

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/Engg./B.Tech./70/2022

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faculty of Science & Technology, **the Academic Council at its meeting held on 01 November 2021 has accepted revised following syllabus of Bachelor of Technology Third Year (Vth & VIth semester) in accordance with Choice Based Credit & Grading System as per guidelines of AICTE as appended herewith.**

Sr.No.	Syllabi as per CBC & GS
[1]	B.Tech. [Civil Engineering],
[2]	B.Tech. [Mechanical Engineering],
[3]	B.Tech. [Plastic and Polymer Engineering],
[4]	B.Tech. [Electronics and Telecommunication Engineering],
[5]	B.Tech. [Electrical Engineering],
[6]	B.Tech. [Computer Science & Engineering].
[7]	B.Tech.[Agricultural Engineering]

This is effective from the Academic Year 2021-22 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.

REF.NO.SU/2022/ 6330-38

Date:- 07.01.2022.

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[Signature]
**Deputy Registrar,
Academic Section**

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

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- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
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**Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad-431004**



**Revised Syllabus of Third Year (TY) Bachelor of
Technology**

Civil Engineering

(V & VI Semester)

Under Choice Based Credit System (CBCS)

Under Faculty of Science and Technology

(Effective from 2021-22 and onwards)

FACULTY OF SCIENCE AND TECHNOLOGY															
Syllabus Structure w.e.f. 2021-2022 (Choice Based Credit System)															
Third Year B. Tech. (Civil Engineering)															
Semester-V															
Course Code	Course Name	Teaching (Hrs/Week)			Examination Scheme and Marks							Credits			
		Theory	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TUT	TW/PR	Total
CED301	Design of Steel Structure	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED302	Hydrology and Water Resources Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
BSH303	Managerial Economics, Finance & Costing	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED341- CED343	Professional Elective Course-II	3	-	-	15	15	10	60	-	-	100	3	-	-	3
	Open Elective- I	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED321	Lab: Design of Steel Structure	-	-	2	-	-	-	-	-	25	25	-	-	1	1
CED322	Lab: Hydrology and Water Resources Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
CED323- CED325	Lab: Professional Elective Course-II	-	-	2	-	-	-	-	25	-	25	-	-	1	1
CED326	Minor Project	-	-	2	-	-	-	-	25	-	25	-	-	1	1
CED327	Lab: STADD-PRO	-	-	2	-	-	-	-	-	25	25	-	-	1	1
CED328	Lab: Experiential/ Problem Based Learning	-	-	2	-	-	-	-	25	-	25	-	-	1	1
		15	-	12	75	75	50	300	75	75	650	15	-	6	21
Semester-VI															
Course Code	Course Name	Teaching (Hrs/Week)			Examination Scheme and Marks							Credits			
		Theory	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TUT	TW/PR	Total
CED351	Design of RCC Structure	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED352	Geotechnical Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED353	Environmental Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED391- CED393	Professional Elective Course-III	3	-	-	15	15	10	60	-	-	100	3	-	-	3
	Open Elective- II	3	-	-	15	15	10	60	-	-	100	3	-	-	3
CED371	Lab: Design of RCC Structure	-	-	2	-	-	-	-	-	25	25	-	-	1	1
CED372	Lab: Geotechnical Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
CED373	Lab: Environmental Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
CED374	Major Project-I	-	-	4	-	-	-	-		50	50	-	-	2	2
CED375	Lab:Non-Destructive Testing	-	-	2	-	-	-	-	25	-	25	-	-	1	1
	Mandatory Non-Credit Course (Audit Course)	2													
		17	-	12	75	75	50	300	25	125	650	15	-	6	21
MSE- Mid Semester Exam, ESE- End Semester Examination, TH-Theory, OR- Oral, TA-Teacher Assessment, TW- Term Work, PR- Practical, Tut-Tutorial															

Professional Elective Course-II (Semester V)

Group A	Group B	Group C
CED341: Bridge Engineering	CED342: Disaster Management	CED343: Hydro Power Engineering

Professional Elective Course-III (Semester VI)

Group A	Group B	Group C
CED391: Sustainability in River Basin Management	CED392: Ground Improvement Technique	CED393: Prestressed Concrete

List of Open Elective-I (Semester V)

Sr. No.	Offered by Department	Name of Course	Course Code
1.	Agricultural Engineering	Statistical Methods in Engineering	AED331
2.	Civil Engineering	Environmental Impact Assessment	CED331
3.	Computer Science and Engineering	Artificial Intelligence and its Applications	CSE331
4.	Electrical Engineering	Special Purpose Machines	EED331
5.	Electronics and Telecommunications Engineering	Electronic Product Design	ETC331
6.	Mechanical Engineering	Operations Research	MED331
7.	Plastic and Polymer Engineering	Introduction to Nanotechnology	PPE331

List of Open Elective-II (Semester VI)

Sr. No.	Offered by Department	Name of Course	Course Code
1.	Agricultural Engineering	Fundamentals of Bioenergy	AED381
2.	Civil Engineering	Solid Waste Management	CED381
3.	Computer Science and Engineering	Information & Cyber Security	CSE381
4.	Electrical Engineering	Electrical Materials	EED381
5.	Electronics and Telecommunications Engineering	Internet of Things	ETC381
6.	Mechanical Engineering	Industry 4.0	MED381
7.	Plastic and Polymer Engineering	Polymer Recycling and Waste Management	PPE381

Mandatory Non-Credit Course (Audit Course) (Semester VI)

Sr. No.	Offered by Department	Course	Course code
1.	First Year	German Language	BSH807
2.	First Year	Japanese Language	BSH808
3.	Civil Engineering	Professional Ethics and Constitution	CED801

		of India	
4.	Computer Science and Engineering	Green Computing	CSE801
5.	Electronics and Telecommunications Engineering	Smart Cities	ETC801
6.	Mechanical Engineering	Research Methodology	MED801
7.	Plastic and Polymer Engineering	Industrial Safety and Management	PPE801

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-V					
Course Code: CED301 Course: Design of Steel Structure Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs		
Prerequisite		Introduction to basic properties of steel and concept of load transfer.			
Objectives		1.To introduce steel structures and its basic components. 2.To introduce structural steel fasteners like welding and bolting. 3.To design tension members, compression members, beams and beam-columns, column splices and bases.			
Unit-I		Introduction to structural design: Structural systems, Roll of the designer, Advantages& Disadvantages of steel as a structural material, Types of structural steel, Mechanical properties of steel, various rolled steel sections & structural pipe (tube) sections and their properties, Codes and specifications. Fatigue of steel structures. Principles of Limit state design: Introduction on limit state design, Design philosophies& analysis procedures, Design requirements, Loads& load combinations, Types of limit states (limit state of strength, limit state of serviceability). (06Hrs)			
Unit-II		Connections: Introduction on Connections. Bolted connections: Classification, Behavior of bolted joints. Bolts & Bolting, Design strength of ordinary black bolts, Design of simple connections, Analysis of Bolt Group, beam to beam, beam to column, framed connections. Welded connections: Advantages and disadvantages, types and properties of welds, specification for weld, types of joints, Effective areas of welds, Design of simple connections, Beam to beam, beam to column, framed connections. (06 Hrs)			
Unit-III		Design of Tension members: Types of tension members, Slenderness ratio, Behavior of tension members, Modes of failure, Design of sections for tension, tension member splice, and lug angles. (06 Hrs)			
Unit-IV		Design of Compression Members: Behavior of compression members, Modes of failure, Classification of cross section, Effective length of compression members, Design strength, Compression members in trusses, Design of columns subjected to axial loads, Laced and Battered columns. Column bases: Slab base and Gussetedbase. (08 Hrs)			
Unit-V		Design of beams: Laterally restrained and unrestrained simply-supported beams. Design of compound beams.Design of plate girder: elements of plate girders, economical depth, size of flange, shear buckling resistance of web, end panel design, anchor forces, design connection between flange and web plates, design of bearing stiffeners, web for end stiffeners, connection of intermediate stiffeners to web, design of plate girder. (06 Hrs)			
Unit-VI		Design of Roofing for an industrial building: Roofing materials, Types of trusses, Loading on roof trusses, Analysis of trusses, Design of various members of roof trusses. (04Hrs)			
Textbook/		Sr. No.	Title	Author	Publication Edition

Reference Books	1.	Design of Steel Structures	Dr. N. Subramanian	Oxford University Press.	2010
	2.	Comprehensive Design of Steel Structures	Dr. B C Punmia& A K Jain	Laxmi Pub.	2007
	3.	Design of Steel Structures.	Mr. S K Duggal	Tata McGraw Hill Publishing Company Ltd.	2010
	4.	Design of Steel Structures	Mr. S.S. Bhavikatti	International Publishing House Pvt. Ltd.	2010
	5.	IS:800 2007 and Steel Table.	Bureau of Indian Standards	Bureau of Indian Standards	2007

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (Civil Engineering) Semester-V

Course Code: CED302 Course: Hydrology and Water Resources Engineering Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Fluid Mechanics, Basics of structural analysis and strength of materials.
Objectives	1. This is the basic course to introduce water resources, their occurrences, distribution, and application. 2. This course acts as a foundation for design of various dam and irrigation structures.
Unit-I	Irrigation and Water Resources Engineering: Introduction, World and India water resources, Necessity of irrigation, Advantages and ill-effects of irrigation, techniques of water distribution in farms. Water logging and salinity, Types of drainage. Water requirements of crops: Function of irrigation water, types of soils and water available in various classes, base period, delta, duty and their relationship, evapo-transpiration, field capacity, wilting point, Irrigation seasons, principal crops and crop rotation. (06 Hrs)
Unit-II	Surface and Ground-water Hydrology: Introduction, Hydrological cycle, precipitation, measurement of rainfall, Characteristics of a rain storm (rain hyetograph, mass curve of rainfall, recurrence interval), computation of average rainfall over a basin, Infiltration studies and IC-Curve, factors affecting runoff, Unit hydrograph. Ground Water Hydrology: Terminology, Occurrence and distribution of ground water, aquifers and its parameters, wells in confined and unconfined aquifers. Watershed Management: Concept and Necessity of Watershed Management, steps involved in watershed management, ridge line and drainage line treatment. (06 Hrs)
Unit-III	Canal Irrigation System: Canal classification, factors affecting the alignment of canals, Kennedy and Lacey's silt theories and their application to channel design, longitudinal section and cross section of an irrigation channel. Losses in canals, Advantages and disadvantages and types of lining, Requirement of good lining. Canal Regulation Works and Cross Drainage Works: Types of C. D. Works, their purpose, selection of suitable type of C. D. Work, Design of transitions. Canal Regulation works: Introduction to canal falls, head regulators, cross regulators, canal escapes, outlets and their types. (06 Hrs)
Unit-IV	Planning of Reservoirs: Concept of reservoir and its types, its site selection, determination of storage capacity of reservoir by mass curve analysis, life of reservoirs, economic height of dam, various types of dams with relative merits. Gravity Dams: Various forces acting on gravity dams, modes of failure, principle stresses in gravity dams, Low and high gravity dams, stability analysis, galleries, joints, keys and crack control in gravity dams. (06 Hrs)
Unit-V	Earth Dams: Types of earth dams, components and their functions, causes of failure, design criteria. Arch and Buttress Dams: Types and suitability, different forces acting, stability criteria. Spillways: Types, suitability under different conditions, spillways gates, and energy dissipation

	in spillways. (06 Hrs)				
Unit-VI	Diversion Head Works: Layout, Site selection, component, weirs and their types, causes of failure, design of weir by Bligh and Khosla's theory. Minor Irrigation Works and Practices: isolated tanks and tanks in series, tank weirs or surplus escaping weirs, tank outlets or sluices, introduction to Maharashtra Irrigation Act, Methods of water charge assessment, CADA and participatory irrigation. (06 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Irrigation and Hydraulic structures	Santoshkumar Garg	Khanna Publishers	19 th
	2.	Irrigation and Water power Engineering	Punmia and Pande	Standard Publishers	5 th
	3.	Engineering Hydrology	K. Subramanya	Tata McGraw Hill	4 th
	4.	Hydrology for Engineers	Linsley, Kohler	TMH Publications	1 st

