**Semester VII (Fourth Year]**

**Branch/Course Civil Engineering**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 100705 | Graduate Employability Skills and Competitive Courses (GATE, IES, etc.) | 3 | 0 | 0 | 0 | 101 | TH | 0 | 0 |
| 1017xx | Open Elective- I | 3 | 0 | 0 | 3 | 101 | TH | 70 | 30 |
| 101701 | Professional Practice, Law & Ethics  | 2 | 0 | 0 | 2 | 101 | TH | 70 | 30 |
| 1017xx | Program Elective - III | 3 | 0 | 0 | 3 | 101 | TH | 70 | 30 |
| 1017xx | Program Elective- II | 3 | 0 | 0 | 3 | 101 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 101 | PR | 30 | 20 |
| 100707 | Summer Entrepreneurship - III | 0 | 0 | 16 | 8 | 101 | PR | 30 | 20 |

**Semester VII (Fourth Year]**

**Branch/Course Mechanical Engineering**

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| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 100701 | Induction Program | 3 | 0 | 0 | 0 | 102 | TH | 0 | 0 |
| 102701 | Internal Combustion Engines | 3 | 0 | 0 | 3 | 102 | TH | 70 | 30 |
| 1027xx | Open Elective- II | 3 | 0 | 0 | 3 | 102 | TH | 70 | 30 |
| 1027xx | Program Elective - III | 3 | 0 | 0 | 3 | 102 | TH | 70 | 30 |
| 1027xx | Program Elective- IV | 3 | 0 | 0 | 3 | 102 | TH | 70 | 30 |
| 102701 | Internal Combustion Engines | 0 | 0 | 3 | 1.5 | 102 | PR | 30 | 20 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 102 | PR | 30 | 20 |
| 100702 | Summer Entrepreneurship-III | 0 | 0 | 16 | 8 | 102 | PR | 30 | 20 |

**Semester VII (Fourth Year]**

**Branch/Course Electrical Engineering**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 103702 | Human Values & Ethics  | 3 | 0 | 0 | 0 | 103 | TH | 0 | 0 |
| 1037xx | Open Elective- I | 3 | 0 | 0 | 3 | 103 | TH | 70 | 30 |
| 1037xx | Open Elective- II | 3 | 0 | 0 | 3 | 103 | TH | 70 | 30 |
| 103701 | Power System Protection  | 3 | 0 | 0 | 3 | 103 | TH | 70 | 30 |
| 1037xx | Program Elective- IV | 3 | 0 | 0 | 3 | 103 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 103 | PR | 30 | 20 |
| 100706 | Seminar | 0 | 0 | 2 | 1 | 103 | PR | 30 | 20 |
| 100702 | Summer Entrepreneurship-III | 0 | 0 | 16 | 8 | 103 | PR | 30 | 20 |

**Semester VII (Fourth Year]**

**Branch/Course Electronics & Communication Engineering**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 104701 | Business Analytics  | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 104702 | Cost Management of Engineering Projects  | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 100705 | Graduate Employability Skills and Competitive Courses (GATE, IES, etc.) | 3 | 0 | 0 | 0 | 104 | TH | 0 | 0 |
| 1047xx | Program Elective - III | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 1047xx | Program Elective- II | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 104703 | Wireless Communication  | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 104 | PR | 30 | 20 |
| 100702 | Summer Entrepreneurship-III | 0 | 0 | 16 | 8 | 104 | PR | 30 | 20 |

**Semester VII (Fourth Year]**

**Branch/Course COMPUTER SCIENCE & ENGINEERING**

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| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 100708 | Biology for Engineers | 2 | 1 | 0 | 3 | 105 | TH | 70 | 30 |
| 100701 | Induction Program | 3 | 0 | 0 | 0 | 105 | TH | 0 | 0 |
| 1057xx | Open Elective- I | 3 | 0 | 0 | 3 | 105 | TH | 70 | 30 |
| 1057xx | Open Elective- II | 3 | 0 | 0 | 3 | 105 | TH | 70 | 30 |
| 1057xx | Program Elective - III | 3 | 0 | 0 | 3 | 105 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 105 | PR | 30 | 20 |
| 100707 | Summer Entrepreneurship - III | 0 | 0 | 16 | 8 | 105 | PR | 30 | 20 |
| 1057xx | Professional Elective Lab-II | 0 | 0 | 2 | 1 | 105 | PR | 70 | 30 |

