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MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABAD

An Autonomous Institute Affiliated to

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra (India)

Third Year B.Tech. Syllabus (Civil Engineering) 2023-24

T.Y.B.Tech. SyllabusStructurew.e.f.2023-24														
Civil Engineering														
Sr. No	Course Category	Course Code	Course Title	L	T	P	Contact Hr/Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE/ Oral	Total
			Orientation Program (1 Day)											
1.1	HSMC	HSM301	Engineering Economics & Financial Management	3	-	-	3	3	15	15	10	10	50	100
1.2	PC	CED301	Estimating and Costing	3	-	-	3	3	15	15	10	10	50	100
1.3	PC	CED302	Geotechnical Engineering	3	-	-	3	3	15	15	10	10	50	100
1.4	PC	CED303	Design of Steel Structures	3	-	-	3	3	15	15	10	10	50	100
1.5	PC	CED304	Hydrology and Water Resources Engineering	3	-	-	3	3	15	15	10	10	50	100
1.6	PC	CED321	Lab-I: Estimating and Costing	-	-	2	2	1	-	-	-	25	-	25
1.7	PC	CED322	Lab-II: Geotechnical Engineering	-	-	2	2	1	-	-	-	-	25	25
1.8	PC	CED323	Lab-III: Design of Steel Structures	-	-	2	2	1	-	-	-	-	25	25
1.9	PRO	CED324	Lab-IV: Seminar	-	-	2	2	1	-	-	-	-	25	25
1.10	PRO	CED325	Lab-V: Experience-based learning	-	-	2	2	1	-	-	-	25	-	25
1.11	PC	CED326	Lab-VI: Development of Skills (Computatitional) STADD-PRO	-	-	2	2	1	-	-	-	25	-	25
S5				**15**	**0**	**12**	**27**	**21**	**75**	**75**	**50**	**125**	**325**	**650**

Semester-VI

Sr. No	Course Category	Course Code	Course Title	L	T	P	Contact Hr/Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE/Oral	Total
2.1	PC	CED351	Environmental Engineering	3	-	-	3	3	15	15	10	10	50	100
2.2	PC	CED352	Highway Engineering	3	-	-	3	3	15	15	10	10	50	100
2.3	PC	CED353	Design of Reinforced Cement Concrete	3	-	-	3	3	15	15	10	10	50	100
2.4	PC	CED354	Construction Management	3	-	-	3	3	15	15	10	10	50	100
2.5	OE	CED391	Solid Waste Management	3	-	-	3	3	15	15	10	10	50	100
2.6	PC	CED371	Lab-I: Environmental Engineering	-	-	2	2	1	-	-	-	25	-	25
2.7	PC	CED372	Lab-II: Highway Engineering	-	-	2	2	1	-	-	-	25	-	25
2.8	PC	CED373	Lab-III: Design of Reinforced Cement Concrete	-	-	2	2	1	-	-	-	-	25	25
2.9	PC	CED374	Lab-IV: Non-Destructive Testing	-	-	2	2	1	-	-	-	-	25	25
2.10	PRO	CED375	Lab-V: Major Project-I	-	-	4	4	2	-	-	-	25	25	50
S6				**15**	**0**	**12**	**27**	**21**	**75**	**75**	**50**	**125**	**325**	**650**
		MSE- Mid Semester Exam, ESE- End Semester Examination, TH-Theory, OR- Oral, TA-Teacher Assessment, TW- Term Work, PR- Practical, Tut- Tutorial, CIE-Continuous Internal Evaluation												

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TY OPEN ELECTIVE-III (ALL)

DEPARTMENT OFFERED	COURSE CODE	COURSE TITLE
Agricultural Engineering	AED391	Fundamentals of Bioenergy
Civil Engineering	CED391	Solid Waste Management
Computer Science and Engineering	CSE391	RHCSA (RedHat Certified System Administration)
Computer Science and Engineering	CSE392	Digital Marketing
Electronics and Computer Engineering	ECE391	Data Science
Electronics and Computer Engineering	ECE392	Control Systems
Electrical Engineering	EED391	Special Purpose Electric Machines
Emerging Science and Technology	AID391	Business Intelligence
Mechanical Engineering	MED391	Industry 4.0
Mechanical Engineering	MED392	Operations Research
Plastic and Polymer Engineering	PPE391	Waste Management and Circular Economy

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

Course Code: HSM301 Course: Engineering Economics & Financial Management **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II:15Marks Continuous Internal Evaluation: 10Marks TeacherAssessment:10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs