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (All) Semester-V

Course Code: BSH303 Course: Managerial Economics, Finance and Costing Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Basic knowledge of concepts of economics.
Objectives	On the completion of this course, the learner will be able to 1. Correlate various micro and macro-economic variables and solve numerical problems 2. Analyse, interpret the financial statements and decide upon the health of a firm. 3. Appreciate and illustrate Economic/Industrial/Trade policies and their implications and Role played by various financial institutions/banks. 4. Apply costing and accounting and costing practices in solving real life problems
Unit-I	Managerial Economics Part-I: Introduction- Economics, basic concepts - utility, wealth, welfare, price, markets, and opportunity cost. Micro - and macro- economics, economics of growth and development. (4 Hrs)
Unit-II	Managerial Economics Part-II: Demand and supply analysis: Law and elasticity of demand and supply. Demand function. Market structure - competition, monopoly, oligopoly and imperfect competition. Market imperfections and state interventions. Role of government; monetary, fiscal and trade policies, BOP, industrial policy; instruments of government policy; taxation, incentives, budget. Theory of firm: Production and Cost analysis for short run and long run. Cost-Output Relationship: Cost Function, Cost-Output relationships in Short Run and Long Run. Revenue Analysis and Pricing Policies (8 Hrs)
Unit-III	Finance Part-I: Introduction, Basic business function, sources of finance and their relative importance. Long and short term finance. Fund allocation, alternative uses of finance. Time value of money. Analysis of financial statements –Ratio analysis using balance sheet, profit and loss account. Capital budgeting decisions- type, nature and evaluation criteria: NPV, IRR, Payback. (6 Hrs)
Unit-IV	Finance Part-II: Working capital management. Financial markets; money markets, bill market, discount houses, call loan market, etc., Capital markets; mutual funds, stock markets, industrial banks, world bank, UTI, IDBI, ICICI, SEBI and state finance corporations. (6 Hrs)
Unit-V	Costing Part-I: Cost classification: Cost ascertainment; allocation, apportionment, absorption of overheads and non-production cost; overhead analysis, absorption methods, general considerations. Job costing; factory job costing, contract cost. Unit costing; output and operating cost, simple process costing, normal and abnormal losses in process, waste, scrap, bye-and joint products. Marginal

	costs and breakdown charges. (6 Hrs)		
Unit-VI	Costing Part-II: Cost planning and control, standard cost and budgetary control, setting standards, variance analysis. Cost reduction; tools, techniques and productivity. Depreciation; causes and significance, methods of providing for depreciation, book values, taxes and depreciation. (6 Hrs)		
Textbook/ Reference Books	Sr. No.	Title	Author
	1.	Economics, Tata McGraw Hill.	Paul Samuelson and William Nordhaus
	2.	Financial Management, McGraw Hill.	Prasanna Chandra
	3.	Cost Accounting, Tata McGraw Hill (TMH).	Jawaharlal
	4.	Finance Sense - Text and Cases Tata McGraw Hill	Prasanna Chandra
	5.	Managerial Economics, Sultan Chand and Sons, New Delhi.	Varshney and Maheshwari
	6.	Indian Economy, S.Chand Publication	RuddarDatt and Sundaram
	7.	Financial institutions and markets, McGraw Hill Education.	L.M. Bhole and Jitendra Mahakud
	8.	Managerial Economics, Pearson Publication	Paul Keat, Philip Young and Sreejata Banerjee
Web Resources:	1.	www.nptel.ac.in	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (Civil Engineering) Semester-V

Course Code: CED341 Course: Bridge Engineering Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs		
Course Objectives	The main aim of this course is to enable students to choose the appropriate bridge type for a given project, and to analyses and design the main components of the chosen bridge. The course also provides students with fundamental knowledge in a wide range of state-of-the-art practices, including code specifications, in bridge engineering. Upon completion of this course, students should have learned the analysis and design of bridge superstructures, foundations, bearings, and deck joints.				
Unit-I	Site Investigation & Planning: History of Bridge development, Components of a Bridge, Classification of Bridge, Requirement of Ideal Bridge, identification of Bridges. Selection of Bridge site, Bridge alignment, Collection of Bridge design data, Sub-Surface Investigation. (6 Hour)				
Unit-II	Bridge Hydrology: Determination of flood discharge, Waterway, Economic span, Scour depth, Depth of foundation, Afflux, Clearance, Freeboard. River Training Work for Bridge. (6 Hour)				
Unit-III	Bridge structure: Types of bridge structure, bridge flooring, types of foundation, Bridge Pier, Abutments, Wing wall, Approaches. Types of foundations, Pile foundation in Bridges, well foundation in Bridges: Box Caissons, Failures of foundation, Dewatering of foundation excavations, Cofferdams. (6 Hour)				
Unit-IV	Loadings for Bridge Design: Types of loading for road bridges, Dead load, Live load, simplified equivalent load, impact load, Wind load, Lateral load, Longitudinal force, Centrifugal force, Seismic force, forces due to water current, Earth Pressure, Buoyance, Temperature stresses, Deformation stresses, Secondary stresses, Erection stresses, Loading for Railway bridge, Loads for Military bridges, Requirement of Traffic in the design of Highway bridge. (6 Hour)				
Unit-V	Low-Cost Bridges: Types of Low-cost bridges, Causeways, Timber bridges, suspension bridges, floating bridges, Flying bridges, Culvert, Scupper, Soil steel bridges, Polyethylene Pipes. Erection of Superstructure, Maintenance of Bridges, Strengthening of Bridges, Bridge Architecture. (6 Hour)				
Unit-VI	Bridge Bearing: Definition, function of Bearing, Bearing for Iron, and steel bridges: Fixed bearing, Expansion bearing, Bearing for concrete bridges: Slab bridge, Girder bridge, Recent trends in design of bearing. Joints in bridges, Railing, Articulation. (6 Hour)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Bridge Engineering	Rangwala	Charotar Publishing House Pvt. Ltd.	1986
	2.	Bridge	S. P. Bindra	Dhanpat Rai	1992

		Engineering		Publications	
	3.	Bridge Engineering	Phatak D.R.	Satya Prakashan, New Delhi	1990
	4.	RCC Designs	Punmia B. C., Jain A. K.	Laxmi Pub.(P) Ltd.	2003
	5.	Design of Concrete Bridges	Vazirani&Ratwani	Khanna Publishers, New Delhi	1986
	6.	Bridge Engineering	Ponnu Swamy	Mc Graw-Hill Publication	2008, 4th edition
	7.	Principles and Practice of Bridge Engineering	Bindra S. P.	Dhanpat Rai &sons, Delhi	1999
	8.	Bridge Superstructure	Rajagopalan N.	Alpha Science International	2006
	9.	Essentials of Bridge Engineering	Johnson V.D.	Oxford and IBH Publishing Co., Delhi	2009

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (Civil Engineering) Semester-V

Course Code: CED342 Course: Disaster Management Teaching Scheme: Theory: 03Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Environmental Engineering
Objectives	To provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer.
Unit-I	Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks-severity, frequency and details, capacity, impact, prevention, mitigation. (06 Hrs)
Unit-II	Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); and vulnerability profile of India, mountain and coastal areas, ecological fragility. Manmade disasters industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc. (06 Hrs)
Unit-III	Disaster Impacts - Disaster impacts- environmental, physical, social, ecological, economic, political, health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters. (06 Hrs)
Unit-IV	Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response, water, sanitation, food safety, waste management, disease control, security, communications. (06 Hrs)
Unit-V	Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority. (06 Hrs)

Unit-VI	Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods. (06 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Disaster Risk Reduction in South Asia	Pradeep Sahni	Prentice Hall.	
	2.	Handbook of Disaster Management: Techniques & Guidelines	Singh B.K.	Rajat Publication.	
	3.	http://ndma.gov.in/	Home page of National Disaster Management Authority		
	4.	Disaster Medical Systems Guidelines	Emergency Medical Services Authority, State of California	EMSA no.214,	June 2003

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-V	
Course Code: CED343 Course: Hydropower Engineering Teaching Scheme: Theory: 03Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03Hrs
Prerequisite	Fluid Mechanics and introduction to Water Resources Engineering.
Objectives	Student will get knowledge of different terminologies related with waterpower engineering and will be able to plan different structures for hydro power generation. At the end of this course student will be able to decide suitability of individual power plant in different situation
Unit-I	Introduction: Hydro power and its source need & advantages, hydropower development in India, Hydropower potential. basic waterpower equation, estimation of discharge and head available, Components of hydropower plants (06Hrs)
Unit-II	Nature of demand: Load curves, load factor, capacity factor, utilization factor, diversity factor, load duration curve, firm and secondary power and prediction of load (06 Hrs)
Unit-III	Hydropower Plant: Classification of hydropower plants - Run of river plants, Storage or Valley dam plants, Pumped storage plants, Base load and Peak load plants, advantages &disadvantages. Intakes: types, elements of an intake, losses in intakes, air entrainment at intakes, inlet aeration, canal, fore bay and tunnel. (06 Hrs)
Unit-IV	Conveyance System: Classification of penstock, design criteria for penstock. Economical diameter of penstock, anchor blocks, conduit valves, and types of valves, bends and manifold, water hammer, Tail Race: Functions, Surge tank: Function, location, types, restricted orifice and differential. (06Hrs)
Unit-V	Powerhouse: Types of Powerhouses, Typical layout, Components, Power plant equipment, Instrumentation and control, Power station: surface power

	station, power house structure, variations in design of power house. Underground power station, location of underground power station, type of underground power station, Advantages and limitations of underground powerhouse, Comparison of underground and surface power station and types of layouts. (06Hrs)				
Unit-VI	Pumped storage plants: concepts, general layout and types. Tidal power stations: concepts, general layout, classification, types. Other types of power plant: depression power plant and micro power station. Choice of type of turbine. Turbine setting, cavitations, draft tubes: function and principal types. (06Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Waterpower Engineering	Dandekar M.M. and Sharma K.N.	Vikas Publishing. House Pvt. Ltd. New Delhi	16
	2.	Hydroelectric Engineering Practice" Vol. I, II and III.	Brown, G. Etal	-	-

Course Code: AED 331 Course: Open Elective Course-I (Statistical Methods in Engineering) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Basics of Statistics and Probability Distribution				
Objectives	1.To introduce different techniques involved in statistical analysis 2.To learn and practice various statistical methods for data analysis				
Unit-I	Sampling Distribution: Population and Sample, Sampling Distribution, Standard Error Sampling Distribution of Means, Sampling Distribution of Variance, Sampling Distribution of Proportions (6 Hrs)				
Unit-II	Theory of Estimation: Estimation Theory, Point Estimation – Basic Concept & Notion, Interval Estimation – Interval Estimation for Large Samples, Confidence Limits for Mean, Proportion, Standard Deviation, Difference of Means, Difference of Proportions (6 Hrs)				
Unit-III	Testing of Hypothesis: Statistical Hypothesis, Tests of Significance, Null Hypothesis, Alternative Hypothesis, Types of Errors in Testing of Hypothesis, Level of Significance, Critical Region, One-Tailed and Two-Tailed Tests, Critical Values and Critical Region, P-value of Test Statistic, Procedure for testing of hypothesis (6 Hrs)				
Unit-IV	Large Sample Tests: Sampling of Attributes – Test for Single Proportion, Test of Significance for Difference of Proportions, Sampling of Variables - Test of Significance for a Single Mean (6 Hrs)				
Unit-V	Non- Parametric Tests: Parametric Tests and Non-Parametric Tests, Sign Test, Wilcoxon Signed-Rank Test, Mann-Whitney Test (6 Hrs)				
Unit-VI	Analysis of Variance (ANOVA): Introduction, Analysis of Variance, Assumptions for ANOVA test, One-Way Classification (6 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Statistics for Engineers and Scientists	William Navidi	McGraw	4 th Edition
	2.	Probability & Statistics for Engineers & Scientists	Walpole, Myers, Myers Ye	Prentice Hall	9 th Edition
	3.	Fundamentals of Statistics	S.C. Gupta	Himalaya Publishing House	7 th Edition
	4.	Statistical Methods	S. P. Gupta	Sultan Chand & Sons	1 st Edition