**Semester VII (Fourth Year]**

**Branch/Course INFORMATION TECHNOLOGY**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 100708 | Biology for Engineers | 2 | 1 | 0 | 3 | 106 | TH | 70 | 30 |
| 100701 | Induction Program | 3 | 0 | 0 | 0 | 106 | TH | 0 | 0 |
| 1067xx | Open Elective- I | 3 | 0 | 0 | 3 | 106 | TH | 70 | 30 |
| 1067xx | Open Elective- II | 3 | 0 | 0 | 3 | 106 | TH | 70 | 30 |
| 1067xx | Program Elective - III | 3 | 0 | 0 | 3 | 106 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 106 | PR | 30 | 20 |
| 100707 | Summer Entrepreneurship - III | 0 | 0 | 16 | 8 | 106 | PR | 30 | 20 |
| 1067xx | Professional Elective Lab-II | 0 | 0 | 2 | 1 | 106 | PR | 70 | 30 |

**Semester VII (Fourth Year]**

**Branch/Course LEATHER TECHNOLOGY**

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| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 107701 | Chemical Reaction Engineering | 3 | 0 | 0 | 3 | 107 | TH | 70 | 30 |
| 107703 | Leather Product Technology-II | 3 | 0 | 0 | 3 | 107 | TH | 70 | 30 |
| 1077xx | Program Elective- I | 3 | 0 | 0 | 3 | 107 | TH | 70 | 30 |
| 107702 | Theory of Leather supplements & Synthetics | 3 | 0 | 0 | 3 | 107 | TH | 70 | 30 |
| 107704 | Workshop/heads on Training/Soft Skill  | 3 | 0 | 0 | 0 | 107 | TH | 0 | 0 |
| 107703 | Leather Product Technology-II | 0 | 0 | 3 | 1.5 | 107 | PR | 30 | 20 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 107 | PR | 30 | 20 |
| 100707 | Summer Entrepreneurship - III | 0 | 0 | 16 | 8 | 107 | PR | 30 | 20 |

**Semester VII (Fourth Year]**

**Branch/Course ELECTRICAL ELECTRONICS ENGINEERING**

|  |  |  |  |  |  |  |  |  |  |
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| **Course Code** | **Course Title**  | **L** | **T** | **P** | **Credits** | **Branch** |   |   |  |
| 1107xx | Open Elective- I | 3 | 0 | 0 | 3 | 110 | TH | 70 | 30 |
| 1107xx | Open Elective- II | 3 | 0 | 0 | 3 | 110 | TH | 70 | 30 |
| 1107xx | Program Elective - III | 3 | 0 | 0 | 3 | 110 | TH | 70 | 30 |
| 1107xx | Program Elective- IV | 3 | 0 | 0 | 3 | 110 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 110 | PR | 30 | 20 |
| 100706 | Seminar | 0 | 0 | 2 | 1 | 110 | PR | 30 | 20 |
| 100702 | Summer Entrepreneurship-III | 0 | 0 | 16 | 8 | 110 | PR | 30 | 20 |

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| --- | --- | --- | --- |
| **101701** | **Professional Practice, Law & Ethics** | **2L:0T:0P**  | **2 credits**  |

Basic elements of civil engineering professional practice are introduced in this course. Roles of all participants in the process-owners, developers, designers, consultants, architects, contractors, and suppliers - are described. Basic concepts in professional practice, business management, public policy, leadership, and professional licensure are introduced. The course covers professional relations, civic responsibilities, and ethical obligations for engineering practice. The course also describes contracts management, and various legal aspects related to engineering. Further, the course familiarizes students with elementary knowledge of laws that would be of utility in their profession, including several new areas of law such as IPR, ADR.

The course is designed to address the following:

* To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
* To develop some ideas of the legal and practical aspects of their profession

**Proposed Syllabus**

Professional practice covering the respective roles of the various stakeholders in the profession of civil engineering and the factors governing the same; Professional ethics relating to civil engineering; Various aspects of contracts relating to construction and management of contracts; types of contractual and other disputes in the profession and methods of dispute resolution; legal aspects relating to employment and service conditions of labour; intellectual property rights and their legal framework

**Modules:**

**Module 1 A**- Professional Practice – Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)

**Module 1 B**- Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

**Module 2**:*General Principles of Contracts Management: Indian Contract Act, 1972 and amendments* covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /“Red Flag” conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public- Private Partnerships; International Commercial Terms;

