <ul style="list-style-type: none"> • Objects of Purchasing • Functions of Purchase Dept. • Steps in Purchasing <p>6.5 Modern Techniques of Material Management</p> <ul style="list-style-type: none"> • Introductory treatment to JIT / SAP / ERP 	<p style="text-align: center;">08</p>	

Unit - 7	Project Management (No Numerical) 7.1 Project Management <ul style="list-style-type: none"> • Introduction & Meaning • Introduction to CPM & PERT Technique • Concept of Break Even Analysis 7.2 Quality Management <ul style="list-style-type: none"> • Definition of Quality , concept of Quality , Quality Circle, Quality Assurance • Introduction to TQM, Kaizen, 5 'S', & 6 Sigma 	08	
	Total	48	

Text/ Reference Books:-

Name of Authors	Titles of the Book	Name of the Publishe
Dr. O.P. Khanna	Industrial Engg & Management	Dhanpal Rai & sons New
Dr. S.C. Saksena	Business Administration & Management	Sahitya Bhavan Agra
W.H. Newman E.Kirby Warren Andrew R. McGill	The process of Management	Prentice- Hall
Rustom S. Davar	Industrial Management	Khanna Publication
Banga & Sharma	Industrial Organisation & Management	Khanna Publication
Jhamb & Bokil	Industrial Management	Everest Publication , Pune

TEXTILE CHEMISTRY – II

Subject Code 1628602	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale :

Textile Chemistry is one of the main activities for a diploma holder technician in Textile Engineering. He is required to apply different types of dyes on natural and synthetic fibres finishing of natural fibres, different styles of printing. He must be well versed with the subject of Textile Chemistry.

The subject is being introduced to develop the understanding of Wet Processing, Printing and finishing.

Objective:

After completion of the courses student will be able to :-

- ◆ Define the terminologies related with Textile Chemistry.
- ◆ Explain the principle and working of Dyeing, Printing and Finishing.
- ◆ Methods of application of dyes.
- ◆ Understand the Wet processing and their related problem.

Contents :Theory		Hrs/week	Marks
UNIT-1	<u>DYEING:</u>	[10]	
	01.01 Properties, Selection and application of various dyes like vats, Aniline Black, Azoic, Reactive dyes, Mordant colour, Pre-metallised dyes and other popular dyes used on Cotton, Wool, Silk.	(06)	
	01.02 Various after treatments given to dyed goods.	(02)	
	01.03 Textile auxiliaries and chemicals used in dyeing and their functions.	(02)	
UNIT-2	<u>DYEING OF SYNTHETIC FIBRE:</u>	[16]	
	02.01 Disperse Dyes – Introduction and properties.	(01)	
	02.02 Methods of application on Polyester by High temperature dyeing process, Thermosol process, Carrier method, Rapid dyeing technique.	(04)	
	02.03 Brief idea about Dyeing machine like conventional and Modern H P H T Beam Dyeing machine, H P H T Jet Dyeing machine, Winch Dyeing machine.	(03)	
	02.04 Dyeing of Polyamide fabric with Disperse dyes, Acid dyes.	(02)	
	02.05 Dyeing of Viscose rayon with Direct Dyes, Sulphur Dyes and Vat Dyes.	(01)	
	02.06 Dyeing of Acetate rayon with disperse Dyes.	(01)	
	02.07 Dyeing of blended textiles and garments.	(04)	
UNIT-3	<u>PRINTING:</u>	[10]	
	03.01 Detailed Study of Different styles of printing – Discharge Style, Direct Style, Resists Style.	(04)	
	03.02 Comparative study of different styles of printing and their importance.	(01)	
	03.03 Printing of cotton with Rapid fast colour and Rapidozones Colour.	(01)	
	03.04 Study about Silk goods printing.	(01)	
	03.05 Study about Pigment Printing.	(01)	
	03.06 Printing of synthetic goods.	(02)	

UNIT-4	<u>FINISHING:</u>		[14]	
	04.01	Objects and methods of Finishing.	(01)	
	04.02	Classification of various finishes.	(01)	
	04.03	Finishing process an overview- Sanforization, Anticrease, both internal and external application of synthetic resins, Organdy effects, Water repellent finishes, Fire proofing, Rot proofing, Water proofing, Creping, Calendering, Softening and Stiffening finishes, Raising, Shearing, Heat Setting, Methods of evaluation of finishing effects.	(06)	
	04.04	Special study on finishing of woolen materials, Silk fabrics.	(03)	
	04.05	Finishing of Synthetic fibre fabrics.	(02)	
	04.06	A brief Study of finishing machines like – Water mangle, different types of Starching mangles, cylinder and hot air drying machines, Calenders.	(02)	
Total			60	

Reference Books :-

1.	Textile Chemistry, Vol.-I, II, III, Elsewhere Publishing Co., New York.	-	R. H. Peters.
2.	Modern Techniques of Textile Bleaching, Dyeing and Finishing, SITRA Publication.	-	
3.	Chemical Processing of Cotton, Polyester Cotton Blends	-	J. R. Modi & A. R. Garde.
4.	Dyeing of Polyester blends.	-	M. L. Gulrajani.
5.	Principles and Practice of dyeing.	-	V. A. Shenai.
6.	An Introduction to Textile Finishing.	-	J. T. Marsh.
7.	Textile Printing.	-	Miller.