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Course Code: CED331 Course: Open Elective-I (Environmental Impact Assessment) Teaching Scheme: Theory: 03 Hrs/week		Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3Hrs			
Prerequisite	Environmental science and concept of ecology.				
Objectives	1.Student would overview the concepts, methods, issues and various forms and stages of EIA process. 2.Student will be able to examine the development of EIA in India and highlight the diversity of approach and impact of the EIA process.				
Unit-I	Introduction and Evolution of EIA: Introduction to Environmental Impact Assessment, Origin of EIA, Stages in EIA, thorough discussion of steps in EIA. Establishments of Procedure: Legislative Option, Project Screening for EIA, Public Participation in EIA process. (06Hrs)				
Unit-II	Impact assessment: Background information, IA methods, environmental impact assessment methodology, documentation and selection process, environmental indices and indicators for describing affected environment, Life cycle assessment. (06Hrs)				
Unit-III	Air and noise environment: Prediction and assessment of impact for air and noise environment, Basic information of air quality, identification of type and quantity of air pollutant, existing air quality and air quality standards, impact prediction and assessment, mitigation. Basic information of noise, existing noise levels and standards, prediction of noise levels and assessment of impact, mitigations. (06Hrs)				
Unit-IV	Water and soil environment: Prediction and assessment of impact for water and soil environment, Basic information of water quality (Surface water and ground water), water quality standards, identification of impact, prediction of impact and assessment, mitigations. Background information of soil environment, soil and ground water standards, prediction and assessment of impact for ground water and soil, mitigations. (06Hrs)				
Unit-V	Decision Methods for Evaluation of Alternative: Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, verbal communication in EIA studies. (06Hrs)				
Unit-VI	Environmental Impact Assessment Report: Rapid and Comprehensive EIA, general structure of EIA document, Environmental management plan; post environmental monitoring. Latest EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, Procedure for public hearing, post environmental monitoring, Procedure for obtaining Environmental clearance for construction projects. (06Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Environmental Impact Assessment	Canter R.L.,	Mc Graw Hill International	Edition, 1997.
	2.	Environmental Impact Assessment Theory and Practice	Peter Watten (Eds.)	Unwin Hyman	London (1988)

	3.	Environmental Impact Assessment	R.R. Barthwal	New Age International Publishers	I
	4.	Environmental Impact Analysis Handbook	John G. Rau and David C. Wooten	McGraw Hill Book Company	I

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.Y. B. Tech. (All) Semester-V					
Course Code: CSE331 Course: Open Elective Course-I (Artificial Intelligence and its Applications) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3Hrs		
Prerequisite	Data Structures and Algorithms				
Objectives	1.To introduce different techniques involved defining and simulating an intelligence. 2.To learn and practice various Artificial Intelligence methods, algorithms, and knowledge representation schemes.				
Unit-I	Introduction: Artificial Intelligence, AI Problems and AI techniques, solving problems by searching, Problem formulation. Application of AI techniques in different branches of engineering, Basic Sciences, Medical Science and equipment, Economy and Finance. (6Hrs)				
Unit-II	Searching techniques in AI: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. (6Hrs)				
Unit-III	Heuristic functions: Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto-Arithmetic Problem. (6Hrs)				
Unit-IV	Agents and Environments: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. A Knowledge Based Agent, Environment, Types of Environments WUMPUS WORLD Environment, Case Study: Automated Taxi, Vacuum Cleaner (6Hrs)				
Unit-V	Expert System: Concept of an Expert System. Characteristics of an Expert System, Components of expert System, Concept of Knowledge Base, Components of Knowledge base, Knowledge Representation methods. Case Study:DENDRAL, MYCIN,PXDES,CaDeT (6Hrs)				
Unit-VI	Propositional Logic: Introduction, First Order Predicate Logic, Forward and Backward Chaining, Resolution., Introduction to PROLOG and LISP (6Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson Education	2 nd Edition
	2.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivshankar B Nair	McGraw Hill,	3 rd Edition
	3.	Artificial Intelligence	Elaine Rich, Kevin Knight	TataMcGraw	2 nd

				Hill	Edition
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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.Y. B. Tech. (All) Semester-V

Course Code: EED331 Course: Special Purpose Machines (Open Elective-I) Teaching Scheme: Theory: 3 Hrs/week		Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3Hrs
Prerequisite	They should have basic knowledge about all basic laws and construction / working principle of DC and AC motors and generators,	
Objectives	1.To differentiate between generalized machines and control machines. 2.To understand principle and working of different control machines. 3.To be able to identify and implement control machines.	
Unit-I	Hysteresis Motors: Magnetic field production & nature of torque, Applications. Reluctance Motors: F. H. P. Reluctance motors, switched reluctance motors, Principle of working & operation, Applications. (6Hrs)	
Unit-II	Control Motors: D C servomotors, transfer function of Armature and field-controlled motors their applications, Construction of F. H. P. Induction two-phase servomotors, production of torque, Torque-speed curves-characteristics & features-dynamic equations, Methods of control, Applications. Numerical on DC and AC servos. (6Hrs)	
Unit-III	Eddy Current Devices: Construction & operation of eddy current couplings & dynamometers, merits & limitations. (4Hrs)	
Unit-IV	Tacho-Generators: Basic requirements of tacho-generators, Ideal characteristics, classification. i) D.C. Tacho Generators: Output characteristics, Deviation from no load Characteristics, Dead-zone, Tooth ripples, Temperature effect, Accuracy class. ii) Induction Tacho-generators: Operating principle, Output characteristics, Equivalent circuit, Reasons for deviation from desired characteristics, Corrective means, Advantages. iii) A. C. Tacho-generators: Construction & operation, Output characteristics, non-linearities & tooth ripples, Advantages over other tacho-generators. Dynamic characteristics of techno-generators, Applications of tacho-generators. (8Hrs)	
Unit-V	Synchro & Synchro Transformers: Different types of single phase & three-phase synchro, Differential synchro, Synchro-indicators, Their constructional features, Characteristics & applications, Synchro transformers principle, Characteristics error, applications of synchro transformers. (6Hrs)	

Unit-VI	Linear Motors: Construction, Theory of operation of a linear induction motor, System with two-dimensional & three-dimensional field patterns, Performance of linear induction motors, Effect of variation in the air gap, Effect of width & thickness of the reaction plate, Thrust of linear induction motors, Applications. (6Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1.	‘Electrical Machine and Power Electronics’	Bhimbhra P. S	Tata McGraw Hill Publication.	Edition 2
	2.	‘Modem control Engineering’	Ogata K.	Prentice Hall.	Edition 2
	3.	Principles of Electrical Machines	V.K. Mehta	Chand Publication	Edition 2
	4.	Electrical Machines	Ashfaq Hussain	Dhanpat rai	Edition 3
	5.	Electrical Machines	Nagnath Kothari	TATA McGraw Hill.	Edition 5
	6.	Electrical Technologies	Edward Hughes Elbs	Pearson Education	Edition 2

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.Y. B. Tech. (All) Semester-V					
Course Code:ETC331 Course: Open Elective-I: Electronic Product Design Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Students should be familiar with Circuit design and PCB design.				
Objectives	1.To understand the stages of product (hardware/ software) design and development. 2.To be acquainted with methods of PCB design and different tools used for PCB Design. 3.To understand the importance of testing in product design cycle. ` 4.To understand the processes and importance of documentation.				
Unit-I	Introduction to Electronic product Design: Product development basics, Product development stages, Redundancy, Ergonomics and Aesthetic Design consideration.(6 Hrs)				
Unit-II	Packaging, Noise and Heat management: Introduction to product packaging, Noise in electronic circuits, Grounding, Shielding, Enclosure Sizing, Thermal management (6 Hrs)				
Unit-III	Fundamentals of PCB and PCB design: Important terms related to PCB, Types of PCBs, PCB Design elements, PCB design Steps, Requirements of artwork, Layout rules, Grounding, Shielding, Design issues related to supply and ground conductors (6 Hrs)				
Unit-IV	Software Design :Waterfall model of software development, Phases of Software design, Goals of software design, Design of structured program, Testing and debugging of program (6 Hrs)				
Unit-V	Product Testing: Environmental Testing, Temperature testing Humidity testing, Various test on enclosures, EMI and EMC related testing, Importance of standards, Classification of standards, IEC standards (6 Hrs)				
Unit-VI	Product Documentation: Need of documentation, Types of documentation, Manual, Types of manuals, Study of one typical manual, Bill of Material-examples, (6 Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1.	Electronic Product Design	R.G.Kaduskar	Wiley-India	Second
	2.	Integrated Circuits	K.R.Botkar	Khanna Publisher	Tenth
	3.	Embedded System: A contemporary design Tool	James Peckol	Wiley	Second

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Course Code: MED331 Course: Open Elective-I: Operations Research Teaching Scheme: Theory: 3 Hrs/week		Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs			
Prerequisite	1.Fundamental knowledge and understanding of Engineering mathematics 2.Understanding of concepts of costing and management concepts				
Objectives	1.To familiarize the students with formal quantitative approach to problem solving 2.To formulate real life engineering problems 3.To solve engineering problems using various Operations Research Techniques				
Unit-I	Introduction to Operations Research: Basics definition, scope, objectives, phases, models, applications, and limitations of Operations Research. (02Hrs)				
Unit-II	Linear Programming Problem: Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, Big-M method, two-phase method, degeneracy, and unbound solutions. (08Hrs)				
Unit-III	Transportation Model: Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method, and Vogel’s approximation method. Optimality test – the steppingstone method or MODI method. Degeneracy in Transportation Problem. Assignment Problem: Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem. (08 Hrs)				
Unit-IV	Inventory Control, Replacement Analysis and Theory of Games: Inventory Models: Economic Order Quantity Models, Quantity Discount Models, Stochastic Inventory Models, Multi Product Models, Inventory Control Models in Practice. Replacement Analysis: Replacement of Items that Deteriorate, Replacement of Items that Fail Suddenly. Theory of Games: Introduction, Minimax and Maximin Principle, Solution of Game with Saddle Point, Solution by Dominance. (06Hrs)				
Unit-V	Queuing model and Sequencing model: Queuing Systems and Structures, Notation Parameters, Single Server and Multi Server Models, Poisson Input, Exponential Service, Constant Rate Service, Infinite Population Sequencing Model: Introduction, n jobs through two machines, n jobs through three machines, two jobs through m machines and n jobs through m machines. (06 Hrs)				
Unit-VI	Network Models: Fulkerson ‘s rule, concept and types of floats, float calculations, CPM and PERT, Crashing cost and crashing Network. (06 Hrs)				
Textbook/	Sr. No.	Title	Author	Publication	Edition

**Reference
Books**

1.	Operations Research	Taha H.A.	Prentice Hall of India.	Ninth Edition
2.	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman	Tata McGraw-Hill	Seventh Edition
3.	Operations Research	P.K. Gupta, D.S Hira	S. Chand & Co.	Fourth Edition
4.	Operations Research	Man Mohan, P. K. Gupta, Kanti Swarup	S. Chand & Co.	12 th Edition
5.	Operations Research Principles and Practice	Ravindran, Phillips and Solberg	Mc. WSE Willey	Second Edition
6.	Operations Research: Applications and Algorithms	Wayne L. Winston, Jeffrey B. Goldberg	Thomson Brooks	Fourth edition
7.	Operations Research: Theory, Methods & Applications	S. D. Sharma, Himanshu Sharma	Kedar Nath Ram Nath	Fourth Edition
8.	PERT and CPM: Principles & Applications	L. S. Srinath	East-West Press Private Limited,	Third Edition
9.	Project Planning & Control with PERT & CPM	Dr. B.C. Punmia& K.K. Khandelwal	Firewall Media	Fourth Edition