**Module 3 *:****Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:* Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats

**Module 4 :** *Engagement of Labour and Labour & other construction-related Laws:* Role of

Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment ( Standing Orders) Act, 1946; Workmen’s Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

**Module 5 :** *Law relating to Intellectual property:* Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies;

**ORGANISATION OF COURSE (2-0-0)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.** **No**  | **Module**  | **No of Lectures**  | **Details**  |
| 1A  | Professional Practice  | 2  |   |
| 1B  | Professional Ethics  | 2  |   |
| 2  | Contracts Management  | 18  |   |
| 3  | Dispute Resolution Mechanisms  | 5  |   |
| 4  | Labour; Labour & other Laws  | 2  |   |
| 5  | Intellectual Property Management  | 1  |   |
|  | **TOTAL**  | **30**  |  |

**Text/Reference Books:**

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. The National Building Code, BIS, 2017
3. RERA Act, 2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R. (1979), Law of Contract, Oxford University Press
9. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
10. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
11. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
12. Bare text (2005), Right to Information Act
13. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
14. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
15. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
16. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss2,pp 117-127, MCB UP Ltd
17. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
18. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill
19. Engineering Ethics, National Institute for Engineering Ethics, USA
20. www.ieindia.org
21. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
22. CONSTRUCTION CONTRACTS, http://www.jnormanstark.com/contract.htm
23. Internet and Business Handbook, Chap 4, CONTRACTS LAW, http://www.laderapress.com/laderapress/contractslaw1.html
24. Contract&Agreements http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
25. Contracts, http://206.127.69.152/jgretch/crj/211/ch7.ppt
26. Business & Personal Law. Chapter 7. “How Contracts Arise”, http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
27. Types of Contracts, http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt
28. IV. TYPES OF CONTRACTS AND IMPORTANT PROVISIONS, <http://www.worldbank.org/html/opr/consult/guidetxt/types.html> Contract Types/Pricing Arrangements Guideline- 1.4.G (11/04/02), <http://www.sandia.gov/policy/14g.pdf>

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| **102701** | **Internal Combustion Engines** | **3L:T:3P** | **4.5 Credits** |

###### Objectives:

1. To familiarize with the terminology associated with IC engines.
2. To understand the basics of IC engines.
3. To understand combustion, and various parameters and variables affecting it in various types of IC engines.
4. To learn about various systems used in IC engines and the type of IC engine required for various applications

**Course Contents:**

**Module:1**

Basics of IC Engines, Engine components and classification: Two strokes, four stroke (SI and CI) engines, engines parts, engines working principle and valve timing diagram. Ideal cycles and Fuel-air cycles. **(Lectures 6)**

**Module: 2**

Engine performance-test: purpose and types, measurement of power, Engine system & performance parameters evaluation. **(Lectures 4)**

**Module: 3**

**Combustion in SI and CI engines:** Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for SI engines, Stages of combustion in CI engines, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine. **(Lectures 7)**

**Module: 4**

Fuel supply systems in SI and CI engines, carburetors, Port fuel injection, Direct injection and Common rail injection. **(Lectures 6)**

**Module: 5**

**Ignition system:** Battery and magneto ignition system, spark plug, firing order, quality, quantity & hit and miss governing.

**Lubrication system and Cooling system:** Lubrication of engine components, Lubrication system – wet sump and dry sump, crankcase ventilation, Types of cooling systems – liquid and air cooled, comparison of liquid and air cooled systems. **(Lectures 7)**

**Module: 6**

**Measurement and Testing of IC engines:** Measurement of indicated power, brake power, fuel consumption and emission, Measurement of friction power by Willan’s Line Method and Morse Test, calculation of brake thermal efficiency, brake power and brake specific fuel consumption of IC Engines, variable compression ratio engines, heat balance sheet of IC Engines.

**Engine Emission and their control:** Air pollution due to IC engines, constituent and types of emission HC, CO and NOx emission, catalytic convertor**.** Advanced IC Engine concepts.  **(Lectures 8)**

**Module: 7**

Super charging, engine lubrication and cooling. **(Lectures 4)**

**Text Books:**

1. Obert E. F, “Internal Combustion Engines and Air Pollution”, Harper and Row Publication Inc. NY, 1973.
2. Heisler H, “Advanced Engine Technology”, Edward Arnold, 1995.
3. Heywood J. B, “Internal Combustion Engine Fundamentals”, McGraw Hill Book Co. NY, 1989
4. Heldt P. M, “High Speed Combustion Engines”, Oxford & IBH publishing Co. India, 1985.
5. Stockel M W, Stockel T S and Johanson C, “Auto Fundamentals”, The Goodheart, Wilcox Co.
6. Inc., Illinois, 1996.