TEXTILE TESTING & QUALITY CONTROL

Subject Code 1628603	Theory			No of Period in one session : 50			Credits 03	
	No. of Periods Per Week			Full Marks				: 100
	L	T	P/S	ESE				: 70
	03	—	—	TA				: 10
				CT				: 20

Rationale: This subject covers the topics on yarn and fabric properties and their measurement methods. Study of important features of yarn like twist and its effect on yarn properties and fabrics like cover factor, air permeability, stiffness, drape, etc are very much useful. At the same time yarn and fabric tensile properties and fabric bursting, tearing strength etc control the final product.

Objectives:

- i. Testing of yarns and fabrics.
- ii. The students must be able to carry out the tests on yarns and fabrics and provide appropriate conclusions.

Contents : Theory		Hrs/ week	Marks
UNIT-1	<p><u>YARN TESTING:</u></p> <p>1.1 Twist in Yarn 1.1.1 Introduction, Twist direction, Amount of twist and Use of Twist Multiplier. 1.1.2 The function of twist in yarn structure. Twist and yarn strength. Effects of twist on fabric Properties. 1.1.3 Methods of determination of twist: Ordinary Twist tester (or, straightened fibre method), Continuous Twist tester, Twist Contraction method, Take – up Twist tester, The Quadrant twist tester.</p> <p>1.2 Yarn Strength. 1.2.1 Introduction. 1.2.2 Forces for Strength, Factors affecting the tensile Properties of textiles and the results obtained from testing instruments. 1.2.3 Principles of tensile testing machines – CRL and CRE Principles. 1.2.4 The Pendulum Lever Principle with Constant Rate of Traverse. The Inclined Plane Principle. 1.2.5 Determination of Yarn Strength: Single thread Strength tester, Uster Single thread strength tester, Instron tester, Scott Inclined plane tester, Lea Tester. 1.2.6 Ballistic Principle or the Impact Principle, Ballistic Tester. 1.2.7 The Count – Strength Product (CSP).</p>	[15]	
UNIT-2	<p><u>FABRIC TESTING</u></p> <p>2.1 Introduction, Quality Particulars of Fabric. 2.2 Fabric Length and its measurement. 2.3 Fabric Width and its measurement. 2.4 Fabric Thickness: Introduction, Principle of the measurement of Fabric Thickness. Methods of measuring thickness (Heal’s thickness gauge, Reynolds and Branson thickness tester, Shirley thickness gauge). 2.5 Fabrics weight and its measurement. Threads per inch in woven fabric. 2.6 Crimp of Yarn in Fabric: Crimp, Crimp Percentage and Crimp Amplitude. Crimp and fabric properties. Measurement of Crimp Percentage. W.I.R.A. Crimp tester, Manra Crimp tester. 2.7 Fabric Strength: 2.7.1 Tensile Strength testing: Introduction, Ravelled Strip method, cut Strip method and Grab method. Methods of Measuring Tensile Strength: Combined Tensile strength tester (vertical), Horizontal cloth tester. 2.7.2 Tearing Strength testing: Introduction. Methods of measuring the Tearing Strength: Tongue, tear test, Tongue Double rip tear test, Trapezoid tear, Ballistic tear test and Wing rip tear test. Tearing Strength by ‘Shirley’ double Pendulum ballistic tester. 2.7.3 Bursting Strength testing: Introduction, Methods of Measuring Bursting strength. Hydraulic Bursting strength tester. 2.7.4 Fabric Stiffness, Handle and Drape: Introduction, Drape and its measurement by Drape–Meter. Stiffness and its measurement. Shirley’ stiffness tester. Heart–loop tests. 2.7.5 Crease Resistance and Crease Recovery: Introduction. Measurement of Crease recovery. ‘Shirley’ Crease Recovery tester. 2.7.6 Serviceability, Wear and Abrasion Resistance: Introduction. Testing of Abrasion Resistance. B.F.T Abrasion testing machine. Martindale Abrasion tester. 2.7.7 Pilling of fabrics and its measurement. I.C.I. Pilling tester. 2.7.8 Air Permeability: Introduction, Measurement of Air Permeability, ‘Shirley’ Air Permeability tester, Air Permeability and Fabric Properties.</p>	[21]	

	<p>2.7.9 Water and Fabric Relationships: Introduction, Water Permeability, Absorbability, Shower Proof, Water Proof, Water Repellent and Basic Concept of wetting and water repellency. Methods of Testing & Wettability of Cotton fabrics. Spray Test.</p> <p>2.7.10 Flammability.</p> <p>2.7.11 Shrinkage Tests: Introduction to Shrinkage, Relaxation and Felting. Testing for Shrinkage.</p> <p>2.7.12 Denison Tensile Testing machine (for Cords, ropes and heavy industrial fabrics).</p>		
UNIT-3	<p><u>EVENESS TESTING:</u></p> <p>3.1 Introduction. Nature of Irregularity. Classification of variation. Index of Irregularity.</p> <p>3.2 Methods of measuring Irregularity: Visual Examination Methods, Fielden-Walker Evenness Tester, Uster Evenness Tester.</p> <p>3.3 Causes of Irregularity. Effects of Irregularity. Interpretation of the results of irregularity tests.</p> <p>3.4 Uster Classimat.</p> <p>3.5 Hairiness in spun yarn and its measurement.</p>	[07]	
UNIT-4	<p><u>STATISTICAL QUALITY CONTROL:</u></p> <p>4.1 Introduction, Objectives of Quality Control, Advantages of Statistical Quality Control.</p> <p>4.2 Causes of Variation in Quality: Chance causes and Assignable causes.</p> <p>4.3 Techniques of S.Q.C.: Process Control and Product control and Process Control.</p> <p>4.4 Quality Control Chart: concepts, Use of control chart, Advantages of using quality control charts. Control Limits, Types of Control charts: Control chart for variables & Control charts for Attributes. Application of Quality control charts in Textile Industry.</p> <p>4.5 Product control.</p> <p>4.6 Importance of Quality control in textile.</p>	[07]	
	Total	50	