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Course Code: PPE331 Course: Open Elective-I: Introduction to Nanotechnology Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
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Objectives	1.To study the introduction to nanomaterials and the factors affecting it. 2.To study the types and synthesis methods of nanomaterials. 3.To study the characterizations and properties of nanomaterials. 4.To study the different applications of nanomaterials.
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Unit-I	Introduction Introduction to nanotechnology, conventional micro vs. nano-material properties, role of size in properties of nano-materials, length scale and surface to volume concept, and uniqueness of nanostructured materials; health hazards and handling of nanomaterials. (4 Hrs)
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Unit-II	A) Synthesis Bottom-up and top-down approach for nano materials synthesis, methods: ball milling, chemical vapor deposition, pressure vapor deposition, ultrasound assisted, minimulsion, microemulsion, nanoemulsion, hydrothermal, sol-gel, miscellaneous techniques. (4 Hrs) B) Types of Nano-Materials Natural and synthetic clays – Montmorillonite and layered double hydroxide (LDH); carbon nanofibers (CNFs), carbon nanotubes, graphene nanosheets, nanosilica, nanoaluminium oxide, nanotitanium oxide, nano-hybrids. (4 Hrs)
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Unit-III	Properties of Nanomaterials in terms of Structure Property Relationship Thermal properties, mechanical properties, gas barrier properties, flame retardant properties, electrical and electrochemical properties, electronic properties, optical properties, magnetic properties, biodegradable properties, antimicrobial properties, catalytic properties. (6 Hrs)
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Unit-IV	Preparation of Polymer Nanocomposites Solution intercalation, melt intercalation, roll milling, emulsion polymerization, in-situ polymerization. (6 Hrs)
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Unit-V	Characterization of Nanomaterials and Nanocomposites X-ray diffraction (XRD), dynamic light scattering (DLS), scanning electron microscopy (SEM), Transmission electron microscopy (TEM), energy dispersive X-ray spectroscopy (EDS), atomic force microscopy (AFM), small angle X-ray scattering (SAXS), differential scanning calorimetry (DSC), thermo gravimetric analysis (TGA). (6 Hrs)
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Unit-VI	Application of Nanomaterials and Nanocomposites Biomedical-drug delivery, bone replacement; sensors – gas sensor, metal adsorption and recovery, bio-molecule detectors; energy storage and conversion - super capacitors, solar cells, energy generators; electronics; self-cleaning and self-healing paints, nano-engineering of cement-based materials, agricultural nanotechnologies. (6 Hrs)
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Textbook/	Sr. No.	Title	Author	Publication	Edition
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Reference Books

1.	Polymer Nanocomposites Processing, Characterization, and Applications	Joseph H. Koo	McGraw-Hill Nanoscience and Technology Series	1 st 2006
2.	Encyclopaedia of Nanoscience and Nanotechnology	Hari Singh Nalwa	American Scientific publishers	-
3.	Chapter: Advanced Hybrid Nanostructures: Preparation, Properties and Applications, Book: Encyclopaedia of Nanoscience and Nanotechnology	Aniruddha Chatterjee et al	American Scientific publishers	2018
4.	Nanoparticle Technology Handbook	M Hosokawa, K Nogi, M Naito, T Yokoyama	Elsevier	-
5.	The Science of Nanotechnology: An introductory text	Luanne Tilstra et al	Nova Science Publishers, Inc.	-
6.	Polymer-Layered Silicate and Silica Nanocomposites	Y.C. Ke, P. Stroeve	Elsevier	2005
7.	Nanotechnology in concrete – A review	Florence Sanchez, Konstantin Sobolev	Construction and Building Materials, Elsevier	24 (2010) 2060–2071
8.	Agricultural Nanotechnologies: What are the current possibilities?	Claudia Parisi et al	Nano Today, Elsevier	2014

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Course Code: CED321 Course: Lab Design of Steel Structure Teaching Scheme: Practical: 02 Hrs/week		Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	The objective of this subject is that the students should be able to analyse and design various types of Steel Structural elements related to Structural Engineering's.	
Assigned Work	Manual Design of an industrial building with mezzanine floor which should include the following: 1. Design of roof truss. 2. Design of Purlins. 3. Design of connections. 4. Design of Beams. 5. Design of Columns. 6. Design of Base. 7. Design of Beam to beam and beam to column connections. 8. Detail design report 9. Shop drawing and structural detailing of the above elements on half imperial drawing sheets (AUTOCAD may be used) 10. Report of a site visit mentioning structural details with relevant sketches of structural connections.	
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.	

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Course Code: CED322 Course: Lab Hydrology and Water Resources Engineering Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	This course acts as a foundation for design of various dam and irrigation structures, which students should be able to start design by themselves.
Assigned Work	Assignments based on following topics need to be submitted: 1. Various techniques of water distribution in farms. 2. Ridge line and drainage line treatment of watershed. 3. Kennedy silt theory of canal design with numerical. 4. Lacey's silt theory of canal design with numerical. 5. Design of transitions for C. D. works. 6. Determination of storage capacity of reservoir by mass curve analysis. 7. Stability analysis of gravity dam. 8. Causes of failure of earthen dam. 9. Design of weir by Bligh theory 10. Design of weir by Khosla's theory
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

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Course Code: CED323 Course: Lab Bridge Engineering Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Term work: 25 Marks
Objectives	Upon completion of this course, students should have learned the analysis and design of bridge superstructures, foundations, bearings, and deck joints.
Assigned Work	1. Determination of Flood Discharge under the Bridge. 2. Economic Span of Bridge. 3. Assignment on Bridge Section and Component part. 4. Assignment on Bridge Foundation. 5. Assignment on Culvert, CUP and VUP. 6. Loading standards for Bridge Design. 7. Assignment on Low-Cost Bridge. 8. Assignment on Bridge Bearings. 9. Assignment on Testing and Strengthening of Bridge. 10. Case study of Repairs and Rehabilitation of Bridge deck. 11. Visit to Bridge Site / Culvert.
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

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Course Code: CED324 Course: Lab DisasterManagement Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Term work: 25 Marks
Objectives	To provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer.
Assigned Work	Students should submit the assignments based on following topics: 1. Concept of Disaster, hazards and risk. 2. Classification of disaster. 3. Manmade disasters and their effects. 4. Environmental, physical and social impact of disasters. 5. Global and national disaster trends. 6. Disaster management cycle. 7. Preparedness for disaster. 8. Post-disaster environmental response. 9. DRR programmes in India and the activities of National Disaster Management Authority. 10. Sustainable and environmental friendly recovery; reconstruction and development methods.
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

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Course Code: CED325 Course: Lab Hydropower Engineering Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Term work: 25 Marks
Objectives	Student will get knowledge of different terminologies related with waterpower engineering and will be able to plan different structures for hydro power generation. At the end of this course student will be able to decide suitability of individual power plant in different situation
Assigned Work	Students should submit the assignments based on following topics: 1. Components of hydropower plants. 2. firm and secondary power and prediction of load. 3. Classification of hydropower plants. 4. Types and elements of an intake. 5. Classification of penstock, design criteria for penstock. 6. Typical layout of a powerhouse. 7. Comparison of underground and surface power station. 8. General layout of Tidal power station. 9. Depression power plant and micro power station. 10. Choice of type of turbine for a hydropower plant.
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

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Syllabus of Third Year B. Tech. (Civil Engineering) Semester V

Course Code: CED326
 Course: Minor Project
Teaching Scheme:
 Practical: 02Hrs/week

Credits: 0-0-1
 Term work: 25 Marks

Objectives	1.To plan for various activities of the project and distribute the work amongst team members. 2.To develop the ability to define and design the problem and lead to its accomplishment with proper planning. 3.To understand the importance of document design by compiling Technical Report on the Minor Project work carried out. 4.To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Minor Project.
Guidelines	1. Students should select a problem which addresses some basic home, office or other real-life applications. 2. Projects which will address the social issues will be given due weightage. 3. It is desirable that the systems developed by the students have some novel features. 4. The batch size shall not exceed TWO students per batch. 5. The students have to select a suitable problem, design, prepare the drawings, produce the components, assemble and commission the project. 6. Institute may arrange demonstration with poster presentation of all minor projects developed by the students at the end of semester. 7. At the end of the semester, the students have to prepare and present 20-25 pages project report. 8. Final evaluation shall be based on continuous internal assessment followed by Viva-Voce.
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. Oral Examination conducted on the syllabus and term-work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-V	
Course Code: CED327 Course: Lab STADD PRO Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	Student will be able to handle STAADPro which is the most popular structural engineering software product for 3D model generation, analysis, and design. It has an intuitive, user-friendly GUI, visualization tools, powerful analysis, and design facilities.
List of Practical	1. Elements of the STAADPro Screen. 2. Starting a New Project/Importing CAD Models. 3. Defining Structure Geometry/ Modelling. 4. Setting the Project Units. 5. Assigning Member Specifications. 6. How to specify member releases, Additional Member. 7. Specifications. 8. Assigning Supports and Loads (Nodal Load and Member Load) 9. Creating the Load Cases (Seismic Load Case and Wind Load Case) 10. Creating the Combination Load Case. 11. Performing the Analysis. 12. Design of Steel Structure 13. Design Viewing the Output File 14. Case study of Residential Building (G+3)
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

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Course Code: CED328

Course: Experiential / Problem Based Learning

Teaching Scheme:

Practical: 02 Hrs/week

Credits: 0-0-1

Term Work: 25 Marks

Course Objectives:

On completion of the course, learner will be able to –

- To develop positive attitude, new skills or new ways of thinking.
- To introduce independent and group learning by solving real world problem with the help of available resources.
- To be able to develop systematic approach in technical documentation.
- To select and utilize appropriate Software tools/Equipment/Problem solving tools to solve real life problems.

Guidelines:

The students plan, manage and complete a activity which addresses the stated problem.

1. The students must work in group to solve real life problem.
2. Open ended problems from course teachers can be considered from any course related to engineering field. (It can be domain specific/ multidisciplinary, but the emphasis on Civil Engineering.)
3. A mentor to be assigned to 3-4 groups / one batch.
4. The steps to be followed for problem-based learning are as mentioned below:

Step 1: Explore the issue.

Gather necessary information; learn new concepts, principles, and skills about the proposed topic.

Step 2: State what is known.

Individual students and groups list what they already know about the scenario and list what areas they are lacking information.

Step 3: Define the issues.

Frame the problem in a context of what is already known and information the students expect to learn.

Step 4: Research the knowledge.

Find resources and information that will help create a compelling argument.

Step 5: Investigate solutions.

List possible actions and solutions to the problem, formulate and test potential hypotheses

Step 6: Present and support the chosen solution.

Clearly state and support your conclusion with relevant information and evidence.

Step 7: Review your performance.

Often forgotten, this is a crucial step in improving the problem-solving skills. Students must evaluate their performance and plan improvements for the next problem.

Recommended parameters for assessment, evaluation and weightage:

1. Identification of the Problem (20%)
2. Documentation (Gathering requirements, design & modelling, implementation/execution, use of technology and final report, other documents). (30%)
3. Demonstration (Poster Presentation/Model Exhibition etc). (20%).
4. Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects. (10%)
5. Outcome (Participation in technical events / publication in national international conference journal/copyright/patent/prototype). (20%)

Reference Books/ Research Articles:	Sr. No.	Title	Author
	1.	A new model of problem-based learning	Terry Barrett

Web Resources:	2.	Research Methodology: Methods and Techniques	C. R. Kothari
		1. Problem-Based Learning: https://www.coursera.org/lecture/university-teaching/problem-based-learning-i-pbl-in-practice-SMXol 2. Problem-Based Learning: https://onlinecourses.swayam2.ac.in/ntr20_ed29/preview	
		The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. Oral Examination conducted on the syllabus and term-work mentioned above.	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI					
Course Code: CED351 Course: Design of RCC Structure Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Strength of materials, Design of steel structure				
Objectives	1. Student will be able to perform analysis and design of reinforced concrete members and connections. 2. Student will be able to identify and interpret the appropriate relevant industry design codes.				
Unit-I	Introduction- Stress strain behavior of concrete and steel, Behavior of RCC, Permissible stresses in steel and concrete, Different design philosophies, various limits states, Characteristic strength and characteristic load, Load factor, Partial safety factors. (06 Hrs)				
Unit-II	Limit state of collapse (flexure): Analysis and Design of Singly and Doubly Reinforced rectangular sections, singly reinforced T and L beams. (06 Hrs)				
Unit-III	Limit state of collapse (shear and bond): Shear failure, Types of Shear reinforcement, Design of Shear reinforcement, Bond-types, Factors affecting bond Resistance, Check for development length. b) Limit state of serviceability: Significance of deflection, IS recommendations, Cracking-classification and Types of Cracks, Causes. (06 Hrs)				
Unit-IV	1. Design of slabs: Cantilever Slab, simply supported One-way slab, Two-way slab with different support conditions as per IS:456-2000. 2. Design of staircase: Simply Supported single flight and Dog legged. (08 Hrs)				
Unit-V	Design of Column: Analysis and Design of axially and eccentrically (uni-axial) loaded rectangular columns, Interaction diagram, Design of Circular column with helical reinforcement. (06 Hrs)				
Unit-VI	Design of Footing: Design of isolated rectangular column footing with constant depth subjected to axial load and moment. (04 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Design of R.C. structure	Dr. A. K. Jain	NEM chand, Roorkee	2015
	2.	Design of R.C. structure	Dr. Shah & Karve	Structures publishers, pune	2017
	3.	Design of R.C. structure	Ramamurtham	Dhanpat Rai & Sons	2016
	4.	R. C. C. Designs	Dr. B. C. Punmia	Laxmi	2015
	5.	IS:456 2000 and SP-16.	Bureau of Indian Standards	Bureau of Indian Standards	2000