Prerequisite	Basic knowledge of concepts of economics.
Objectives	The objectives of the course are 1. Understanding the principles of economics. 2. Analyzing cost-benefit analysis. 3. Recognizing the role of markets and competition. 4. Understand decision making in uncertainty. 5. Getting introduced to Indian taxing system.
Unit-I	**Introduction to Engineering Economics:** Introduction to Economics, Importance and scope of economics in engineering, Economic analysis and its role in project management, Overview of economicprinciples and concepts relevant to engineering, Micro - and macro- economics,economics of growth and development, Demand and supply analysis. **(6 Hrs)**
Unit-II	**Cash Flow and Time Value of Money** Interest rates, compounding, and discounting, Present value and future value analysis, Equivalent annual cost analysis. Cash Flow – Diagrams, Categories & Computation, Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis , Calculating Rate of Return, Incremental Analysis. **(6 Hrs)**
Unit-III	**Elements of Managerial Economics** Cost &Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time valueof money (present and future worth of cashflows). Business Forecasting – Elementary techniques. **(6 Hrs)**

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Unit-IV	**Rate analysis and Tendering** Rate analysis - Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity. **(3 Hrs)** **Tendering** - Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, penalty and liquidated charges, Settlement of disputes. Bid conditions, alternative specifications, Alternative Bids, Bid process management. **(3 Hrs)**
Unit-V	**Decision-making under Risk and Uncertainty** Probability and risk assessment in engineering projects, Sensitivity analysis andscenario analysis, Decision trees and expected value analysis, Real options analysis. **(3 Hrs)** **Depreciation** Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation. **(3 Hrs)**
Unit-VI	**Personal Financial Management** Insurance, Investment, Insurance Vs.investment, Investment types, Equity and debt,Investment options, lumpsum, SIP, STP, Compounding effects of investment, Investment analysis, Introduction to Stock market, fundamental and technical analysis, Derivatives, Types of derivatives, Trading awareness. **(3 Hrs)** **Indian Taxing System** Types of tax: Direct and indirect taxation in India, Excise duty, GST, Income tax introduction, Income Tax calculations, example. **(3 Hrs)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Economics for Engineers	James L.Riggs, David D. Bedworth, Sabah U. Randhawa	McGraw-Hill	Fourth
2.	Engineering Economics Analysis	Donald Newnan, Ted Eschembach, Jerome Lavelle	OUP	1st
3.	Principle of Engineering Economic Analysis	John A. White, Kenneth E. Case,DavidB.Pratt	John Wiley	1st
4.	Engineering Economics	R. Paneerseelvam	PHI	1st
5.	Engineering Economics Analysis	Michael RLindeburg	Professional Pub	1st
6.	Managerial Economics	V. Mote, S. Paul, G. Gupta	Tata McGraw Hill	2004
7.	Principles of Economics	Mankiw Gregory N.	Thompson Asia	2002

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

Course Code: CED301 Course: Estimating and Costing 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 Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Basics of Building Construction, Building Materials, Surveying.
Objectives	1. To understand what Estimating and Costing is. 2. To understand the various activities involved in construction.
Unit-I	**Introduction**: Importance and purpose of the subject, Units of measurement as per I.S.1200. Items of work and Description of items of work, administrative approvals, technical sanction, preliminary estimates. objectives, and its methods Earthwork estimates in road, hill roads and canals, mass haul curves, methods of consumptions of earthwork. **(4 Hrs)**
Unit-II	**Detailed estimates**: objects, importance, accuracy. Methods of detailed estimates, Detailed estimates of load bearing and framed structures. Calculation of reinforcing steel with Bar bending Schedule. **(6 Hrs)**
Unit-III	**Tenders and Contracts**: Method of carrying out works, tender notice, acceptance of tender, essentials of contract, type of contracts, contract documents, land acquisition act, Legal aspects of various contract provisions, Arbitration. **(6 Hrs)**
Unit-IV	**Specifications**: IS 1200 Introduction, Purpose and principles of specifications writing, Types of specifications, writing and developing detailed specifications of Important items of building and road work. **Cost Accounting :** Various methods, classification of cost, direct and indirect charges, distribution of overheads, issue rates and stores Account. **(8 Hrs)**
Unit-V	**Rate Analysis**: Introduction, Purpose and principles of CSR, Factors affecting analysis of rates, labour guidelines from National Building Organization, market rates of materials and labour, Rate analysis of major items of work. **(6 Hrs)**
Unit-VI	**Valuation**: Purpose of valuation, Factors affecting property price and cost, Types of Value. Real Estate, Tenure of land, Free hold and lease hold, sinking fund, Depreciation, and its methods, Capitalized value, Methods of valuation, Net & Gross income, Rent fixation. **(6 Hrs)**