Books Recommended:

- | | |
|-----------------------------------------------------|-------------------|
| 01. Principle of Textile Testing | - J.E. Booth |
| 02. Hand Books of Methods of Testing | - C.T.R.L. |
| 03. Hand Books of Textile Testing & Quality Control | - Grover |
| 04. ISI Hand Books of Textile Testing | - I.S.I. |
| 05. Textile Testing | - Skinkle |
| 06. Textile Testing | - Angappan |
| 07. Textile Testing and Analysis | - Vaishnav. Joshi |

PROCESSING OF SYNTHETIC & THEIR BLENDS

Subject Code 1628604	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Contents : Theory			Hrs/week	Marks
UNIT-1	<u>GENERAL INTRODUCTION TO SPINNING:</u>		[02]	
	01.01	Introduction, General information on manmade.		
	01.02	Common systems of Spinning of staple fibres. Cotton system of spinning.		
	01.03	Fibre characteristics and spinnability such as staple length, Fibre denier (Fineness), Fibre strength, Crimp, Fibre finish, Merge number.		
	01.04	Fibre Properties and end – uses.		
UNIT-2	<u>BLENDING:</u>		[05]	
	02.01	Introduction and Reason for Blending. The aim of Blending.		
	02.02	Principles of fibre selection.		
	02.03	Measures of blending. Migration. Tinting.		
	02.04	Selection of blend constituent.		
02.05	Mechanics of blending. Blending at blowroom. Blending at drawframe. Relative merits and demerits of different blending methods. Optimum blending method.			
UNIT-3	<u>BLOWROOM:</u>		[05]	
	03.01	Introduction.		
	03.02	Conditioning.		
	03.03	Typical Sequence of blowroom machines.		
	03.04	Principles of Opening.		
	03.05	Bale Breaker, Krischner beater.		
	03.06	Speed and settings.		
03.07	General Considerations such as Grid bars, Calender– roller Pressure, Draft between cages, calendars and lap roller, Pneumatic conveyance, Lap spindle, Lap licking, Lap weight, Lap storage, Atmospheric conditions etc. Waste and Production.			
UNIT-4	<u>CARDING:</u>		[04]	
	04.01	Introduction and objectives of carding.		
	04.02	Intensity of carding, Card clothing, Speeds and settings,		
	04.03	General Considerations, Waste and Production.		
	04.04	Card Auto-Levellers,		
	04.05	Fibre Hooks. Formation of Fibre Hook, Tracer Fibre Technique.		
	04.06	Carding faults & their elimination.		
04.07	Process control of man – made Fibres & their blends.			
UNIT-5	<u>DRAWING:</u>		[04]	
	05.01	Introduction and objectives of drawframe.		
	05.02	Blending at drawframe.		
	05.03	Drafting Systems.		
	05.04	Roller lapping: causes and remedies.		
	05.05	General considerations.		
	05.06	Waste, Production and Unevenness.		
05.07	Theory of drafting for removal of hooks in sliver.			
UNIT-6	<u>ROVING:</u>		[03]	
	06.01	Introduction and objects.		
	06.02	Drafting systems adopted for man- made fibres and blends.		
	06.03	Roller Setting.		
	06.04	Spindle speed.		
	06.05	Roving twist and False – twist attachments.		
	06.06	General considerations.		
06.07	Production and Unevenness.			