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI						
Course Code: CED352 Course: Geotechnical Engineering Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs			
Prerequisite						
Objectives		1. “The objective of this course is to introduce the civil engineering students to the behavior of soils under different loading conditions. It explores the natural characteristics, methods of classification and testing of soils as an engineering material 2.Students will understand the concept of bearing capacity and settlement related to design of the above structures and related permissible Criteria of B.I.S. Codes.”				
Unit-I		Introduction and Properties of soil: Origin of soil, scope of “Geotechnical Engineering”, soil Minerals, Mechanical composition of soil, Properties of soil and interrelationships, moisture content, grain size analysis, mechanical and sedimentation analysis, consistency limits, soil texture and structure, elementary ideas about swelling sensitivity and thixotropy (04 Hrs)				
Unit-II		Classification of Soil, Soil Moisture and Permeability: Particle size classification, Highway Research Board Classification, IS Classification and Unified Classification, Effective and neutral pressure. Seepage and flow net, Inverted Filters. (08 Hrs)				
Unit-III		Stress Distribution in Soil Bossinesq’s equation for point load, vertical pressure under loaded circular area and uniformly distributed Load, preparation and use of Newmark’s Chart (04Hrs)				
Unit-IV		Compaction and Consolidation: Proctor density and optimum moisture content. Comparison of’ standard and modified proctor test factor, affecting compaction. compressibility of soil, concept of consolidation spring analogy, Terzaghis one dimensional consolidation, secondary compression, square root of time fitting method. (06 Hrs)				
Unit-V		Shear Strength: Principles stresses, Mohr’s envelops for cohesive and non-cohesive soils and composite soils, general principle of drained, Consolidated un-drained and drained tests. Determination of shear strength by direct, unconfined, tri-axial and vane Shear tests. (08 Hrs)				
Unit-VI		Stability of slopes and Bearing capacity Factors contributing to slope failures, Classification of Slope failures, Infinite and finite slope. Friction circle method, Taylor’s number and stability curve. Types of foundations, Selection criteria, Bearing capacity of soil, settlement, laboratory test (06 Hrs)				
Text Book/ Reference Books		Sr. No.	Title	Author	Publication	Edition
		1.	Soil Mechanics and Foundation Engineering	- B.C.Punmia	Laxmi Publications	17th edition
		2.	Soil Mechanics and Foundation Engineering	Dr.K. R. Arora	A. K. Jain for standard publisher’s distributors	7th edition

	3.	Basic and applied soil mechanics	Gopal Ranjan and A. S. R. Rao	New age international publishers	3rd edition
	4.	Foundation Engineering	B.J. Kasmalkar	Pune Vidyarthi Griha	3rd edition

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Syllabus of T.Y.B. Tech. (Civil Engineering) Semester-VI

Course Code: CED353 Course: Environmental Engineering Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Basics of fluid mechanics.
Objectives	1. "A knowledge of Environmental Engineering-I helps the engineers to analyse, think logically and pursue the engineering approach for the benefits of society and therefore desirable as an integral part of engineering education and training, irrespective of the branch specialization." 2. A Knowledge of Environmental Engineering help the engineers to analyse, think logically and pursue the engineering approach for safe disposal of waste and therefore desires as an integral part of engineering education and training, irrespective of the branch specialization
Unit-I	Water demand & quantity: Introduction to Water Supply Scheme, Different Components of Water Supply Scheme, Water Demands, its Variation, Different factors affecting Water Demand, Design of Components, Population Forecasting Methods, Numerical Quality of water & its analysis: Wholesome water, potable water, contaminated water, Impurities in water. Analysis of water-physical, chemical & biological tests. Microorganism in water and Water Borne Diseases. IS standards. (06 Hrs)
Unit-II	Water treatment and softening process: Layout of WTP, Screening, Aeration, Primary settling, Coagulation & flocculation, sand filters, disinfection, methods of disinfection - boiling, chlorination, forms of chlorination chlorine demand & its estimation, break point chlorination, Design of various components of Water Treatment Plant. Examples, Water softening Methods, removal of colors, odors & tastes, treatment with activated carbon, removal of Heavy metals, Fluoridation & De-fluoridation. (06 Hrs)
Unit-III	Conveyance and Distribution system of water: Intakes & its types; Stresses in pipes, Corrosion of pipes & its prevention, Pipe appurtenances, Methods of distribution, Storage and distribution reservoirs —locations & types, Capacity estimation methods, numerical, Layouts of distribution system, Analysis & Design of distribution system – examples. Water piping systems- Plumbing Terminology, Fixtures Component Design. Air pollution & Control: Various layers of atmosphere, types of pollutants, Sources of air pollution & its effect (humans, property, plants & animals) control technique for SPM & gaseous pollutant (three methods of each), problems on particulate matter, Controlling equipment, Fabric Filters, Cyclones, Electrostatic Precipitator. (06 Hrs)
Unit-IV	Wastewater Terminology: Terminology in Waste Water-Sewage, Storm Water, Sullage, Sewer, Sewerage. Components of sewerage system, system of sanitation. Sewer System- Types, Layouts, Patterns of Collection System, Design of Sewers, Appurtenances. Quality and Characteristics of Wastewater: Physical, Chemical and Biological Parameters, BOD and COD, first and second stage BOD, limitations of BOD, Numerical on first stage BOD, and Basic Microbiology Related to Waste Water. (06 Hrs)
Unit-V	Natural Methods of Wastewater Disposal: Methods of disposal, disposal by dilution, Water Quality Modeling (self-purification & Zones of Pollution in streams, Oxygen Sag Curve, Streeter-Phelps Equation) Disposal on Land, Comparison Of Disposal Methods, Inline-Offline

	Flow Equalization. Wastewater Treatment process and its Design: Layout of STP, Screen, grit chambers, Settling Tanks, Activated Sludge Process, sludge disposal methods, design of various components of Wastewater Treatment Plant. (06 Hrs)				
Unit-VI	Low Cost Wastewater Treatment System and its Design: Objectives of Low Cost Treatment Plant, Types - Aerated lagoon, stabilization pond, Oxidation Ditch, Numerical. Advance Wastewater System: Nitrification and Denitrification, Phosphorous Removal, Removal of Dissolved Inorganic Substances. (06 Hrs)				
References	Sr. No.	Title	Author	Publication	Edition
	1.	Environmental Engineering	Howard, S. Peavy	Tata McGraw-Hill International Editions	International Edition
	2.	Water supply, Waste Disposal & Environmental Engineering	A. K. Chatterjee	Khanna publishers	8 th Edition
	3.	Water supply Engineering	S. K. Garg	Khanna publishers	34 th Edition
	4.	Water supply Engineering	B. C. Punmia, Ashok Jain, Arun Jain	Laxmi Publications	16 th Edition
	5.	Water Supply & Sanitary Engineering	G.S. Birdie, J. S. Birdie	Dhanpat Rai Publishing Company	4 th Edition
	6.	Air Pollution	M. N. Rao	Tata McGraw-Hill International Editions	1988
	7.	Sewage Disposal and Air Pollution	S. K. Garg	Khanna publishers	40 th Edition
	8.	Waste-Water Engineering	B. C. Punmia, A. K Jain	Laxmi Publications	2005
	9.	Waste-Water Engineering	Metcalf and Eddy	Tata McGraw Hill	2017

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Course Code: CED391 Course: Sustainability in River BasinManagement Teaching Scheme: Theory: 3 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Working knowledge of the water cycle, water budget, hydrological parameters and instrumentation.				
Objectives	1.To understand the concept of sustainability, hydrological cycle, nutrient cycle and factors influencing water resources. 2.To understand the insights of management options and tools in river basin management				
Unit-I	Introduction to climate and hydrology: Anthropocene, climate change, climate variability Hydrological cycle, water balance, catchment terminology, surplus, deficit, Stream morphology and land use Nutrient cycles. (06 Hrs)				
Unit-II	Sustainability: Sustainability indicators, resources depletion, growth models Planetary System Boundaries, footprints, prosperity Globalization, inter-connected world Stakeholders in sustainability. (06 Hrs)				
Unit-III	Climate change and water crisis: Pollution, water related diseases, water scarcity, water crisis, source water protection, wetlands, desertification Dams, diversions, artificial rainfall, Hydrological change due to climate change. (06 Hrs)				
Unit-IV	River basin management: River basin management, Water and land use, Water and society, poverty, demography Water governance, integrity, accountability ,Economic and financial instruments in water management. (06 Hrs)				
Unit-V	Conservation of water resources: Protecting water resources / improving water quality, Living standards, equity, education and technology transfer ,Water conservation and efficiency, Improving monitoring and data management, decision support systems. (06 Hrs)				
Unit-VI	Water management: Improving management and justice, Improving administrative (transnational) structures, Improving prediction and risk assessment Sustainability criteria (ecological, economic, institutional, social), Multi-criteria decision support. (06 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition/Year
	1.	Watershed Management	Murthy, J.V.S	New Age Intl	10 th Edition
	2.	Watershed Planning and Management	Vir Singh Raj	Yash Publishing house	2000
	3.	Irrigation Engineering	Michael A.M	Vikas Publishing house	1992
	4.	Watershed Development in India	Purandhare, A.P., Jaiswal A.K.	NIRD, Hyderabad	1995

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Course Code: CED392 Course: Ground Improvement Techniques Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-1 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Geotechnical Engineering
Objectives	Student would be able to design the ground improvement techniques and various parameter of groundwater depth.
Unit-I	Compaction: Introduction, review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil - lime, soil - cement, soil - bitumen and soil - lime - flyash mixes. (06 Hrs)
Unit-II	Drainage Methods: Seepage, Filter, Method of Dewatering systems, Design steps of dewatering system. Pre-compression and vertical drains: compressibility of soil and consolidation, monitoring of compression, in - situ densification methods in granular soils, Deep compaction: Introduction, Terra - Probe, Vibro-flotation techniques, Ground Suitability for Vibro-flotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. (06 Hrs)
Unit-III	In - situ densification methods in cohesive soil: Introduction, Pre - loading and de - watering, Vertical drains, Electrical method, Thermal method. Case studies. (06 Hrs)
Unit-IV	Grouting: introduction, suspension grout, solution grout, grouting equipment's and methods, Grouting design and layout Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. (06 Hrs)
Unit-V	Underpinning of foundations: importance and situations for underpinning, methodology, typical Examples and case studies. (06 Hrs)

Unit-VI	Geotextiles: types, functions, specifications, precautions in transportation and storage. (06 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Ground Improvement Techniques	Dr. P Purushothama Raj,	Laxmi Publication	1 st 2005
	2.	Ground Control and Improvement	Petros P. Xanthakos, Lee W. Abramson, Donald A. Bruce	Wiley Publication	1994
	3.	Basic and Applied Soil Mechanics	Gopal Ranjan and A. S. R. Rao		2007
	4.	Ground Improvement Techniques	Nihar Ranjan Patra	S. Chand Publication	1 st 2012
	5.	Geosynthetics World	Mandal J.N.	New Age International	1 st 1994

