

BIJUPATNAIKUNIVERSITY OF TECHNOLOGY, ODISHA
ROURKELA



Curriculum and Syllabus

B. Tech (*CivilEngineering*)from the Admission Batch
2018-19

Semester (7th)

Seventh Semester							
Theory							
Sl No	Category	Course Code	Course Title	L-T-P	Credit	University Marks	Internal Evaluation
1	HS	RED7E001	Entrepreneurship Development	3-0-0	3	100	50
2	PE	RCI7D001	Prestressed Concrete	3-0-0	3	100	50
		RCI7D002	Design of Concrete Structures-II				
		RCI7D003	Estimating, Costing and Professional Practice				
3	PE	RCI7D004	Integrated Watershed Management	3-0-0	3	100	50
		RCI7D005	Ground Water Hydrology				
		RCI7D006	Water Resource Engineering				
4	OE	RMM7E003	Marketing Management	3-0-0	3	100	50
		RGT6A003	Green Technology				
		RIS7B001	Industrial Safety Engineering				
5	OE	REV5D004	Disaster Management	3-0-0	3	100	50
		RIP7E002	Intellectual Property Right				
		RAE6G001	Finite Element Method				
6	OE	RIT7D001	Internet of Things	3-0-0	3	100	50
		RCS7D007	Soft Computing				
		RIT7D006	E-Commerce & ERP				
7	MC*	RIK7F001	Essence of Indian Knowledge Tradition - II	3-0-0	0		100 (Pass Mark is 37)
Total Credit (Theory)					18		
Total Marks						600	300
Practical							
1	PSI	RMP7H201	Minor Project	0-0-6	3		200
2	PSI	RSM7H202	Seminar - II	0-0-3	1		100
3	PSI	RCV7H203	Comprehensive Viva	0-0-3	1		100
Total Credit (Practical)					5		
Total Semester Credit					23		
Total Marks							400

***Mandatory Non-Credit Courses (MC) result will be reflected with Pass (P) / Fail (F) grade. Thus the grade obtained will not be affecting the grade point average. However it shall appear on the grade sheet as per AICTE rule.**

7th Semester	RED7E001	Entrepreneurship Development	L-T-P 3-0-0	3 Credits
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Module I: (10 hours)

Entrepreneurship: Concept of entrepreneurship and intrapreneurship, Types of Entrepreneurs, Nature and Importance, Entrepreneurial Traits and Skills, Entrepreneurial Motivation and Achievement, Entrepreneurial Personality

Module II: (08 hours)

Entrepreneurial Environment, Identification of Opportunities, Converting Business Opportunities into reality. Start-ups and business incubation, setting up a Small Enterprise. Issues relating to location, Environmental Problems and Environmental pollution Act, Industrial Policies and Regulations

Module III: (10 hours)

Need to know about Accounting, Working capital Management, Marketing Management, Human Resources Management, and Labour Laws. Organizational support services - Central and State Government, Incentives and Subsidies.

Module IV: (12 hours)

Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Governments in reviving industries.

Books:

- [1] Entrepreneurship Development and Management, Vasant Desai, HPH
- [2] Entrepreneurship Management, Bholanath Dutta, Excel Books
- [3] Entrepreneurial Development, Sangeeta Sharma, PHI
- [4] Entrepreneurship, Rajeev Roy, Oxford University Press

Digital Learning Resources:

Course Name: Entrepreneurship
 Course Link: <https://nptel.ac.in/courses/110/106/110106141/>
 Course Instructor: Prof. C Bhaktavatsala Rao, IIT Roorkee

Course Name: Entrepreneurship Essentials
 Course Link: <https://nptel.ac.in/courses/127/105/127105007/>
 Course Instructor: Prof. Manoj Kumar Mondal, IIT Kharagpur

7th Semester	RCI7D001	Prestressed Concrete	L-T-P 3-0-0	3 Credits
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Module I: (10 hours)

Prestressing system, materials and codes: Basic concept, Losses of prestress, analysis of prestress and bending stresses. Need for high strength steel and concrete. Advantages and applications. Pre-tensioning and post tensioning systems.

Module II: (08 hours)

Design of beams : Analysis and design of section for bending and shear, pressure line, concept of load balancing, cracking moment, bending of cables, limit state analysis and design, anchorage zone stresses, design of end block, Application to bridges.