**Course Outcomes:**

Students who have done this course will have a good idea of the basics of IC engines and how different parameters influence the operational characteristics of IC Engines

**Laboratory:**

1. To study the cross-sectional view of I.C. engine.
2. Determination of the calorific value of a given fuel and its flash & fire points.
3. To study the actual valve timing diagram of 4-stroke engine.
4. To prepare the heat balance sheet by conducting performance test on a single cylinder 4-stroke diesel engine.
5. To prepare the heat balance sheet by conducting performance test on a single cylinder 4-stroke petrol engine.
6. Performance evaluation of multi cylinder Diesel Engine.
7. Conduct the Morse test on a multi cylinder petrol engine and find out the friction power.

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| **103702** | **Human Values & Ethics [2]** | **3L:0T:0P** | **0 credits** |

**Course Outcome:**

At the end of this course, students will demonstrate the ability to

* Identify the core values that shape the ethical behavior of an engineer.
* To create awareness on professional ethics and Human Values.
* To appreciate the rights of others.

**Module 1 : HUMAN VALUES**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Co-operation – Commitment – Empathy – Self-confidence – Character – Spirituality – The role of engineers in modern society – Social expectations.

**Module II : ENGINEERING ETHICS**

Sense of ‘Engineering Ethics’ – Variety of moral issued – types of inquiry – moral dilemmas – moral autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of Professional Roles & Professionalism – theories about right action – Self-interest – customs and religion – uses of ethical theories.

**Module III : ENGINEERING AS SOCIAL EXPERIMENTATION**

Engineering as experimentation – engineers as responsible experimenters – Research ethics – Codes of ethics – Industrial Standard – Balanced outlook on law – the challenger case study.

**Module IV : SAFETY, RESPONSIBILITIES AND RIGHTS**

Safety and risk – assessment of safety and risk – Riysis – Risk benefit analysis and reducing risk – Govt. Regulator’s approach to risks – the three mile island and Chernobyl case studies & Bhopal – Threat of Nuclear Power, depletion of ozone, greenery effects – Collegiality and loyalty – respect for authority – collective bargaining – Confidentiality – conflicts of interest – occupation crime – professional rights – employees’ rights – Intellectual Property Rights (IPR) – discrimination.

**Module V : GLOBAL ISSUES**

Multinational corporations – Business ethics – Environmental ethics – computer ethics – Role in Technological Development – Weapons development – engineers as managers – consulting engineers – engineers as expert, witnesses and advisors – Honesty – Leadership – sample code of conduct ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers (IETE), India, etc.,

**Text / References:**

1. Mika Martin and Roland Scinger, ‘Ethics in Engineeering’, Pearson Education/Prentice Hall, New York 1996.
2. Govindarajan M., Natarajan S., Senthil Kumar V. S., ‘Engineering Ethics’ Prentice Hall of India, New Delhi, 2004.
3. Charles D. Fleddermann, ‘Ethics in Engineering’, Pearson Education/Prentice Hall, New Jersey, 2004 (Indian Reprint).
4. Charles E. Harris, Michael S. Protchard and Michael J. Rabins, ‘Engineering Ethics – Concept and Cases’, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available).
5. ‘Concepts and Cases’, Thompson Learning (2000).
6. John R. Boatright, ‘Ethics and Conduct of Business’, Pearson Education, New Delhi, 2003.
7. Edmund G. Seebauer and Robert L. Barry, ‘Fundamentals of Ethics for Scientists and Engineers’, Oxford University of Press, Oxford, 2001.