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Course Code: CED 393 Course: Prestress Concrete Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
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Prerequisite	Design of Reinforced Concrete Structure
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Objectives	1. To understand the Basic concept of Prestress Concrete 2. The purpose of the subject of Prestressed Concrete is to make the students aware of the Analysis and design of prestressed Concrete members for various types of failure and limit states.
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Unit-I	Introduction: Introduction to Prestressed Concrete. Pre-tensioning, Post-tensioning, Methods of Prestressing. Advantages and Disadvantages, Materials Used, Need of high strength materials, various terms, and definitions. Losses in prestressing, equations to evaluate losses, I. S. code provisions Application of various limit states in design of PC sections, I.S. Code provisions. Analysis of prestress and bending stresses due to self-weight and imposed loads. Load balancing concept (4Hrs)
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Unit-II	Analysis of stresses Resultant stress in PC member: Thrust line or pressure line. Shift of pressure line, Analysis of stresses by Internal resisting couple method. Strength of P.C. sections: Types of flexural failures, Flexural Strength of PC sections. Strain compatibility method, simplified I.S. Code method. Numerical on rectangular sections, flanged sections with X D for pretensioned, bonded post - tensioned members and unbounded post-tensioned members. (6Hrs)
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Unit-III	Shear and bond strength of P.C. sections: Principal tension in axially prestressed and with transverse prestressed members. Ultimate Shear resistance of sections (Web Shear failure, flexural Shear failure), Design of Shear reinforcement — I.S. Code Provisions, Transfer of prestress — Transmission of Prestressing force by bond., transmission length, Bond stress, code provisions for bond and transmission length. (6Hrs)
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Unit-IV	Analysis and design of end blocks: Anchorage zone Stresses in Post - tensioned members, Stress distribution in End Block, Anchorage zone Reinforcement, Principles of dimensioning Limit state design criteria: Philosophy of LSM, Design loads and Strengths, Strength, and serviceability limit states. Design of P.C. sections: Design for flexure, Equations for Prestressing force, minimum section modulus and eccentricity. Limitations for long span beams, Limiting zone for Tendons, Design for axial tension, bond, compression, flexure. (8Hrs)
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Unit-V	Analysis and design of continuous beams: Advantages of continuous members Method of Analysis of secondary moments, Concordant Cable profile, Guyon's theorem, Linear transformation, Ultimate load Analysis, Design of continuous beams. Circular prestressing: Circular Prestressing, Types of pipes, Design of circular pipes, Circular tanks, Analysis of tanks. (6Hrs)
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Unit-VI	Composite sections: Types of composite construction, Analysis of stresses, Strength and serviceability limit states, Flexural strength of a composite section, Shear strength of a composite section, Design of composite sections. Prestressed concrete poles and sleepers (6Hrs)
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Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Prestressed Concrete	Y N. Krishna Raju,	Tata McGraw-Hill Publishing Co.Ltd ,	Ninth edition

	2.	Prestressed Concrete	BY T. Y. Lin, Tata	McGraw-Hill Publishing Co.Ltd	Ninth edition.
	3.	Prestressed Concrete	S. Ramamrutham-	Dhanpat rai Co.and Sons	3rd edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester- VI					
Course Code: AED381 Course: Open Elective-II Fundamentals of Bioenergy Teaching Scheme: Theory: 3 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60Marks End Semester Examination (Duration):3 Hrs		
Prerequisite		Biomass sources and waste to energy recovery			
Objectives		1.Understand bioenergy technologies, processes, reactions and energy conversion rates for anaerobic Digestion, gasification, pyrolysis and combustion 2.Know what constitutes a suitable feedstock for bioenergy applications			
Unit-I		Introduction to bioenergy- Introduction,Unit of Energy and Introduction of Bioenergy, How Biomass Formed on the Earth, Road Map of Bioenergy, Basic Biomass Technology (Resources and Production) Exploration of Photosynthesis Process (06 Hrs)			
Unit-II		Biogas- Basic concept in anaerobic digestion and biogasification, mechanism of anaerobic digestion, Biochemical methane potential assay and calculations for biogasification feasibility analysis, Biogas utilization, Biomass production System and their Categorization, Components of biogas plants (06 Hrs)			
Unit-III		Bioethanol- Basic concept of Cellulosic Bioethanol Process, Pretreatment and Enzyme treatment of Cellulosic Bioethanol Process, Fermentation and Distillation in Cellulosic Bioethanol Production, characteristics of bioethanol (06 Hrs)			
Unit-IV		Biodiesel- Biodiesel production processes, Biodiesel characterization , Biodiesel feedstocks, biodiesel characteristics, Environmental permitting and safety considerations for biodiesel production. (06 Hrs)			
Unit-V		Thermo Chemical Processes: Basic concepts in gasification and pyrolysis, Gasification and pyrolysis systems, Gasification Types - Up Drift Gasifier, Down Draft and cross flow gasifier, operation and performance of gasifier (06 Hrs)			
Unit-VI		Bioenergy distribution and end use for a sustainable future: Biological root of gasification, non-conventional energy sources, waste-to-energy recovery (06 Hrs)			
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Introduction to Bioenergy (Energy and the Environment)	Vaughn C. Nelson (Author), Kenneth L. Starcher	CRC press	-
	2.	Bioenergy: Biomass to Biofuels	Anju Dahiya	AP Publications	-
	3.	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal	Wiley Publications	1 st edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester- VI					
Course Code: CED381 Course: Solid Waste Management Teaching Scheme: Theory: 3 Hrs/week			Credits: 3 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs		
Prerequisite	Environmental Engineering				
Objectives	1.To get introduced to the generation, collection and management of the various types of solid waste and different waste management techniques.				
Unit-I	Introduction to Solid Waste Management (SWM): Need and Objectives, Waste Management Hierarchy, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, types, Composition, Quantities, Physical, chemical and Biological properties. (06 Hrs)				
Unit-II	Generation of solid waste: Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection Systems, Transfer station: Meaning, Necessity, Transportation of solid waste: Means and Methods, Routing of vehicles. (06 Hrs)				
Unit-III	Segregation and Material Recovery: Objectives, Stages of segregation, sorting operations, Guidelines for sorting for materials recovery, E waste management, Biomedical waste management. (06 Hrs)				
Unit-IV	Waste processing: processing technologies: Composting, thermal conversion technologies incineration, treatment of biomedical wastes. Energy recovery from solid waste: Parameters affecting energy recovery, Bio-methanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options. (06 Hrs)				
Unit-V	Disposal: Landfills and its introduction, Definition, Essential components, Site selection, Land filling methods, Leachate analysis and landfill gas management, treatment & disposal, Determination of capacity of landfill disposal site. (06 Hrs)				
Unit-VI	Hazardous waste management (HWM): Types of hazardous waste (such as nuclear, biomedical and industrial waste), problems and issues related to HWM, Need for HWM, Legislations on management and handling of HW, Hazardous Characteristics, reduction of wastes at source, Recycling and reuse, labeling and handling of hazardous wastes, incineration, solidification & stabilization of hazardous waste. (06 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Integrated Solid Waste Management	Hilary Theisen and Samuel A, Vigil, George Tchobanoglous	McGraw- Hill, New York	1993
	2.	Manual on Municipal Solid waste management	CPHEEO, Central Public Health and Environmental Engineering Organization	Government of India, New Delhi	2000
	3.	Environmental Resources Management and Hazardous waste	Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans	Mc-Graw Hill International edition, New York	2001

		Management,			
	4.	Solid waste Engineering	Vesilind P.A., Worrell W and Reinhart	Thomson Learning Inc., Singapore	2002
	5.	Hazardous Waste Management	Charles A. Wentz	McGraw Hill International Edition, New York	1995 Second Edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester- VI	
Course Code: CSE381 Course: Open Elective-II Information & Cyber Security Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Knowledge of Computer Networking is necessary to understand the concepts.
Objectives	1.To understand the foundations of Information Security. 2.To learn various types of algorithms and its applications of Cyber Security 3.To identify insights on how to apply Cyber Security
Unit-I	Introduction The History of Information Security, Balancing Information Security and Access, Introduction and Security Trends, General Security Concepts and introduction to what is an “infosphere”, Operational Security and People’s Role in Information Security. 6 Hrs
Unit-II	Security Needs The Need for Security, Business Needs, Needs to protect against Threats and Attacks, Security in Emails. Secure Software Development. Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. 6 Hrs
Unit-III	Cryptography Concepts Concepts of Data encryption, Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography. Public Key Infrastructure (PKI), Different attacks on Cryptosystems. 6 Hrs
Unit-IV	Internet Standards and Authentication Basic concepts of Internet Standards and Physical Security, Network Security and Infrastructure, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Basics of authentication in Wireless Networks, Need of authentication in Wireless Communication. 6 Hrs
Unit-V	Security in Evolving Technology Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Open Source/ Free/ Trial Tools: adb for android, xcode for ios, 6 Hrs
Unit-VI	Cyber Security Vulnerabilities & Safe Guards Vulnerabilities-Overview, vulnerabilities in software, System administration, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment .Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit. 6 Hrs

Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Cryptography and Network Security	William Stallings	Pearson Education/PHI	2006
	2.	Cryptography and Network Security	V.K. Jain	Khanna Publishing House.	
	3.	Principles of Information Security	Michael E Whitman and Herbert J Mattord	Vikas Publishing House, New Delhi.	
	4.	Handbook of Information Security Management	Micki Krause, Harold F. Tipton,	CRC Press LLC	
	5.	Information and Cyber Security	Gupta Sarika	Khanna Publishing House, Delhi.	
	6.	Cryptography and Network Security	Atul Kahate	McGraw Hill.	

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Syllabus of Third Year B. Tech. (All) Semester- VI

Course Code: EED381 Course: Open Elective-II : Electrical Materials Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Basics of Electrical and Electronics Engineering, Physics, Chemistry
Course Objectives	1.To understand Basic electrical and electronics engineering. 2.To understand Electromagnetism and its laws. 3.To study the conducting and superconducting materials 4. To study the dielectric and nano materials
Unit-I	Crystallography Crystal directions and planes, Diatomic Crystal (CsCl, NaCl, Diamond, BaTiO ₃) Crystal imperfection, Point defects, Line defects, Surface and Volume defects, Structure properties relationship, structure determination by X-ray diffraction. (8Hrs)
Unit-II	Magnetic Materials Origin of magnetization using atomic theory, classification of magnetic materials and properties, Laws of magnetism, comparison of electrical and magnetic circuits theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Antiferromagnetic and Ferrimagnetic materials, Ferrites and Garnets. (5Hrs)
Unit-III	Conducting and Superconducting Materials Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors. (5Hrs)
Unit-IV	Semiconducting Materials Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic cell. (6Hrs)
Unit-V	Dielectric Materials Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials. (6Hrs)
Unit-VI	Nano Materials Nanomaterials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials. (6 Hrs)

Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Electrical engineering materials	A.J. Dekkar	McGraw Hill Publication	Edition 2
	2.	Science of Engineering Materials and Carbon Nanotubes	C.M. Srivastava and C. Srinivasan	New Academic Science	Edition 3
	3.	Material Science and Engineering	V.Raghavan	PHI Learning	Edition 5
	4.	Solid State Physics	A.J. Dekkar	Laxmi publication	Edition 3

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Syllabus of Third Year B. Tech. (All) Semester- VI

Course Code:ETC381 Course: Open Elective-II : Internet of Things Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Python Fundamentals, basics of electronics, Networking fundamentals, WWW Terminology				
Objectives	1.To understand IOT value chain structure (device, data cloud), application areas and technologies involved 2.To understand IOT sensors and technological challenges faces by IoT devices. 3.Explore and learn about Internet of things with the help of projects				
Unit-I	Unit-I : Introduction to IoT: Industry 4.0., Definition of IOT- Evolution of IOT and related terms, hardware, software, network stack for IoT, SAAS Model (6Hrs)				
Unit-II	Unit-II : Elements of IoT: Introduction to elements of IOT, Basic Architecture of an IOT application sensors, and Actuators, WPAN and LPWAN, 6LoPAN, Sigfox (6Hrs)				
Unit-III	Unit-III : IoT Sensors: Node MCU ESP 8266- hardware specification, GPIO programming, WIFI connectivity programming, Access Point Programming, Introduction to basis looping and conditional statements, basics of HTML. (6Hrs)				
Unit-IV	Unit-IV : Communication and Connectivity Technologies: Introduction to: TCP/IP, UDP, NTP, MQTT, Network and Sockets, Cloud Computing in IOT, IOT Communication Model (6Hrs)				
Unit-V	Unit-V : Data Analytics and IOT Platforms: Basics of statistics, Descriptive statistics and probability distributions. Big Data Analytics, Hadoop, Data Visualization, IOT Platforms Things speak, Microsoft Azure and Amazon Web Services, IBM Watson, Google Home and Amazon’s Alexa (6Hrs)				
Unit-VI	Unit-VI : Preparing IoT Projects Creating the sensor project with Node MCU ESP 8266, Sensor libraries, Internal representation of sensor values, External representation of sensor values, Exporting sensor data, Creating the actuator project (6Hrs)				
Text Book/ Reference Books/ Web	Sr. No.	Title	Author	Publication	Edition
	1.	The Internet of Things: Applications and Protocols,	Oliver Hersent, David Boswarthick, Omar Elloumi	Wiley publications	
	2.	Architecting the Internet of Things,	Dieter Uckelmann, Mark Harrison,	Springer publications.	