Module III: (08 hours)

Selection of prestress concrete members, short term and long term deflections of uncracked members.

Module IV: (08 hours)

Flexural strength of prestressed concrete sections, Continuous beams, Design concept concordancy of cables, Secondary design consideration

Module V: (06 hours)

Design pre-tensioned and post tensioned beam.

Books:

- [1] Prestressed Concrete, N Krishna Raju, Tata McGraw-Hill
- [2] Design of Prestressed Concrete Structures, T Y Lin, Ned H Burns, John Wiley & Sons
- [3] Prestressed Concrete Structures, P. Dayaratnam, P. Sarah, Medtech Publisher

Digital Learning Resources:

Course Name: Prestressed Concrete Structure
 Course Link: <https://nptel.ac.in/courses/105/106/105106118/>
 Course Instructor: Dr.Amlan K. Sengupta, Prof.Devdas Menon, IIT Madras

7th Semester	RCI7D002	Design of Concrete Structures-II	L-T-P 3-0-0	3 Credits
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Module I:**(06 Hours)**

Design of Foundations:

Combined Footing: Rectangular, Trapezoidal, raft, strap, pile foundation: single/group pile.

Module II:**(06 Hours)**

Design of Water tanks: Design requirements, Design of elevated and Intze type water tanks.

Calculation of dimensions; Design of top dome; Design of top ring beam ; Design of cylindrical wall ; Design of bottom ring beam, Design of portal frames and domes by LSM and using latest IS codes.

Module III:**(10 Hours)**

Earthquake Engineering: Introduction to EQ Engineering: Cyclic behaviour of concrete and reinforcement, significance of ductility, ductility of beam, design and detailing for ductility, simple problems based on above concept, Computation of earthquake forces on building frame using Seismic Coefficient Method as per IS 1893-2016.

Module IV:**(08 Hours)**

Prestressing systems: materials, basic concepts and design of prestressing, losses of prestress, analysis of prestressed beams and slab (pretension and post tension), advantages and application.

Module-V:**(10 Hours)**

Bridge Engineering: Introduction: classification and components of a standard bridge, economical span, location of piers and abutments, vertical clearance above HFL, scour depth and choice of bridge type.

Standard Loadings for Road Bridges, Impact effect and impact factor calculation for RCC and steel bridges, Design of single vent rectangular slab culvert.

Books:

- [1] Advanced Concrete Structure Design by P. C. Verghese, Prentice Hall of India
- [2] Limit state design- A K Jain, Nem Chand and Brothers
- [3] Reinforced Concrete Vol. II [Advanced reinforced concrete] By Dr. H. J. Shah Edition
- [4] P. Dayaratham, Design of Reinforced Concrete Structures, New Delhi, Oxford and IBH Publishing Co
- [5] Limit state design of reinforced concrete by B.C. Punmia, AK Jain and A.K. Jain, Laxmi Publishers New Delhi 2007
- [6] J. Krishna and O. P. Jain, Plain and Reinforced Concrete Vol-I & II, Nem Chand and Bros., Roorkee.

7 th Semester	RCI7D003	Estimating, Costing and Professional Practice	L-T-P 3-0-0	3 Credits
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Module-I:**(08 hours)**

Quality estimation:

Principles of estimation, methods and units, Estimation of materials in buildings, Culverts and bridges.

Module-II:**(08 hours)****Specifications**-Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.**Rate analysis**-Purpose, importance and necessity, factors affecting Analysis of rates, Prime cost, Schedule rates, Analysis of rates for various types of works.**Tender**- Types of Tender, Preparation of tender documents, inviting tenders, general and special conditions, contract types. termination of contracts, penalty and liquidated charges, Settlement of disputes, Arbitration, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, Introduction to e-tendering.**Module-III:****(08 hours)**

Objective and functions of management in construction.