**107401 Business Analytics 3L: 0T: 0P 3 Credits**

**Contents**

1 Unit 1: (8 Lectures) Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business An- alytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview. 8

2 Unit 2: (8 Lectures) Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology. 8

3 Unit 3: (8 Lectures) Organization Structures of Business analytics: Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive Modelling Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization. 8

4 Unit 4: (10 Lectures) Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Fore- casting Time Series with Seasonality, Regression Forecasting with Casual Vari- ables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New- Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model. 10

5 Unit 5: (8 Lectures) Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent trends: In Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism. 8

**Sl. No. Name of Authors / Books /Publishers**

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education

**107704 Wireless Communication 3L: 0T: 0P 3 Credits**

**Contents**

1 Introduction to Wireless Communication Systems: Evolution of mobile radio communications; examples of wireless comm. systems; paging systems; Cordless telephone systems; overview of generations of cellular systems, comparison of various wireless systems. 4

2 Introduction to Personal Communication Services (PCS): PCS architecture, Mobility management, Networks signalling. The Cellular Concept and Multiple Access Techniques: A basic cellular system, Frequency Reuse basic theory of hexagonal cell layout, spectrum efficiency, FDM/TDM, Cellular System, channel allocation schemes, Handover Analysis, cellular CDMA, Soft capacity, Erlang capacity comparison, multiple access techniques: FDMA, TDMA, CDMA. 9

3 2G Networks: Second generation, digital, wireless systems: GSM, I S136 (D-AMPS), IS-95 CDMA. Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signalling, mobile management, voice signal processing and coding. Spread Spectrum Systems- Cellular code Division Access Systems-Principle, Power Control, effects of multipath propagation on code division multiple access. 11

4 2.5G Mobile Data Networks: Introduction to Mobile Data Networks, General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes, EDGE, Wireless LANs, (IEEE 802.11), Mobile IP. Third Generation (3G) Mo- bile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G, Introduction to 4G. 11

5 Introduction to Wireless Channels and Diversity: Fast Fading Wireless Channel Modelling, Rayleigh/Ricean Fading Channels, BER Performance in Fading Channels, Introduction to Diversity modelling for Wireless Communications. 5

**Sl. No. Name of Authors / Books /Publishers**

1. Theodore S. Rappaport, “Wireless Communications: Principles and Practice” 2nd Edition (2008), 2008
2. Andrew J Viterbi, “CDMA Principles of spread spectrum communications”,Addition Wesley, 1995
3. J S Lee and L E Miller, “CDMA systems engineering handbook”, Artech House,1998
4. Marvin K Simon, Jim K Omura, Robert A Scholtz, Bary Klevit, “Spread Spectrum Communications”, 1995
5. Sergio Verdu, “Multiuser Detection”, Cambridge University Press, 1998
6. Andrew S Tanenbaum, “Computer Network”, Pearson/ PHI, 4th edition, 2009

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| **107701** | **Chemical Reaction Engineering** | **3L: 0T:0P** | **3.0 Credits** |

**Module 1 (10hours)**

Rate of Reaction, Elementary and non-elementary homogeneous reactions, Molecularity and order of reaction, Mechanism of reaction, temperature dependency from thermodynamics, collision and activated complex theories. Integral and differential methods for analyzing kinetic data, interpretation of constant volume reactor, zero, first, second and third order reactions, half life period, irreversible reaction in parallel and series, catalytic reaction, auto catalytic reaction, reversible reactions.

**Module 2 (8hours)**

Interpretation of variable volume batch reactions for zero, first and second order reactions,

Space-time and state-velocity, design equation for ideal batch, steady-state continuous stirred

tank, steady-state plug flow reactors for isothermal reaction.

**Module 3 (10hours)**

Design for single reactions, Size comparison of single reactors, Multiple reactor systems, plug flow/mixed flow reactors in series and parallel, reactors of different types in series, optimum reactor size, recycle reactor, autocatalytic reactions.

**Module 4 (10hours)**

Introduction to multiple reactions, qualitative discussion about product distribution, quantitative treatment of product distribution and of reactor size, selectivity, the side entry reactor, irreversible first-order reactions in series, Quantitative treatment: plug flow or batch reactor, Quantitative treatment: mixed flow reactor, Successive irreversible reactions of different orders, reversible reactions, irreversible series-parallel reactions.

**Module 5 (8hours)**

Residence time distribution of fluids in vessels, State of aggregation of the flowing systems,Earliness of mixing, Role of RTD, Conversion in Non-ideal flow reactors.

**Text /References**

Levenspiel, O., “Chemical Reaction Engineering”, 3rd edition, John Wiley (1998).

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| **107703** | **Leather Product Technology-II** | **3L: 0T:3P** | **4.5 Credits** |

**Module 1. Clicking 05**

Characteristics and variations in leather, Material selection, Clicking of upper linings, Socks and fabrics.