References	Sr No	Title	Author	Publication	Edition

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	1	Estimating and Costing	B.N. Dutta	UBS Publishers' Distributors Ltd	27th Revised edition
	2	Estimating & Costing by	M. Chakraborty	Chakraborty Publishers'	3rd edition
	3	Valuation	Roshan Namavati	Namavati Publishers'	1st edition
	4	Philosophy of Valuation.	S. S. Rathore.	Allied Publishers Pvt. Ltd	1st edition

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED302 Course: Geotechnical 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 Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 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. **(4 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. **(8 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. **(4Hrs)**
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. **(6 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. **(8 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

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	test. (6 Hrs)				
References	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1	Soil Mechanics and Foundation Engineering	B. C. Punmia	Laxmi Publications	**2005**
	2	Soil Mechanics and Foundation Engineering	Dr. K. R. Arora	A. K. Jain for standard publisher's distributers	**2008**
	3	Basic and applied soil mechanics	Gopal Ranjan and A. S. R. Rao	New age international publishers	**1991**
	4	Foundation Engineering	B.J. Kasmalkar	Pune Vidyarthi Griha	**2012**

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

Course Code: CED303 Course: Design of Steel Structure. Teaching Scheme: Theory: 3Hrs/week Practical: 2 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 3 Hrs

Prerequisite	Strength of Materials, Engineering Mechanics
Objectives	Students will have a comprehensive understanding of 1. Structural design principles, limit state design, steel structures and its basic components 2. Various connection types, Structural steel fasteners like welding and bolting. 3. Design of tension and compression members, design of beams and plate girders, roofing system design, and an introduction to cold-formed steel.
Unit-I	Introduction to structural design: Structural systems, Roll of the designer, Advantages & Disadvantages of steel as a structural material, Types of structural steel, various rolled steel sections & structural pipe (tube) sections and their properties, Codes and specifications. Introduction to Limit state design: Design philosophies & analysis procedures, Design requirements, Loads & load combinations, Types of limit states (limit state of strength, limit state of serviceability). **(6Hrs)**
Unit-II	Connections: i) Bolted connections: Classification, Behavior of bolted joints. Design strength of ordinary black bolts, Design of simple connections, Analysis of Bolt Group, beam to beam, beam to column, framed connections. ii) Welded connections: Advantages and disadvantages, types and properties of welds, specification for weld, types of joints, Design of simple connections, Beam to beam, beam to column, framed connections. **(6 Hrs)**
Unit-III	Design of Tension members: Types of tension members, Behavior of tension members, Modes of failure, Design of sections for tension, tension member splice, and lug angles. **(6 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 Battened columns. Column bases: Slab base and Gusseted base. **(6 Hrs)**

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Unit-V	Design of beams: Laterally restrained and unrestrained simply-supported beams. Design of compound beams. Design of plate girder: Economical depth, shear buckling resistance of web, end panel design, anchor forces, design of plate girder with stiffeners. **(6 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. Introduction to Cold formed Steel (CFS) Brief history of cold-formed steel usage, Manufacturing Processes, special issues in Cold formed steel (Geometric imperfections and residual stesses), Different types of buckling, review of various design codes for CFS, Review of Direct Strength Method, Effective Width Method (EWM). **(6Hrs)**

References

Sr no	Title	Author	Publication	Edition
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.	2nd 2005
3.	Design of Steel Structures.	Mr. S K Duggal	Tata McGraw Hill Publishing Company Ltd.	3rd
4.	Design of Steel Structures	Mr. S.S. Bhavikatti	International Publishing House Pvt. Ltd.	2009