Project Management: Project Planning, Scheduling and Controlling, Bar charts: Development of Bar charts and its shortcomings. Network techniques: Event, activity, Dummy activity. Network rules, Numbering of events, Critical Path Method, Critical activities, Slack, Project Evaluation and Review Techniques (PERT): Time estimates, Different types of Float of activity, Probability of meeting schedule date for the project.**Module-IV:****(08 hours)****Cost Model:** Project cost, indirect and direct cost, slope of direct cost curve, optimum project duration, contracting the network for cost optimization. Introduction to updating, resources smoothing and resources leveling**Module-V:****(08 hours)****Quality Control:** Quality Control by Statistical Methods, Sampling Plan, Control Charts, X Chart, R Chart, C chart and P Chart. Introduction to construction safety.**Books:**

- [1] Estimating and Costing in Civil Engineering Theory & Practice, B.N. Dutta, UBS Publishers
- [2] PERT and CPM, L.S. Sreenath, East West Press
- [3] Civil engineering contracts and estimates by B.S. Patil, University Press
- [4] Construction Management and Planning, B Sengupta & H Guha, Tata McGraw Hill
- [5] PERT & CPM, L. S. Sreenath. East - West Press
- [6] Relevant IS Code: National Building Code-2016

Digital Learning Resources:

Course Name: Construction Economics and Finance
 Course Link: <https://nptel.ac.in/courses/105/103/105103023/>
 Course Instructor: Dr. Bulu Pradhan, IIT Guwahati.

7th Semester	RCI7D004	Integrated Watershed Management	L-T-P 3-0-0	3 Credits
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Module I: (12 Hours)

Introduction, watershed behaviour, effects of land use and its change on hydrological cycle components, Land capability and suitability classification.

Measurement of meteorological (temperature, wind speed, sunshine hours, atmospheric pressure, relative humidity) and hydrological (suspended sediment and bed load) parameters
Modelling Runoff with SCS methodology, modifications suggested for Indian conditions, case study

Module II: (14 Hours)

Erosion process–Factors affecting erosion, Types of erosion Assessment of erosion, Modelling Erosion using USLE, RUSLE, introduction to few other models, Indian studies, case study

Control measures for soil erosion – vegetative and mechanical (including design), for agricultural and non-agricultural lands Wind erosion and its modelling, control measures.

Module III: (06 Hours)

Crop water management and crop planning with special reference to different agro-ecological zones in India Water conservation practices for deserts

Module IV: (04 Hours)

Watershed development in India, Common Guidelines, Allocation of funds Wetland management- types, hydrologic conditions and water budget, hydrological and ecological functions, the Ramsar convention

Module V: (04 Hours)

Drought and its management-causes and impacts, definition, management objectives and strategy-short term and long term measures.

Books:

- [1] Sharda V.N., Sikka A.K. and Juyal G.P. (2006) Participatory Integrated Watershed Management: A Field Manual, Central Soil and Water Conservation Research and Training Institute, 218, Kaulagarh Road, Dehradun.
- [2] Tideman E.M. (1999) Watershed Management–Guidelines for Indian Conditions, Omega Scientific Publishers, New Delhi.
- [3] . Common Guidelines for Watershed Development Projects (2008) Government of India.
- [4] Dhruva N.V.V. (2002) Soil and Water Conservation Research in India, Indian Council of Agricultural Research, KrishiAnusandhanBhavan, Pusa, New Delhi- 110012.
- [5] Dhruva N.V.V., Sastry G. and Patnaik U.S. (1990) Watershed Management, Indian Council of Agricultural Research, New Delhi.
- [6] Frevert R.K., Schwab G.O., Edminster T.W. and Barnes K.K. (2009) Soil and Water Conservation Engineering, 4th Ed, John Wiley and Sons, New York.
- [7] Jain S.K. and Singh V.P. (2006) Water Resources Systems Planning and Management, Reed Elsevier India Pvt. Ltd., New Delhi. 6. James L.D. and Lee R.R. (1971) Economics of Water Resources Planning, McGraw Hill Book Company.

Digital Learning Resources:

Course Name: Watershed Management
Course Link: <https://nptel.ac.in/courses/105/101/105101010/>
Course Instructor: Dr. T.I. Eldho, IIT Bombay.

7 th Semester	RCI7D005	Ground Water Hydrology	L-T-P 3-0-0	3 Credits
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Module-I:**(12 Hours)**

Hydrologic cycle, Water balance, Occurrence of ground water: Origin, geological formations as aquifers, type of aquifers, groundwater basins, springs. Darcy's Law, validity of Darcy's Law permeability, laboratory and field measurement of permeability, groundwater Flow lines. Steady flow to a well, steady radial flow to a well in confined aquifer and unconfined aquifer, Unsteady radial flow into a confined aquifer, Non equilibrium Theis equation, Theis method of solution, multiple well system.