			Florian Michahelles		
	3.	Internet of Things with Arduino	Marco Schwatz	Cookbook, Packt Publications	
	4.	Introduction to internet of things - Course (nptel.ac.in)			

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (All) Semester- VI

Course Code: MED381 Course: Open Elective II- Industry 4.0 Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
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Prerequisite	•Computer fundamentals and understanding of basics of information technology. •Understanding of basic concepts of production and manufacturing technology
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Objectives	1.To make students aware of the structure and role of Industry 4.0, in current evolving industrial environment. 2.To give learners overview of Industry 4.0 technologies and their integration.
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Unit-I	Introduction- Four industrial revolutions, Digital transformation of Industry and the fourth industrial revolution, Scope of Industry 4.0, Automation pyramid and Industry 4.0, Principles of Industry 4.0. (6Hrs)
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Unit-II	Internet of Things (IoT)– Concept of IoT, IoT Architecture – Sensing layer, Network layer, Data processing layer, Application layer, Applications of IoT – for automobiles, homes, etc. Internet of Service (IoS), Internet of Energy (IoE). (6Hrs)
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Unit-III	Technologies in Industry 4.0 (1)- Augmented reality and Virtual Reality, 3D Printing, Collaborative robots, Smart material handling, Smart sensors, Concept of smart products. (6Hrs)
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Unit-IV	Technologies in Industry 4.0 (2)- Machine learning, Introduction to Cyber Physical Systems (CPS), Components of Cyber Physical Systems, Digital twins, Machine vision, Smart factory, Artificial intelligence. (6Hrs)
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Unit-V	Data in Industry 4.0- Big Data, Data Mining, Data Analytics, Cloud computing, Data – anew resource of organization, Data analysis for optimal decision making, Digitalization of the entire value chain. (6Hrs)
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Unit-VI	Applications of Industry 4.0- Industry 4.0 in Manufacturing – Predictive maintenance, Real-time supply-chain optimization, Digital performance management, Smart energy consumption, Challenges in implementing Industry 4.0. (6Hrs)
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Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	
	2.	Industry 4.0_ Managing The Digital Transformation	Alp Ustundag, Emre Cevikcan	Springer	
	3.	Automated Manufacturing System	Hugh Jack	-	
	4.	Industry 4.0_Opportunities Behind The Challenge	Dr. Mirjana Stankovic, Ravi	UNIDO General Conference 2017	

			E. Figueroa		
	5.	Handbook of Ind. Automation	Richard L. Shell Ernest L. Hall	Marcel Dekker	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of Third Year B. Tech. (All) Semester- VI

Course Code: PPE381 Course: Open Elective-II: Polymer Recycling and Waste Management Teaching Scheme: Theory: 03Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
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Prerequisite	•Basic knowledge of polymeric materials, additives and their properties. •Basic knowledge of polymer rheology and processing.
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Objectives	1.To learn the basic concepts used in the recycling of polymers along with learning about solid waste management.
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Unit-I	Significance of Recycling Introduction and classification of waste. Global polymer production and consumption, Global polymer waste composition, quantities and disposal, Identification of polymer for recycling. Recycling Process: collection, sorting and segregation of waste, Use of advanced technologies such as artificial intelligence in sorting, Recycling methods: primary, secondary, tertiary and quaternary recycling, landfilling. (6Hrs)
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Unit-II	Recycling Equipment/Machinery Equipment for primary and secondary recycling: shredder, granulator, pulverizer, shredder, cutter, Classification and types of reactors for tertiary recycling, Case study on waste to energy conversion plant. (5Hrs)
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Unit-III	Recycling of Plastics from Urban Waste Physiochemical, mechanical and rheological characteristics of recycled plastics, hydrolytic treatment of plastics waste containing paper, mixed plastic waste and its processing, recycling extrusion and additives used in polymer recycling, wood plastic composites, use of x-ray photoelectron spectroscopy (XPS) in recycling, international standards in recycling. (7Hrs)
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Unit-IV	Recycling Techniques PE/PP packaging films and woven sacks, PET bottles and films, PVC products, fiber reinforced plastics (FRP), and rubber products. (6Hrs)
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Unit-V	Municipal Solid Waste Management and Treatment Techniques Collection, storage, transportation and disposal of municipal solid waste, sorting of MSW, vehicles and equipment for primary collection, secondary collection and transport. a) Sanitary landfilling: Requirements, layout, leachate management, waste placement and inspection. b) Composting: windrow, aerated static pile, in vessel, decentralized, bin, box and vermicomposting. c) Biomethanation and refuse derived fuel. (7Hrs)
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Unit-VI	Tools for Combating Polymer Waste Combating tools for waste management: Case studies on extended producer responsibility, product stewardship, usage of green products and usage of biodegradable or environmentally degradable polymers, plastic roads. (5Hrs)
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Text Book/	Sr. No.	Title	Author	Publication	Edition
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Reference Books

1.	Plastics Fabrication and Recycling	Manas Chanda and Salil K. Roy	CRC Press	4 th (2007)
2.	Introduction to Plastics Recycling	Vannessa Goodship	Smithers Rapra	2 nd (2006)
3.	Recycling of Polymers	Raju Francis	Wiley-VCH	1 st (2016)
4.	Recycling of Plastic Materials	Francesco Paolo La Mantia	Chemtec Publishing	2 nd (1993)
5.	Feedstock Recycling and pyrolysis of waste plastics	John Schiers & W. Kaminsky	John Wiley and Sons	1 st (2006)
6.	Mixed Plastic Recycling Technology	B. Hegberg, G. Brenniman	Noyes Data Corporation	1 st (1992)
7.	Plastics Waste: Recovery of Economic value	Jacob Leidner	Marcel Decker Inc.	2 nd (2001)
8.	Management of municipal solid waste	T. V. Ramchandra	TERI Press	1 st (2009)
9.	Waste Management	Martin F. Lehmann	I. A. Publishers	1 st (2008)
10.	Environmental Waste Management	Ram Chandra	CRC Press	1 st (2015)
11.	Plastic Waste	Jacob Leidner	Marcel Decker Inc.	1 st (1981)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI	
Course Code: CED371 Course: Lab Design of RCC Structure Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	1.Student will be able to perform analysis and design of reinforced concrete members and connections. 2.Student will be able to identify and interpret the appropriate relevant industry design codes.
Assigned Work	Part A: - TW shall consist of detailed design and drawing based on structural planning and designing of R.C.C residential/ public building (G + 2) by limit state method. It shall include analysis and design of all structural members as per IS -456 -2000. The drawing shall be submitted on at least three full imperial size sheets. Part B: - Any of the above two structural components must be designed by the latest R.C.C design software like STAAD etc. Programs may also be developed using excel. Report of a site visit mentioning structural details with relevant Pictures of structural connections is required to be submitted (If any)
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI	
Course Code: CED372 Course: Lab Geotechnical Engineering Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	1.The objective of this course is to introduce the civil engineering students to the behavior of soils under different loading conditions. It explores the natural characteristics, methods of classification and testing of soils as an engineering material.
Assigned Work	List of Practical (Any 10 practical to be conducted) The term work shall consist of a record of laboratory experiments as mentioned below: 1. Determination of specific gravity 2. Field density test 3. Determination of particle size distribution of soil 4. Determination of Atterberg's Limits 5. Permeability test-variable or constant head method 6. Standard proctor compaction test 7. Direct shear test 8. Unconfined compression test 9. Tri-axial shear test 10. Consolidation test 11. Static cone penetration test 12. Standard Penetration test Note: Minimum 10 experiments should be carried out, out of 8, 9, 10, 11 and 12 four demonstration experiments will be permitted.
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI

Course Code: CED373 Course: Lab Environmental Engineering Teaching Scheme: Practical: 02 Hrs/week		Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	1.A Knowledge of Environmental Engineering help the engineers to analyze, think logically and pursue the engineering approach for drinking water and safe disposal of waste and therefore desires as an integral part of engineering education and training, irrespective of the branch specialization.	
Assigned Work	1. Determination of pH using pH meter 2. Determination of turbidity by titration method 3. Determination of alkalinity, Chloride and hardness of water sample by titration method. 4. Determination of fluoride and sulphate in Spectrophotometer 5. Visit to water treatment plant 6. Determination of Total solids in sewage sample. 7. Determination of SVI. 8. Determination of BOD @ 3 days and 5 days. 9. Determination of COD. 10. Determination of Characterization of wastewater from any two source and interpretation of results. 11. Visit to waste water treatment plant.	
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI

Course Code: CED374
 Course: Major Project-I
Teaching Scheme:
 Practical: 04 Hrs/week

Credits: 0-0-2
 Practical Examination: 50 Marks

Prerequisite

Application of theory in real life problems.

Objectives

1. The Projects in the undergraduate study of engineering aims at developing in the student, knowledge and skills to match the current and projected needs of industry, society or user systems and to create social awareness and professional attitudes. Apart from monitoring the engineering processes and maintenance of engineering work, machines and equipment, an engineer has to do investigate survey, collect data, refer handbooks/datasheets, prepare estimates and design the systems.

Contents

- The completion of project is to be carried out in two semesters i.e. in Third Year Sem. VI and Final Year B. Tech Sem. VII.
- The students shall form project group of maximum 3 students for within department projects and maximum of 6 students in case of interdisciplinary projects of their choice.
- The students groups shall collect the information on the topic/area of interest and submit brief synopsis to Project Coordinator.
- The Project Coordinator shall allot the Project Guide depending upon the area or specialization of eligible faculty members from the department.
- The individual student from the project group shall maintain the project diary and update weekly by taking remark of respective guide.
- The industry sponsored projects and inter departmental projects shall be encouraged and in case of inter departmental projects, students of maximum 3 different departments/disciplines shall work together by forming the group. The guide allotment and internal/external assessment of such groups shall be done by the respective departments.
- The projects addressing issues related to environmental, rural development and societal issues shall be preferred.
- The selected project shall help to promote participation in government approved schemes like Unnat Maharashtra Abhiyaan (UMA) and Unnat Bharat Abhiyaan (UBA).
- The students shall aim to promote their project work in project exhibitions/competitions, paper presentation/publication in reputed journals and conferences.
- The relevance of project and implementation including details of attainment of POs and PSOs addressed through the projects with justification must be clearly stated.

Phases of Major Project - I:

Phase I: Problem Identification, Literature survey, data collection, deciding scope of topic and objectives and Methodology of the project.

Phase II: Confirmation of block diagram or layout of the proposed project.

Phase III: Submission of report of project work.

The assessment of term work shall be done on the basis of the following:

- Continuous Assessment.
- Performing the experiments in the Laboratory.

Oral Examination conducted on the syllabus and term-work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Civil Engineering) Semester-VI	
Course Code: CED375 Course: Lab Non-Destructive Testing Teaching Scheme: Practical: 02 Hrs/week	Credits: 0-0-1 Term work: 25 Marks
Objectives	1.To understand and demonstrate various non-destructive test techniques and methods for quality control of new construction as well as the inspection of existing concrete structures.
List of Practical (Any 8)	1. Rebound hammer test to determine compressive strength of concrete and its comparison with destructive test in the laboratory 2. Rebound hammer test to determine compressive strength of cement mortar and its comparison with destructive test in the laboratory 3. Rebound hammer test to determine compressive strength of concrete in existing concrete structure 4. Rebound hammer test to determine compressive strength of concrete in existing concrete structure and its comparison with results obtained from core test 5. Rebound hammer test to determine compressive strength of brick 6. UPV test to determine quality of concrete 7. UPV test to determine crack location and its width 8. UPV test to determine thickness of concrete member 9. Rebar locator test to locate reinforcing bars in existing concrete structures 10. Corrosion test for reinforcing bars in concrete structure
	The assessment of term work shall be done on the basis of the following: • Continuous Assessment. • Performing the experiments in the Laboratory. • Oral Examination conducted on the syllabus and term-work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science and Technology)
Syllabus of T.Y.B. Tech. (All) Semester-VI