UNIT-7	<u>RING SPINNING:</u>		[05]	
	07.01	Introduction and objects.		
	07.02	Drafting Systems. Roller settings. Modified drafting system.		
	07.03	Yarn twist.		
	07.04	Spindle speed. Spinning rings and travelers.		
	07.05	Yarn hairiness.		
	07.06	General considerations. Feed, Roller Lapping and Roller weighting. New aprons, Fibre Lubricant film.		
	07.07	Yarn quality and Common Yarn faults. Waste and Production.		
UNIT-8	<u>SPINNING OF DYED FIBRES:</u>		[02]	
	08.01	Introduction.		
	08.02	Fibre dyeing.		
	08.03	Application of antistatic finish and Segregation.		
	08.04	Spinning Processes.		
	08.05	Effect of dyeing on Fibre Properties.		
	08.06	Waste and Yarn quality.		
UNIT-9	<u>WINDING AND DOUBLING:</u>		[03]	
	09.01	Introduction.		
	09.02	Winding machine.		
	09.03	General Considerations.		
	09.04	Doubler winding.		
	09.05	Doubling.		
UNIT-10	<u>PROPERTIES OF BLENDED YARNS:</u>		[02]	
	10.01	Introduction.		
	10.02	Influence of fibre Properties and blend composition on yarn properties. Yarn tenacity. Breaking extension. Yarn evenness.		
UNIT-11	<u>PROCESSING OF STAPLE FIBRES IN WOOLLEN AND WORSTED SPINNING SYSTEM:</u>		[05]	
	11.01	Methods of Man-made Fibre Processing in Worsted Spinning.		
	11.02	Tow Conversion Technique: Cutting, abrasion and stretch- breaking. Stapling of Tow by Cutting. Stapling of Tow by Stretch – Breaking.		
	11.03	Blending wool with Man-made fibres.		
	11.04	Processing of Polyester/wool blends on Worsted system.		
	11.05	Processing of Acrylic/ wool blends on worsted system.		
	11.06	Processing of Acrylic /wool blends on woollen system.		
UNIT-12	<u>WEAVING:</u>		[03]	
	12.01	Brief study of Weaving of Synthetic : Warping, Sizing, Beaming, Looming, Weaving on Loom.		
UNIT-13	<u>WET PROCESSING:</u>		[07]	
	13.01	Brief study of wet Processing of synthetic and their blends grey inspection and Preparation of the stain, stamping, Bleaching, Mercerization, Heat setting, Dyeing, Printing and Finishing.		
Total			50	

ELECTIVE- (ANY ONE) (i) NON-WOVEN & KNITTING

Subject Code 1628605A	Theory			No of Period in one session : 48			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale: The subject deals with manufacturing techniques and properties of different types of nonwoven fabrics. These topics are essential to the students to understand the selection of a particular type of nonwoven for a specific application

UNIT	CONTENTS : Theory	Hrs/Week	Marks
	Section I		
UNIT-1	Introduction to Nonwovens Introduction, definition, Properties, Classification of Nonwovens Raw-materials fibres, binding agents.	2	2
UNIT-2	Web Formation Techniques Parallel laid webs, Cross laid webs, Random laid webs, Air laid webs.	4	5
UNIT-3	Web Bonding Techniques Thermal bonding – Hot calendaring – area bonding, point bonding and Embossing, Belt Calendaring, through air, Ultrasonic bonding. Chemical (Adhesive) bonding – Bonding Process, bonding methods - Saturation, Foam, Spray, Print and powder bonding and applications. Spun-bonding – Principles, Physical properties of spun-bonded fabrics. Spunlace nonwovens (Hydroentanglement) – Process, Properties of spun-lace fabrics, Applications. Melt-blown nonwovens – Properties and Applications.	8	12
UNIT-4	Needle Punched Nonwovens Needle Punching looms – up-punching, Down Punching, Single needle board, Multi-board. Needling Parameters, Needle Board parameters, Needle type and specifications. Production techniques – Continuous, Off-line final needling, Factors affecting production Major applications: Floor covering, Domestic Blankets, Industrial belts.	6	9
UNIT-5	Finishing of Nonwovens Dry Finishing – Shrinkage, Wrenching, Creeping, Crabbing, Calendaring and Crabbing, Splitting, Singeing Wet Finishing – Washing, Dyeing, Printing Chemical Finishes – Antistats, Antimicrobials, Water repellents, UV absorbers, Flame retardants, Absorbency and rewetters, Soil-release. Nonwoven defects.	4	7
	Section II		
UNIT-6	Introduction to Knitting Introduction: Properties of Knitted Fabrics, Comparison of woven and knitted, Terms and Definitions, Classification of Warp and Weft knitting machines, Comparison of Warp and Weft knitting. Knitting Needle Types: Needle Types - Latch needle, Bearded Needle, Compound needle, Advantages and disadvantages of different needles.	5	7

UNIT-7	Weft Knitting Structures Weft Knit Structures: Symbolic representation, Features and Properties of Plain Single Jersey, Rib-, Interlock and Purl knit structure. Designing of Weft Knit Structures: Ornamentation of Plain-knit Fabrics. Derivatives of plain knit (Single Jersey) – Knit and float, knit and tuck, knit, float and tuck.	5	9
UNIT-8	Weft Knitting Machines Weft Knitting Machines Plain Single Jersey knitting machine – Knitting Elements - Cams, Cylinder, Feed yarn carriers, Take-up mechanisms; Operation Cycle – Clearing, Feeding, Knitting Position. Circular Rib knitting machine – Operation Cycle – Rest, Clearing, Feeding, Knitting Position. Circular Interlock knitting machine – Operation Cycle. Purl knitting machine – Operation Cycle.	8	10
UNIT-9	Warp Knitting Machines Warp Knitting Machines: Classification –Tricot Machine, Raschel Machine – Main Parts, Knitting elements, Knitting cycle, Comparison of Tricot and Raschel Machines and Fabrics.	4	5
UNIT-10	Fabric Defects Fabric Defects: Warp and Weft knit Production calculation	2	4
	Total	48	70

Learning Resources:-

Text Books:

- 1 Introduction to Nonwovens Technology. By Subhash K. Batra, Nonwovens Cooperative Research Center, North Carolina State University
- 2 Needle-punching – A. T. Purdy, Textile Institute, Monograph series No. 3
- 3 Knitting Technology – Prof. D. B. Ajgaonkar
- 4 Knitting – By Anbumani

References:

- 1 Handbook of nonwovens, Woodhead Publishing
- 2 Nonwoven Bonded fabrics, J. Lunenschloss & W Albrecht, John Wiley & sons
- 3 Knitting Technology by Marks and Spencer.