Module-II:**(10 Hours)**

Methods of constructions of deep and shallow wells: The percussion (or cable tool) method of drilling,

Direct circulation hydraulic rotary method, Down the hole hammer method, well logs-receptivity logging, testing of wells for yield, Effect of irrigation, stream flow, rainfall on groundwater fluctuations, seasonal and secular variations, fluctuation due to miscellaneous causes.

Surface and Subsurface investigations of groundwater: Geophysical exploration, Electrical resistivity method, aerial photo interpretation, remote sensing applications to ground water exploration, test drilling,

Artificial recharge by water spreading, through pits and shaft, recharge through other methods;

Module-III:**(10 Hours)**

Ground water pollution: Municipal sources, liquid wastes from domestic uses, solid wastes, Industrial sources, tank and pipeline leakage, Mining activity, agricultural sources, septic tank and cesspools, saline water intrusion in coastal aquifers, methods to control saline water intrusion.

Module-IV:**(08 Hours)**

Groundwater management: Concepts of Basin management, Equation of hydrologic equilibrium, groundwater basin investigations, conjunctive use of surface and groundwater.

Books:

- [1] Groundwater Hydrology, D. K. Todd, John Wiley and Sons.
- [2] Ground Water, H. M. Raghunath, New Age International Publishers.
- [3] Groundwater and Tube Wells, S. P. Garg, Oxford and IBH Publishing Co., New Delhi.

Digital Learning Resources:

Course Name: Ground water hydrology
 Course Link: <https://nptel.ac.in/courses/105/103/105103026/>
 Course Instructor: Dr.Rajib Kumar Bhattacharya, IIT Guwahati

7th Semester	RCI7D006	Water Resource Engineering	L-T-P 3-0-0	3 Credits
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Module-I: (06 hours)

Introduction - Hydrologic cycle and significance of its components; Clouds, Precipitation, interception, evaporation, evapo-transpiration, depression storage, infiltration, Interflow and surface runoff.

Precipitation - Measurement of precipitation, rain gauge network, adequacy of Rain gauge station, Test for consistency of record, Estimation of missing data, Mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship

Module-II: (08 hours)

Runoff: Runoff characteristics of streams, Catchment characteristics, Rainfall-Runoff Correlation, runoff volume: empirical equations, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve,

Reservoir Planning: capacity of reservoirs, Calculation of storage Volume of reservoir from mass curve, Maintainable demand, Variable demand, Sequent Peak Procedure

Module-III: (08 hours)

Hydrograph: factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph: derivation, limitations, different duration, Synthetic unit hydrograph, IUH.

Flood:flood estimation, Rational Method, Empirical formula, frequency analysis, Flood Routing, Reservoir routing and Channel routing,

Module-IV: (08 hours)

Drought: Definition and Classification, Methods of Water Harvesting, Environmental flow, Environmental flow assessment

Open Channel Flow: Classification of flows, Velocity Distribution, Equation of continuity, energy equation, momentum equation, energy-depth relations, Specific Energy, Critical depth and its computation, critical, subcritical, supercritical flow,

Module- V: (10 hours)

Open Channel flow: Uniform flow, Chezy'sKutter's equation, Manning's Formula, Most economical Section, Non-uniform flow, Gradualvaried flow, classifications of flow profiles, Controlled sections; Rapidly Varied flow, Hydraulic jumps

Books:

- [1] Engineering Hydrology, K Subramanya, McGraw Hill.
- [2] Applied Hydrology, K N Muthreja, Tata McGraw Hill.
- [3] Flow in Open Channels, K Subramanya, McGraw Hill
- [4] Open Channel Hydraulics, VenTeChowMcGraw Hill Book Company
- [5] Water Resources Engineering, L W Mays, Wiley.
- [6] Engineering Hydrology, C S P Ojha, R Berndtsson and P Bhunya,, Oxford.
- [7] Hydrology and Water Resources Engineering by K. C. Patra, Narosa Publishing House, New Delhi

Digital Learning Resources:

Course Name: Water Resource Engineering
Course Link: <https://nptel.ac.in/courses/105/104/105104103/>
Course Instructor: Dr.Pranab K Mohapatra, Prof. Rajesh Srivastava, IIT Kanpur.