**Module 2. Preparation (Pre – Closing)**

* 1. Identification making, stitch making, Punching, Perforating and embossing.
	2. Skiving – Objectives, different types skiving.
	3. Reinforcements.
	4. Topline and edge treatments.

**06**

**Module 3. Closing operations**

* 1. Stitching – Types of stitching m/c, Types of stitch, Different types of seam.
	2. Eyeleting , lasting, etc

**05**

**Module 4. Construction**

Assembly, Definition of construction, Types of Construction, Flowchart of different construction, Details of cemented construction – Methods,

Details of moulded construction – DVP construction, Direct PVC moulded construction, Direct PU moulded construction, Veldtschoen construction, Machine welted construction. Slip – lasted construction, string lasted shoes.

**16**

**Module 5. Treeing Department (Shoe-room operations)**

Shoe-room operations for grain, leather and suede leather uppers.

**03**

**Module 6. Quality control in footwear industry, Marketing of footwear, Hand tools and fittings for footwear industry.05**

**Suggested Books:**

1. Manual of Shoe – making – Clark.
2. Text book of Footwear Manufacture – J. H. Thronton.
3. Principle of Footwear Manufacture – Dr. Somnath Ganguly.

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| **107702** | **Theory of Leather supplements & Synthetics** | **3L: 0T:0P** | **3.0 Credits** |

**Module 1** Chemistry of the most common Polymeric materials used in leather industry as supplements.

**04**

**Module 2** Concept of a macromolecule, natural & synthetics polymer, modes of polymerization, radical, condensation, stereo regular polymerization, polymerization kinetics, mechanism, anionic and cationic polymerization.

**10**

**Module 3** Manufacture of industrially important polymer for plastics, fibres and elastomer, polyethylene, polypropylene, polyvinyl, chloride, polyvinyl, alcohol, polyacrylonitrile, polyurethane, fluoro – carbon polymer, epoxy resins, polyamides, polyesters, alkyd resin, silicon polymers, cellulosics, polyacrylates, polyurethanes and their common applications.

**12**

**Module 4** Testing of Polymers, Mechanical and thermal testing.

**04**

**Module 5** Polymer and Rubber industries in India.

**04**

**Module 6** Manufacture of Rubber and Synthetic rubber, Natural rubber processing and vulcanizing synthetic elastomers, butadiene copolymer, Polyisoprene, Polybutadiene, Thermosetting, Thermoplastic.

**10**

**Text/References:**

1. Introduction to the Principles of Leather Manufacture. By – S. S. Dutta, 4th Edition, ILTA, Kolkata
2. Theory & Practice of Leather Manufacture. By – K. T. Sarkar, Macmillan India Press, Chennai.

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| **100708** | **Biology for Engineers** | **2L:1T:0P** | **3 Credits** |

**Module 1: Introduction Lecture: 2 hrs.**

**Purpose**: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

**Module 2: Classification Lecture: 3 hrs.**

**Purpose:** To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (f) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus.

**Module 3: Genetics Lecture: 4 hrs.**

**Purpose:** To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences”

Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

**Module 4: Biomolecules Lecture: 4 hrs.**

**Purpose:** To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine.

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

**Module 5: Enzymes Lecture: 4 hrs.**

**Purpose:** To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

**Module 6: Information Transfer Lecture: 4 hrs.**

**Purpose:** The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

**Module 7: Macromolecular analysis Lecture: 5 hrs.**

**Purpose:** How to analyse biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

**Module 8: Metabolism Lecture: 4 hrs.**

**Purpose:** The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keqand its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge.

**Module 9: Microbiology Lecture: 3 hrs.**

**Purpose:** Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

**Suggested Reference Books:**

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

**Course Outcomes**

After studying the course, the student will be able to:

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per seis not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
4. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
5. Classify enzymes and distinguish between different mechanisms of enzyme action.
6. Identify DNA as a genetic material in the molecular basis of information transfer.
7. Analyse biological processes at the reductionistic level
8. Apply thermodynamic principles to biological systems.
9. Identify and classify microorganisms.

**100701 Induction Program**

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| **Induction program (mandatory)** | **3 weeks duration** |
| Induction program for students to be offered right at the start of the first year. | * Physical activity
* Creative Arts
* Universal Human Values
 |
|  | * Literary
 |
|  | * Proficiency Modules
 |
|  | * Lectures by Eminent People
 |
|  | * Visits to local Areas
 |
|  | * Familiarization to Dept./Branch &Innovations
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