ELECTIVE- (ANY ONE) (ii) SERICULTURE AND SILK TECHNOLOGY

Subject Code 1628605B	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale :

Silk is called as queen of textile world. Fabrics made of silk are much in demand because of its durability and appearance. The production of Silk yarns has increased keeping the pace with market demand.

“Sericulture and Silk Technology” is being offered as an elective for those students who are interested in enhancing their knowledge and skill in this field. The course is designed for the students to go a bit deep into the subject which may be useful for their career advancement.

Objective:

A student will be able to understand :-

- ◆ Sericulture industry, Silk worms seed production, Silk worm rearing etc.
- ◆ Silk reeling and silk throwing.
- ◆ Silk weaving and processing industry.

Contents : Theory		Hrs/week	Marks
UNIT-1	<u>SERICULTURE:</u>		[16]
	01.01	Mulberry Cultivation.	(02)
	01.02	Diseases and pests of mulberry.	(01)
	01.03	Silk worms seed production – Embryonic growth – Hibernating eggs.	(02)
	01.04	General Principles of Silk worm rearing.	(02)
	01.05	Primary requisites for successful silk worm rearing.	(02)
	01.06	Facilities for rearing, disinfection, brushing.	(02)
	01.07	Environmental conditions for silk worm rearing.	(01)
	01.08	Bed cleaning.	(01)
	01.09	Spacing, mounting and harvesting.	(02)
	01.10	Diseases and pests of silk worm.	(01)
UNIT-2	<u>COCOONS:</u>		[06]
	02.01	Physical and Commercial characteristics.	(01)
	02.02	Sorting of cocoons.	(01)
	02.03	Cocoon testing, Storage of cocoons, Stifling of cocoons, Drying of cocoons.	(02)
	02.04	Cooking of cocoons – Various methods employed.	(02)
UNIT-3	<u>REELING:</u>		[06]
	03.01	Silk Reeling.	(01)
	03.02	Methods of Silk reeling – Charkha, Cottage basins, Filatures.	(03)
	03.03	Raw Silk testing.	(01)
	03.04	Packing of raw silk, Utilisation of by – products.	(01)

UNIT-4	<u>SILK THROWING:</u>		[04]	
	04.01	Manufacture of yarns for use in ordinary, Chiffon, Crepe, Georgetts fabrics.	(02)	
	04.02	Number of plies and different twist levels used.	(01)	
	04.03	Recent developments in Silk throwing industry.	(01)	
UNIT-5	<u>WEAVING INDUSTRY:</u>		[08]	
	05.01	Preparation of warp and weft Yarn.	(01)	
	05.02	Different machinery employed in small scale and organised sections.	(04)	
	05.03	Silk Weaving – Handloom and Powerloom Weaving.	(02)	
	05.04	Special features of Silk looms.	(01)	
UNIT-6	<u>PROCESSING INDUSTRY:</u>		[06]	
	06.01	Degumming and drying of silk yarns.	(01)	
	06.02	Dyeing of silk by different dyes.	(03)	
	06.03	Printing of Silk goods.	(01)	
	06.04	Finishing of Silk fabrics.	(01)	
UNIT-7	<u>SPUN SILK INDUSTRY:</u>		[04]	
	07.01	Introduction regarding Spun Silk Industry.	(04)	
Total			50	

Reference Books:-

1. Hand Book of Practical Sericulture. - S. R. Ullal & M. N. Narasimhanna.
2. F. A. O. Publications. -

ELECTIVE- (ANY ONE) (iii) TECHNICAL TEXTILES

Subject Code 1628605C	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

Rationale: This subject covers technical textiles like geotextiles, industrial fabrics like filtration fabrics, coated fabrics and other miscellaneous functional textiles.

Objectives:

- Introduce the students to the unconventional uses of textiles in medical, sports and the fields of agriculture.
- Learn in details the various finishing requirements of these textiles to be used as technical textiles.

Contents : Theory		Hrs/week	Marks
UNIT-1	Introduction: Definition and scope of “Technical Textiles”, Classification, Products, market overview and growth projections of technical textiles. Brief idea about technical fibers, yarns and fabric structures.	[03]	
UNIT-2	Hi Tech Fibres: Speciality/High performance fibres: Ultra fine, micro fibres, nano fibers, Hollow fibers, Aramid fibers, Carbon fibers, glass fibers.	[03]	
UNIT-3	Textile - Reinforced Composite Materials: Introduction, classification of composite materials, Reinforcement materials, Matrix/Resin, Brief idea about manufacturing processes of Composites, Applications of Composites. Composite Testing.	[05]	
UNIT-4	Fabric finishing, coating and lamination: Flame retardant finishes, Water and soil repellent finishes and antimicrobial finishes. Coating techniques. Classification of Laminates and Types of laminates.	[05]	
UNIT-5	Textiles in Filtration: Introduction, Principles of wet and dry filtrations. Mechanisms of separation. Fiber and fabric selection for filtration, Characteristic properties of fibers and fabrics in filtration.	[05]	
UNIT-6	Automotive Textiles: Introduction, Applications of technical textiles in passenger Cars, other road vehicles, Aircraft and Rail, Fibers used for automotive applications – upholstery, carpeting, pre-formed parts, type safety devices, filters and engine compartment items. Brief idea about manufacturing processes and application of these devices or parts.	[07]	
UNIT-7	Geo- Textiles: Introduction, Geo synthetics and its field, functions and application areas of geo textiles and parameters influencing this functions, fibers and fabric selection criteria for geo textile applications. Functions of Geo-textiles- filtration, reinforcement, drainage, road & railway work, erosion control, etc.	[09]	
UNIT-8	Medical Textiles: Introduction, Fibers used, Classification of Medical Textiles, Non-implantable materials, Extracorporeal Devices, Implantable materials, Healthcare/ Hygiene products.	[07]	
UNIT-9	Other Fields of technical Textiles: Protective and defense textiles, Agro textiles, Textiles in Packaging, Textiles in Sports, etc.	[06]	
Total		50	