7th Semester	RMM7E003	Marketing Management	L-T-P 3-0-0	3 Credits
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Module I: (12 Hours)

Marketing Management: Concept, Process, Functions and relevance in the current context. Marketing Environment: Elements of micro and macro environment Competition Analysis: Factors contributing to competition, porter's five forces model, Identifying and analyzing competitors.

Marketing Planning: Exploring Opportunity, Product -market selection, Marketing Planning Process. Market Research and Information Systems: Research Process, The Internet and World Wide Web based Information collection and processing, Database, Data Warehouses and Data Mining, Global Market Research. Consumer Behaviour: Factors influencing consumer behavior, consumer decision process. Organizational buying behaviour.

Module II: (12 Hours)

Market Segmentation, Targeting and Positioning: Definition, Bases of segmenting consumer and Industrial markets. Target Market strategies: Market Positioning. Market Demand Forecasting: Key Terms, Forecasting Tools: Short term tools: Moving average and Exponential smoothing methods, Long-term forecasting Tools: Time series analysis, Econometrics methods, Qualitative tools : Buying Intention Survey, Sales Force Opinion and Delphi Techniques.

Product Planning: Product Life Cycle, New Product Development Process, Branding Strategy, Positioning a Brand, Brand Equity, Packaging and Labeling, Product-mix and Product Line, Planned Obsolescence.

Module III: (12 Hours)

Pricing Decision: Objectives and Factors influencing pricing, Pricing method and strategies. Integrated Marketing Communication(IMC)- Concept of IMC, the marketing communication process, Promotion Mix, elements of promotion mix, Direct marketing. Channels of Distributions: Types of intermediaries, functions of distribution channels, channel levels, Designing Distribution Channels, Physical Distribution, Supply Chain Management (Basic only). Trends in Marketing: Green Marketing, Customer Relationship Management, E-marketing, Rural Marketing and Service Marketing (concepts only)

Books:

1. Etzel , Walker ,Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.
2. Saxena,"Marketing Management" Tata McGraw Hill, 4/e.
3. Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
4. Karunakaran "Marketing Management", Himalaya PublishingHouse, 2010/e.
5. Kotler, Keller,Koshy and Jha, "Marketing Management", 13/e, Pearson Education

7th Semester	RGT6A003	Green Technology	L-T-P 3-0-0	3 CREDITS
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Module I: (12 Hrs)

Global Warming and its effect:- Introduction and physical definition of global warming, the New Carbon Problem: Accumulation, Long Half-Life, Heating Potential, Carbon Emission Factors, Carbon Absorption in Nature, The Global Emission Situation and its effect in India, The Kyoto and Other Protocols and its view in India, Effect of climate change and its impact. Planning for the Future to reduce global warming:- Steps taken to Control Carbon Emissions universally, Use of Promotional and Punitive Mechanisms for Reducing Carbon in Atmosphere, The General Approach in Planning for the Future, Developing Countrywide Adaptive Measures for Safety of Local People, Developing Mitigative Measures for Global Reduction of Carbon, India's National Action Plan on Climate Change (NAPCC) till date, National Mission for a Green India, The MRV Debate.

Module II: (8 Hrs)

Opportunities in Control of Carbon Emissions and Accumulation:- Essential Steps for Control of Carbon Emissions and Accumulation, Procedure to develop own Priorities and Business Opportunities in India for control of carbon emissions and accumulation, Needs a Mix of Green and Traditional Power Sources in India, A Logical Approach for Carbon Reduction, Need in India —More Forests, Less Deforestation and payment rates procedure for controlling carbon emissions and its Promotional Mechanisms at India. Green Technologies for Energy Production: - Various Technologies Available for Energy Production, Cost Comparison of a Few Typical Systems for Power Generation, Sources of Energy Production Already in Use, Alternative Methods Ready for Use, Green Technologies Needing some Prior R&D Work.

Module III: (10 Hrs)

Green Technologies for Personal and Citywide Application: - Measures to be taken for Green city, Carbon Emission Reduction at Personal Level, Carbon Emission Reduction at Local Authority and Citywide Level, Carbon Emissions from Imports. Green Technologies for Specific Applications:- Promotion of 'Green' Buildings, Guidelines, The Energy Conservation Building Code (ECBC), Green Hotels and Hospitals, Green Technologies for Transport, Green Roads, Ports and Harbours, Industries, Carbon, Carbon Emissions from a Few Selected Industries in India, The Changing Scenario in Cities, Need for Wider Application to Town Planning and Area Re-Development Projects, 'Green' Infrastructure for Municipal Services, Bringing up Indian Villages, Green Services for Crematoria, Spreading Message to all Stakeholders.