Course Code: BSH807 Course: Mandatory non-credit course (German Language) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
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Objectives	1.Students will be able to apply communicative German Grammar in communication. 2.Students will be able to enhance the level of German vocabulary. 3.Students will be able to pronounce and articulate words as well as sentences accurately. 4.Students will be able to understand and apply German language eventually. 5.Students will be able to develop German language skills. 6.Students will be able to manage situational communication in German. .
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Unit-I	Introduction - Self –Introduction - Nos. up to 10,000 - Weekdays, Months - Date and Time - Greetings (6 Hrs)
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Unit-II	Vocabulary - My house - My family - Daily routine - Hobbies - Food (6 Hrs)
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Unit-III	Grammar - Verb forms (Present Tense) - Articles - Possessive pronouns - Auxiliary verbs - Wh-Questions / Yes-No Questions - Past-Tense of haben and sein (12 Hrs)
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List of ReferenceBooks	Sr. No.	Title	Author	Publication
	1	German Made Simple: Learn to speak and understand German quickly and easily	Arnold Leitner PhD	Namrata's Amazon.in
	2	The Everything Learning German Book: Speak, write, and understand basic German in no time	Edward Swick	Adams Media
	3	Langenscheidt German in 30 Days	Von Angelika G. Beck	Langenscheidt
	4	Complete German Beginner to	<u>Heiner Schenke</u>	The McGraw

		Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself		Hill
	5	German: How to Speak and Write It (Beginners' Guides)	Joseph Rosenberg	Repro Books
	6	Collins Easy Learning – Collins Easy Learning German Grammar and Practice	Collins	Collins

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Syllabus of T.Y.B. Tech. (All) Semester-VI

Course Code: BSH808 Course: Mandatory non-credit course (Japanese Language) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
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Objectives	1.Students will be able to apply communicative Japanese Grammar in communication. 2.Students will be able to enhance the level of Japanese vocabulary. 3.Students will be able to pronounce and articulate words as well as sentences accurately. 4.Students will be able to understand and apply Japanese language eventually. 5.Students will be able to develop Japanese language skills. 6.Students will be able to manage situational communication in Japanese.
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Unit-I	Introduction - Introduction - Numbers - Days, Months, Dates (8 Hrs)
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Unit-II	Grammar - Verb and verb forms - Present and Past Tense(8 Hrs)
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Unit-III	Communication - Introduction of Japanese script - Dialogues (Shopping, in the restaurant) - Themes: Family, my city, my country, my friend(8 Hrs)
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Sr. No.	Title	Author	Publication
1	Japanese Kanji for Beginners	Timothy G. Stout and Kaori Hakone	Tuttle Publishing
2	Essential Japanese Grammar: A Comprehensive Guide to Contemporary Usage	Masahiro Tanimori and Eriko Sato Ph.D.	Tuttle Publishing
3	15-Minute Japanese: Learn in Just 12 Weeks	D.K. Goel and Rajesh Goel	Amazon.in
4	Oxford Japanese Grammar and Verbs (Dictionary)	Bunt Jonathan	Oxford Publication
5	Read and write Japanese scripts: Teach yourself	Helen Gilhooly	Teach Yourself
6	Complete Japanese Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Helen Gilhooly	Teach Yourself

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.Y.B. Tech. (All) Semester-VI					
Course Code: CED801 Course: Mandatory non-credit course (Professional Ethics and Constitution of India) Teaching Scheme: Theory: 02 Hrs/week				Credits: 0-0-0 Marks: 50 (Continuous Assessment)	
Prerequisite	Knowledge of the basic structure of constitution of India.				
Objectives	To create awareness of Engineering Ethics and human values, instill moral social values, loyalty and ethical issues. It will allow the students to assimilate with basic information about Indian Constitution, know its salient features and thus functioning of Democracy in India.				
Unit-I	Professional Ethics: Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift v/s Bribery, Environmental breaches, Negligence, Deficiencies in state of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. (4Hrs)				
Unit-II	Engineering and Professionalism: Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. (4Hrs)				
Unit-III	Responsibility and reliability in Engineering: Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering. (4Hrs)				
Unit-IV	Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. (4Hrs)				
Unit-V	Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370,371,371J) for some States. (4Hrs)				
Unit-VI	Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74, ,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. (4Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	“Engineering Ethics(Including Human Values)	Govindrajan.M, Natrajan S, SenthilkumarV.S	PHI publication	

2.	Ethics, Integrity and Aptitude	Reddy.N H, Ajmera, Santosh,	Tata McGraw Hill	2014
3.	Introduction to the Constitution on India	Durga Das Basu	Prentice –Hall EEE, 19th / 20th Ed.	2008 and latest
4.	“Constitution of India and Professional Ethics	Shubham Singles, Charles E. Haries, and Et al	Cengage Learning India Private Limited	Edition – 2018
5.	An Introduction to Constitution of India	M.V.Pylee	Vikas Publishing	2002

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.Y.B. Tech. (All) Semester-VI	
Course Code: CSE801 Audit Course: Mandatory non-credit course (Green Computing) Teaching Scheme: Theory: 2 Hrs /week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
Prerequisite	
Objectives	1. To learn the fundamentals of Green Computing. 2. To understand the concepts related to Green IT, Green devices and hardware along with software methods, green enterprise activities. 3. To study the various laws, standards, protocols for regulating green IT 4. To study various case studies related to the application of Green IT strategies.
Unit-I	Green IT: An Overview Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labeling of IT. (4Hrs)
Unit-II	Green Devices and Hardware with Green Software Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques. (4Hrs)
Unit-III	Green Enterprises and the Role of IT (04 hrs) Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues. (4Hrs)
Unit-IV	Managing Green IT: Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and social media. (4Hrs)
Unit-V	Regulating the Green IT: Laws, Standards and Protocols Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace. (4Hrs)
Unit-VI	Case Studies The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and

	Applications to a Home, Hospital. (4Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Harnessing Green IT Principles and Practices	San Murugesan, G.R. Gangadharan	Wiley Publication	
	2.	Green IT Strategies and Applications-Using Environmental Intelligence	BhuvanUnhelkar	CRC Press	June 2014
	3.	The Greening of IT	John Lamb	Pearson Education	2009
	4.	Green Home computing for dummies	Woody Leonhard, Katherine Murray		2012

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Syllabus of T.Y.B. Tech. (All) Semester-VI

Course Code: ETC801 Course: Mandatory Non-credit Course (Smart Cities) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
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Prerequisite	Nil
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Objectives	1.To identify urban problems. 2.To study Effective and feasible ways to coordinate urban technologies. 3.To study models and methods for effective implementation of Smart Cities.
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Unit-I	Smart cities: Ideal Smart City loop, Socio-economic and environmental issues, Implications of Urbanization, Urbanization models and global trends, Urbanization in India (04 Hrs)
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Unit-II	Criteria for smart cities: Smartness - Citizens, Living, Environment, Mobility, Economy, Governance Pillars of Smart cities, Buildings, Utilities, Transportation and road Infrastructure, Health Care, Sustainability issues (04 Hrs)
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Unit-III	Fundamental Technologies: Ubiquitous computing, Big Data, Networking, Internet of Things, Cloud computing, Cyber security architectures (04 Hrs)
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Unit-IV	ICT for Smart Cities: Complex Urban systems ICT Infrastructure modelling, Typical Edge Environment, Smart Cities as Systems of Systems, IoT Centric approach, IoT technologies: WiFi, 6LowPAN, Cellular, NFC, LoRa, Bluetooth, RFID, Zigbee (04Hrs)
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Unit-V	Smart City: Smart Street lighting, Smart Parking, Environmental pollution monitoring, Vehicular tracking, Smart Traffic Control, Waste Management, Smart Grid, Amenity availability, Heritage Information portal, Mobile application design, development and Visualization (04 Hrs)
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Unit-VI	Case Studies of Smart Cities: National and International smart cities, their model, Clusters and Urbanization, Environmental Issues: The Role of Local and Global Climate Change (04Hrs)
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Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	The City of Tomorrow: Sensors, Networks, Hackers, and theFuture of Urban Life (The Future Series)	Carlo Ratti and Matthew Claudel	Yale University Press	
	2.	The Responsive City: Engaging Communities Through Data-Smart Governance	Stephen Goldsmith, Susan Crawford	Jossey Bass – Wiley	, 1st Edition.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.Y.B. Tech. (All) Semester-VI

Course Code: MED801 Course: Mandatory non-credit course (Research Methodology) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
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Prerequisite	No prerequisite as such
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Objectives	1.To introduce students to quantitative and qualitative methods for conducting meaningful inquiry and research. 2.Prepare a preliminary research design for projects in their subject matter areas 3.Accurately collect, analyze, and report data 4.Present complex data or situations clearly
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Unit-I	Research Problems and Research Design: -Meaning of research, objectives of research, motivation in research, types of research, steps involved in research process, criteria of good research, significance of research, research methods versus methodology, selection of research problem, steps involved in defining research problem, research process, need for research design, types of research designs, basic principles of experimental design, formal and informal experimental design. (4 Hrs)
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Unit-II	Sampling Design: -Need for sampling, steps in sampling design, different types of sampling designs, sampling distributions, concept of central limit and standard error, sources of errors, population mean and proportion, sample size calculations, tests of measurements for validity, reliability, and practicality. (4 Hrs)
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Unit-III	Data collection, Processing and Analysis: -Methods for collection of data, selection of data collection method, data processing operations, statistics in research, confidence level, measures of central tendency, dispersion, asymmetry and relationship. Spearman's and Pearson's coefficient of correlation, simple & multiple regression analysis, analysis of variance (ANOVA), factor analysis methods. (4 Hrs)
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Unit-IV	Hypothesis Test:- Concept of research hypothesis, concept of testing of hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of a hypothesis test, Parametric tests (z, t, F and chi-square tests), Hypothesis testing of means and correlation coefficient, Limitations of the tests of hypotheses. (4 Hrs)
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Unit-V	Report Writing Interpretation: Meaning of Interpretation, Why Interpretation? Technique of Interpretation, Precaution in Interpretation. Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions. (4 Hrs)
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Unit-VI	Ethics: - Ethical Issues, Ethical Committees, Commercialization, copy right, royalty, Intellectual Property rights and patent law, Reproduction of published material, Plagiarism, Citation and Acknowledgement, Reproducibility, and accountability. (4 Hrs)
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Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
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1.	Research Methodology: Methods & Techniques	C. R. Kothari and G. Garg	New Age International	4 th Edition, 2019.
2.	Research Methodology	R. Pannerselvam	PHI Learning,	2 nd Edition, 2014
3.	Research Methods and Statistics	Bernard C. Beins & Maureen A. McCarthy	Pearson Education Inc.	2012
4.	Research Methods Handbook	Stuart MacDonald & Nicola Headlam	CLES	-
5.	Intellectual Property Rights-- Unleashing the Knowledge Economy,	Ganguli Prabuddha.	Tata McGraw-Hill,	2001
6.	Intellectual Property Rights	Neeraj Pandey and Khushdeep Dharni.	PHI Learning	1st Edition, 2014
7.	Fundamentals of Intellectual Property Rights,	Ramakrishna B.	Notion Press	1st Edition, 2017
8.	The Indian Patents Act 1970 (as amended in 2005)	-	-	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T.Y.B. Tech. (All) Semester-VI

Course Code: PPE801 Course: Mandatory non-credit (Industrial Safety and Management) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
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Objectives	1.To understand the fundamental concepts, and methods in Industrial Safety. 2.To understand the impact of safe industrial operations, its benefits and safety management.
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Unit-I	Introduction to Industrial Safety Introduction, key concepts, terminologies, Need for safety, Safety information system. (4 Hrs)
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Unit-II	Safety Management Safety inspection, procedure, checklist, safety sampling, safety audit, safety survey, accident prevention, training for safety. (4 Hrs)
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Unit-III	Safety in Process Safety in material handling and equipments used, design for safety in process. (4 Hrs)
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Unit-IV	Fire Safety Classification of fires. Common causes of industrial fires. Fire protection systems. (4 Hrs)
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Unit-V	Hazards Occupational health hazards, physical and chemical hazards. (4 Hrs)
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Unit-VI	Hazard Analysis Fault tree and event tree analysis, hazard identification techniques (e.g., HAZOP, HAZAN, OSHAS 18001). (4 Hrs)
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Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Industrial Safety, Health and Environment Management Systems	R.K.Jain and Sunil S.Rao	Khanna Publishers, New Delhi	2006
	2.	Industrial Safety Management	Deshmukh L M	Tata McGraw-Hill	
	3.	Handbook of Occupational Safety and Health	Slote.L	John Willey and Sons, New York	
	4.	Safety at Work	Ridley J and Channing J	Butterworth-Heinemann UK	
	5.	Loss of prevention in Process Industries , Vol. 1 and 2	Frank P. Lees	Butterworth-Heinemann Ltd., London	1991
	6.	Safety Management	Grimaldi and Simonds	AITBS Publishers, New Delhi	2001

Website	https://nptel.ac.in/courses/110/105/110105094/
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