Books Recommended:

1. Handbook of Technical Textiles, Ed. A R Horrocks and S C Anand, Woodhead Publication Ltd., Cambridge, 2000.
2. Wellington Sears Handbook of Industrial Textiles, Ed. Sabit Adanaur, Technomic Publishing Company, Inc., Pennyslavania, USA, 1995.
3. Engineering with Geosynthetics, Ed. G V Rao and G V S Raju, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.
4. Geo- Textiles – NWM John.
5. Non- Woven Bonded Fabrics – J. Lunenschloss – W. Albrecht.

ELECTIVE- (ANY ONE) (iv) COMPUTER AIDED TEXTILE DESIGN

Subject Code 1628605D	Theory			No of Period in one session : 50			Credits 03
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	100	
	03	—	—	TA	:	10	
			CT	:	20		

Rationale:

Computer Aided Textile Design are much in demand because of its own quality and varieties. The computer aided textile design, therefore, has increased keeping the pace with market demand.

The 'Computer Aided Textile Design' is being offered as an elective for those students who are interested in increasing their knowledge and skill in this field. The course is designed for the students to go a bit deep in to the subject which may be useful for their career advancement.

Objective:

A student will be able to understand –

- ◆ Concept of computer graphics.
- ◆ Language and their interpreters.
- ◆ Basic concept of design.
- ◆ Realisation of the Algorithm.
- ◆ Programming.

Contents : Theory			Hrs/week	Marks
UNIT-1	<u>CONCEPT OF COMPUTER GRAPHICS:</u>		[04]	
	01.01	Idea about Data Structure, data bases and list handlings.	(02)	
	01.02	Picture structure and transformations.	(02)	
UNIT-2	<u>LANGUAGE AND THEIR INTERPRETERS:</u>		[08]	
	02.01	Idea about interaction handling, display processor, display file and picture file organisation.	(04)	
	02.02	Language concepts of interactive computer graphics.	(04)	
UNIT-3	<u>BASIC CONCEPT OF DESIGNS:</u>		[12]	
	03.01	Basic concept of computer aided Textile designs.	(02)	
	03.02	Advantages to the system.	(01)	
	03.03	Characteristics of the range of computer.	(02)	
	03.04	Description of a regular surface pattern, lattice, symmetry elements, point group, plane group.	(03)	
	03.05	Basic idea of a general algorithm, the independent motif part, choice of lattice mathematical description of symmetry operations.	(04)	

UNIT-4	<u>REALISATION OF THE ALGORITHM:</u>		[12]	
	04.01	Principles of realisation of the algorithm.	(02)	
	04.02	Properties.	(01)	
	04.03	Limitations.	(01)	
	04.04	Comparison of methods.	(02)	
	04.05	Programmes.	(06)	
UNIT-5	<u>PROGRAMMING:</u>		[14]	
	05.01	Computer programmes of simple woven textile design (plan, Twill).	(12)	
	05.02	Principles linking CAP system with production machineries.	(02)	
Total			50	

TEXTILE CHEMISTRY LAB – II

Subject Code 1628606	Practical			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	Internal	:	15	
				External	:	35	

Rationale: Diploma holder technicians in Textile Engineering is very frequently require to dye natural and manmade fibre, print the fabric for their proper use. The course is introduced to develop the skill to dye natural and manmade fibre, print the cotton fabric for better understanding of the subject.

Objective: Able to develop skill to :-

- ◆ Dye cotton with vat, Azoic and Reactive dyes.
- ◆ Dye polyester and polyamide with Disperse dye.
- ◆ Print the cotton fabric by different styles.