Module IV: (10 Hrs)

Some High-tech Measures for Reducing Carbon Emissions: - Use of Solar Power with Satellite-Based Systems, Use of Carbon Capture and Storage (Sequestration), Microorganisms, A Quick SWOT Analysis. Recommended Plan of Action: - India's National Action Plan Take Us to a Low-Carbon Path, The Missions Help Develop Awareness, few case studies on Projects undertaken by Various Countries, Adaptive Measures Essential for Indian People to Cope with Climate Change

Books

- [1] Green Technologies, Soli J. Arceivala, McGraw Hill Education
- [2] Green Technologies and Environmental Sustainability edited by Ritu Singh, Sanjeev Kumar

Digital Learning Resources:

Course Name: Sustainable Materials and Green Buildings

Course Link: <https://nptel.ac.in/courses/105/102/105102195/>

Course Instructor: Dr. B. Bhattacharjee, IIT Delhi

7 th Semester	RIS7B001	Industrial Safety Engineering	L-T-P 3-0-0	3 CREDITS
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Module-I:**(7 hours)**

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Module-II**(7 hours)**

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Module-III:(7 hours)

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Module-IV:**(7 hours)**

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of faultfinding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Module-V:**(8 hours)**

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

7 th Semester	REV5D004	Disaster Management	L-T-P 3-0-0	3 CREDITS
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Module I (12 hr)

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

Module II (6 hr)

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

Module III (6 hr)

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

Module IV (12 hr)

Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Books

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015
1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India

<http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf>

7th Semester	RIP7E002	Intellectual Property Right	L-T-P 3-0-0	3 Credits
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MODULE-I**(12Hours)**

Introduction: Intellectual property: meaning, nature and significance, need for intellectual property Right (IPR), IPR in India – Genesis and development, IPR in abroad, Examples: - Biotechnology Research and Intellectual Property Rights Management. What is a patent, what can be protected by a patent, why should I apply for a patent? Patent Law, Patentability requirements, non-Patentable subject matters, Layout of the Patents. Procedure for domestic and international filing of applications, Restoration, Surrender and Revocations of Patents, Rights of Patentee and Working of Patent, Licensing and Enforcing Intellectual Property.

MODULE-II**(10Hours)**

Copyrights: Copyright: meaning, scope; What is covered by copyright? How long does copyright last? Why protects copyright? Related rights, Rights covered by copyright. Ownership: Duration, Division, Transfer and Termination of Transfers.

MODULE-III (10Hours)

Infringement and Remedies: Literal and non-literal infringement, Role of claims, Doctrines on infringement: Equivalent doctrine, Pith and Marrow doctrine, Comparative test. Defences: Gillette Defence, General grounds, Patents granted with conditions, Parallel import. Remedies: Civil, Administrative.

MODULE-IV (08Hours)

State Law: Trade Secret, Contract, Misappropriation, Right of Publicity Trademarks, Trade Secret - Overview, Requirements, Misappropriation of Trade Secret, Departing Employees, Remedies, Criminal Liability, Misappropriation, Clickwrap Agreements, Idea Submissions; Right of Publicity, Federal Pre-emption, Review.

Books:

- [1] W. R. Cornish and D. Llewellyn, Intellectual Property: Patents, Copyrights, Trade Marks and Allied Rights, Sweet & Maxwell.
- [2] Lionel Bently and Brad Sherman, Intellectual Property Law, Oxford University Press.
- [3] P. Narayanan, Intellectual Property Law, Eastern Law House
- [4] B. L. Wadehra, Law Relating to Intellectual Property, Universal Law Publishing Co.
- [5] V. K. Ahuja, Law Relating to Intellectual Property Rights, LexisNexis
- [6] AjitParulekar and Sarita D'Souza, Indian Patents Law – Legal & Business Implications;Macmillan India ltd, 2006
- [7] P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi, 2010.

7th Semester	RAE6G001	Finite Element Method	L-T-P 3-0-0	3 Credits
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Module – I INTRODUCTION

Review of basic approximate methods of analyses – Stiffness and Flexibility matrix for simple cases – Governing equation and convergence criteria of finite element method.