Contents : Practical		Hrs/week	Marks
UNIT-1	<u>DYEING:</u>	[42]	
01.01	Dyeing of five shade with vat colour on cotton. (0.5%, 0.8% 1.0%, 1.2%, 1.5%) using all three methods (IN, IW, IK).	(06)	
01.02	Dyeing of three shade with solubalised vat colour (0.5%, 1.5%, 2%).	(03)	
01.03	Dyeing of two shade of cotton with Aniline black (0.8%, 1.2%).	(03)	
01.04	Dyeing of cotton with Azoic dyes (4 samples of different shades 0.5%, 0.8%, 1.2%, 1.5%).	(06)	
01.05	Dyeing of cotton with Reactive dyes (4 Sample of different shade 0.5%, 0.8%, 1.2%, 1.5%).	(03)	
01.06	Dyeing of Polyester fibre with Disperse dyes (4 Sample of different shade 0.8%, 1%, 1.2%, 1.5%).	(06)	
01.07	Dyeing of Polyamide fibre with Disperse dyes (4 Sample of different shade 0.5%, 0.8%, 1.2%, 1.5%).	(03)	
01.08	Dyeing of Polyamide fibre with Acid dyes (4 Sample of different shade 0.8%, 1.0%, 1.2%, 1.5%).	(03)	
01.09	Dyeing of Acetate rayon with Disperse dyes (4 Sample of different shade 0.5%, 1.2%, 1.5%, 1.8%).	(03)	
01.10	To study the effect of Time, temperature, concentration of chemicals, exhaustion etc. during dyeing.	(03)	
01.11	Dyeing of blended fabrics and garments.	(03)	
UNIT-2	<u>PRINTING:</u>	[12]	
02.01	To study about different styles of printing (Direct, Resist and Discharge style).	(06)	
02.02	To study about Pigment printing.	(03)	
02.03	To study about Rotary Screen Printing.	(03)	
UNIT-3	<u>IDENTIFICATION:</u>	[06]	
03.01	To identify the different dye stuff.	(04)	
03.02	To identify the different dyed goods.	(02)	
Total		60	

TEXTILE TESTING LAB – II

Subject Code 1628607	Practical			No of Period in one session : 60			Credits 02
	No. of Periods Per Week			Full Marks			
	L	T	P/S	ESE	:	50	
	—	—	06	TA	:	15	
				CT	:	35	

Rationale :

Diploma holder technicians in Textile Engineering is very frequently require to test the sample for these properties and purposes.

The course is introduced to develop the skill to yarn testing, fabric testing and evenness testing for better understanding of the subject.

Objective :

Able to develop skill to :-

- ◆ Yarn testing for single yarn strength, ply yarn's structure, abrasion on yarn strength, work of rupture, crimp in the yarn.
- ◆ Fabric testing for bursting strength, abrasion strength, tearing strength, crease recovery, percentage shrinkage.
- ◆ Everness Testing of yarn & roving.
- ◆

Contents : Practical		Hrs/week	Marks
UNIT-1	<u>YARN TESTING:</u>		[19]
	01.01	Determination of strength of single yarn by using single thread strength tester.	
	01.02	Determination of Bundle strength of yarn using Lea Tester.	
	01.03	Determination of ply yarn's structure.	
	01.04	Determination of the influence of abrasion on yarn strength.	
	01.05	Determination of work of rupture using Ballestic tester.	
	01.06	Determination of crimp by using crimp tester.	
	01.07	Determination of tenacity work of rupture and strain & stress curke of cotton yarns inclined plane tester.	
UNIT-2	<u>FABRIC TESTING:</u>		[31]
	02.01	Determination of the bursting strength of fabric.	
	02.02	Determination of Abrasion Resistance of fabric.	
	02.03	Determination of the fabric tearing strength by single tongue, double tongue Trapezoid, Nail, snage method.	
	02.04	Determination of the crease recovery of snage method.	
	02.05	Determination of the percentage shrinking of the given bleached cloth.	
	02.06	Determination of draping Duality of fabric.	
	02.07	Determination of colour fastness to Rubbing using crock mates.	
02.08	Determination of the wettability of fabric using spray Testes.		
UNIT-3	<u>EVERNESS TESTING:</u>		[10]
	03.01	Determination of Visual examination of yarn for everness and gradings.	
	03.02	Determination of the yarn and roving everness by using fielden walker everness tester.	
Total			

TEXTILE CHEMISTRY II - TW

Subject Code 1628608	Term Work			No of Period in one session : 60			Credits
	No. of Periods Per Week			Full Marks			01
	L	T	P/S	Internal			
	—	—	03	External			

Contents : Term Work		Hrs/week	Marks
UNIT-1	<u>DYEING:</u>	[42]	
01.01	Dyeing of five shade with vat colour on cotton. (0.5%, 0.8% 1.0%, 1.2%, 1.5%) using all three methods (IN, IW, IK).	(06)	
01.02	Dyeing of three shade with solubilised vat colour (0.5%, 1.5%, 2%).	(03)	
01.03	Dyeing of two shade of cotton with Aniline black (0.8%, 1.2%).	(03)	
01.04	Dyeing of cotton with Azoic dyes (4 samples of different shades 0.5%, 0.8%, 1.2%, 1.5%).	(06)	
01.05	Dyeing of cotton with Reactive dyes (4 Sample of different shade 0.5%, 0.8%, 1.2%, 1.5%).	(03)	
01.06	Dyeing of Polyester fibre with Disperse dyes (4 Sample of different shade 0.8%, 1%, 1.2%, 1.5%).	(06)	
01.07	Dyeing of Polyamide fibre with Disperse dyes (4 Sample of different shade 0.5%, 0.8%, 1.2%, 1.5%).	(03)	
01.08	Dyeing of Polyamide fibre with Acid dyes (4 Sample of different shade 0.8%, 1.0%, 1.2%, 1.5%).	(03)	
01.09	Dyeing of Acetate rayon with Disperse dyes (4 Sample of different shade 0.5%, 1.2%, 1.5%, 1.8%).	(03)	
01.10	To study the effect of Time, temperature, concentration of chemicals, exhaustion etc. during dyeing.	(03)	
01.11	Dyeing of blended fabrics and garments.	(03)	
UNIT-2	<u>PRINTING:</u>	[12]	
02.01	To study about different styles of printing (Direct, Resist and Discharge style).	(06)	
02.02	To study about Pigment printing.	(03)	
02.03	To study about Rotary Screen Printing.	(03)	
UNIT-3	<u>IDENTIFICATION:</u>	[06]	
03.01	To identify the different dye stuff.	(04)	
03.02	To identify the different dyed goods.	(02)	
Total		60	

TEXTILE TESTING II - TW

Subject Code 1628609	Term Work			No of Period in one session : 60			Credits 01
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	07	
	—	—	03	External	:	18	

Contents : Term Work		Hrs/week	Marks	
UNIT-1	<u>YARN TESTING:</u>		[19]	
	01.01	Determination of strength of single yarn by using single thread strength tester.		
	01.02	Determination of Bundle strength of yarn using Lea Tester.		
	01.03	Determination of ply yarn's structure.		
	01.04	Determination of the influence of abrasion on yarn strength.		
	01.05	Determination of work of rupture using Ballistic tester.		
	01.06	Determination of crimp by using crimp tester.		
	01.07	Determination of tenacity work of rupture and strain & stress curve of cotton yarns inclined plane tester.		
UNIT-2	<u>FABRIC TESTING:</u>		[31]	
	02.01	Determination of the bursting strength of fabric.		
	02.02	Determination of Abrasion Resistance of fabric.		
	02.03	Determination of the fabric tearing strength by single tongue, double tongue Trapezoid, Nail, snage method.		
	02.04	Determination of the crease recovery of snage method.		
	02.05	Determination of the percentage shrinking of the given bleached cloth.		
	02.06	Determination of draping Duality of fabric.		
	02.07	Determination of colour fastness to Rubbing using crock mates.		
	02.08	Determination of the wettability of fabric using spray Testes.		
UNIT-3	<u>EVERNESS TESTING:</u>		[10]	
	03.01	Determination of Visual examination of yarn for everness and gradings.		
	03.02	Determination of the yarn and roving everness by using fielden walker everness tester.		
Total			60	

PROJECT WORK AND ITS PRESENTATION IN SEMINAR-TW

Subject Code 1628610	Term Work						Credits
	No. of Periods Per Week			Full Marks			
	L	T	P/S	Internal	:	30	
	—	—	—	External	:	70	

Rationale: The Project work and its presentation in seminar is an important subject for a diploma holder technician in Textile Engineering. The course is designed to help a student to develop confidence, skill in report writing, skill to analyse, deciding a process etc. The course will also help in developing communication skill, and skill of quality documentation.

Objective: A student will be able to:-

- Identify a Problem.
- Analyse the Problem.
- Develop logical approach to solution of a Problem.
- Design of a product.
- Manufacture the product in – Textile Mill or Workshop.
- Test the product for its Quality.
- Prepare a project report (Computer printed / typed)
- Present in the form of Seminar.

	Contents : Term Work	Hrs/week	Marks
UNIT-1	Blending Polyester with cotton at different blending ratio.	[]	
UNIT-2	Blending Polyester with viscose at different blending ratio.	[]	
UNIT-3	Blending Silk with cotton at different blending ratio.	[]	
UNIT-4	Silk Waste is processed in cotton system.	[]	
UNIT-5	Modern Textile Design.	[]	
UNIT-6	Problems related to Quality Control.	[]	
UNIT-7	Problems related to Weaving Section.	[]	
UNIT-8	Regarding Automatic looms.	[]	
UNIT-9	Regarding fabric defects.	[]	
UNIT-10	Other Similar Problems.	[]	
Total			

REPORT WRITING:-

A report must include

Contents (Term Work)		Hrs/week	Marks
UNIT-1	Introduction.	[]	
UNIT-2	Blends.	[]	
UNIT-3	Fibre Selection.	[]	
UNIT-4	Selection of Blends.	[]	
UNIT-5	Spinning Process.	[]	
UNIT-6	Experimental Work.	[]	
UNIT-7	Own Experience.	[]	
UNIT-8	Results and Discussion.	[]	
UNIT-9	Scope for further Work.	[]	
Total			

OR

The Project Report should consist of :-

Contents (Term Work)		Hrs/week	Marks
UNIT-1	Introduction.	[]	
UNIT-2	Problem statement.	[]	
UNIT-3	Background.	[]	
UNIT-4	Organisational set –up.	[]	
UNIT-5	Plant Layout.	[]	
UNIT-6	Reasons for Selecting a problem.	[]	
UNIT-7	Analysis of Problem.	[]	
UNIT-8	Best solution possible.	[]	
UNIT-9	Any other.	[]	
Total			

Project Work/Project Report should be presented in the form of a Seminar for developing confidence and communication Skill among the students.

NOTE:-

Project work will be allotted to the students just in the beginning of the session. Each student will be give a separate work under the supervision of a teacher. Total number of students may be divided among the number of teachers available. The teacher concerned will select separate problem for each student under him and allot it to him at the beginning of the session. The work allotted should be completed within scheduled time. i.e. by the end of the session. Problems selected should preferably conform to the syllabus. If it is outside of the syllabus then it must be within the field of Textile Engineering.