Module – II DISCRETE ELEMENTS

Bar, Frame, beam elements – Application to static, dynamic analysis.

Module – III CONTINUUM ELEMENTS

Various types of 2-D-elements Application to plane stress, plane strain and axisymmetric problems.

Module – IV ISOPARAMETRIC ELEMENTS

Applications to two and three-dimensional problems(four, eight and nine noded element), Numerical Integration

Module – V FIELD PROBLEM

Applications to other field problems like heat transfer and fluid flow.

Books

1. Tirupathi.R.C and Ashok D.B, “Introduction to Finite Elements in Engineering”, Prentice Hall India, Third Edition, 2003.
2. Reddy J.N. “An Introduction to Finite Element Method”, McGraw-Hill, 2000.
3. Krishnamurthy, C.S., “Finite Element Analysis”, Tata McGraw-Hill, 2000.
4. Bathe, K.J. and Wilson, E.L., “Numerical Methods in Finite Elements Analysis”, Prentice Hall of India, 1985.

7 th Semester	RCS7D007	Soft Computing	L-T-P 3-0-0	3 Credits
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Module I: (14 Hrs)

Basic tools of soft Computing: Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non - linear Error surface and optimization

Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets; Basic set operations; Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference; Defuzzification; Fuzzy logic control; Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition.

Module II: (14 Hrs)

Neural networks: Single layer networks, Perceptron; Activation functions; Adaline- its training and capabilities, weights learning, Multilayer perceptrons; error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm, Kohonen self - organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS).

Module III: (8 Hrs)

Evolutionary Computing: Genetic algorithms: Basic concepts, encoding, fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic, basic evolutionary programming concepts Applications, hybrid evolutionary algorithms.

Books:

1. F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design - Theory, Tools and Applications". Pearson Education. (Printed in India).
2. J. S. R. Jang. C. T. Sun and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd., New Delhi.
3. Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.
4. S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India. 4) V. Keeman, "Learning and Soft computing", Pearson Education, India.
5. R. C. Eberhart and Y. Shi, "Computational Intelligence Concepts to Implementation". Morgan Kaufmann Publishers (Indian Reprint).

7th Semester	RIT7D006	E-Commerce and ERP	L-T-P 3-0-0	3 Credits
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Module I

Overview of Electronic Commerce, Driving the Electronic Commerce Revolution, The Internet, Portals. Open Systems Inter Connection (OSI) Model, XML, Data Warehousing, BuildingOwnWebSite,InternetSecurity

Module II

E-Commerce and Internet, Electronic Market, Business to Business E-Commerce, Four C's (Convergence, Collaborative Computing, Content Management and Call Center), Wireless Application Protocol (WAP), Intranet and Extranets. Data Interchange (EDI), Electronic PaymentSystems,E-Security

Module-III

Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to consider in planning designing and implementation of cross functional integrated ERP systems. Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.

Module IV

ERP IMPLEMENTATION: Planning Evaluation and selection of ERP systems, Implementation life cycle - ERP implementation, Methodology, Data Migration, Success and Failure factors of ERP Implementation. Extended ERP systems and ERP add-ons - CRM, SCM, Manufacturing prospective, Business analytics .

Book:

1. E- Commerce and Enterprise Resource Planning; CSV Murthy, HPH
2. Enterprise Resource Planning- Concepts and Practices ; V K Garg and N K Venkatkrishna, PHI
3. Enterprise Resource Planning; AlexixLeon ; TMH

7th Semester	RIK7F001	Essence of Indian Knowledge Tradition - II	L-T-P 3-0-0	0 CREDITS
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Course Objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day to day life

Course Outcomes :

At the end of the Course, Student will be able to:

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. Illustrate the various enactments related to the protection of traditional knowledge.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Explain the importance of Traditional knowledge in Agriculture and Medicine.

Module-1:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

Module-2:

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Module-3:

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

Module-4:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

Module-5:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their

food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.

Digital Learning Resources:

Course Name:	Ayurvedic Inheritance of India
Course Link:	https://nptel.ac.in/courses/121/106/121106003/
Course Instructor:	Dr M. S. Valiathan, IIT, Madras

<https://www.youtube.com/watch?v=LZP1StpYEPM>