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED304 Course: Hydrology and Water Resources 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 Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs
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	**Water requirements of crops:** Factors affecting crop water requirement, irrigation water standards, types of soils and water available in various classes, permanent wilting point, crop period, base period, optimum use of Irrigation water, delta, duty and their relationship, evapo-transpiration, field capacity, Irrigation seasons, principal crops and crop rotation, design and frequency of Irrigation, Necessity, Advantages and ill-effects of irrigation, techniques of water distribution in farms. **(6 Hrs)**
Unit-II	**Hydrology:** Introduction, Hydrological cycle, precipitation and its forms , measurement of rainfall, rain guage network , presentation of rainfall data its frequency, Characteristics of a rain storm (rain hyetograph, mass curve of rainfall, recurrence interval, DAD curve), computation of average rainfall over a basin, evaporation, reduction in evaporation, evaporimeters, Infiltration its measurement, IC-Curve, factors affecting runoff, Concept of Hydrograph and factor affecting Unit hydrograph. **Ground Water Hydrology:** aquifers and its parameters, , specific yield of well , Theim's and Dupuit's theory for wells in confined and unconfined aquifers, recharge of groundwater. Various methods and their suitability. **(6 Hrs)**
Unit-III	**Canal Irrigation System**: Canal classification, factors affecting the alignment of canals, Design of Canals by Kennedy and Lacey's silt theories and their applications, longitudinal section and cross section of an irrigation channel. Losses in canals, Advantages and disadvantages and types of lining **Canal Regulation Works and Cross Drainage Works:** Types, purpose, selection of suitable type of C. D. Work, Design of transitions. Canal Regulation works: Introduction to canal falls, head and cross regulators, canal escapes, outlets and their types. **Diversion Head Works:** Layout, Site selection, component, Types of weirs and Barrage , causes of failure, design of weir by Bligh and Khosla's theory. **(6 Hrs)**

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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, **Dams:** Site Selection and various types of dams with relative merits, economic height of dam **Gravity Dams:** Various forces acting on gravity dams, modes of failure, principle stresses in gravity dams, Design of Low and high gravity dams, stability analysis, galleries, joints, keys and crack control in gravity dams. **(6 Hrs)**
Unit-V	**Earth Dams:** Types of earth dams, components and their functions, causes of failure, design criteria. Design of filters, rock toe and pitching, seepage control **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. **(6 Hrs)**
Unit-VI	**Watershed Management:** Concept and Necessity of Watershed Management, steps involved in watershed management, ridge line and drainage line treatment. **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. **(6 Hrs)**

References

Sr No	Title	Author	Publication	Edition
1	Irrigation and Hydraulic structures	Santoshkumar Garg	Khanna Publishers	19th
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

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED321 Course: Lab I: Estimating and Costing Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Practical Techers Assessment : 25 Marks
List of Practical	**PRACTICAL – Minimum 8 practical assignment based on** 1. Preliminary estimate using Plinth area method. 2. Detailed estimate of Load bearing structure 3. Detailed estimate of Frame structure. 4. Calculation of steel with Bar bending Schedule. 5. Detailed estimate of earthwork of road for Approximate 1km length. 6. Draft Detailed specification for 8 major items. 7. Analysis the unit rate of 8 major items of work contained. 8. Draft a short tender notice for proposed work. 9. Calculation of annual and total Depreciation and book value of the end of each year. 10. Fixation of standard rent of property. 11. Market survey for material and labour rates for various items.
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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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED322 Course: Lab II: Geotechnical Engineering **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 Practical/Oral: 25 Marks

Objectives	:	Objective: "The objective of this course is to introduce the civil engineering students to the behavior of soils under ds of classification and testing of soils as an engineering material." different loading conditions. It explores the natural characteristics, metho
List of Practical	:	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.

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED323 Course: Lab III: Design of Steel Structure **Teaching Scheme:** Practical: 2 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 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. 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 Assignment work in Laboratory	

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED324 Course: Lab-IV: Seminar **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 Practical/Oral: 25 Marks
Objectives	• To encourage the students to study advanced engineering developments. • To develop skills in doing literature survey, technical presentation and reportpreparation. • To prepare and present technical reports. • To encourage the students to use various teaching aids such as power pointpresentation and demonstrative models.
Guidelines	Each student shall identify a topic of current relevance in his/her branch of engineering, get approval of faculty concerned. To encourage and motivate the students to read and collect recent and reliable information about their area of interest confined to the relevant discipline, from technical publications including peer reviewed journals, conferences, books, project reports etc., prepare a report based on a central theme and present it before a peer audience. Each student shallpresent the seminar for about 20 minutes duration on the selected topic. The report and the presentation shall be evaluated by a team of faculty members comprising Academic coordinator for that program, seminar coordinator and seminar guide based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
Evaluation	Distribution of marks for the seminar is as follows: i. Topic Selection and Technical Contents: 30 % ii. Presentation : 20% ,iii. Ability to answer questions :20% & iv. Report : 30%). Evaluation is based on rubrics prepared based on above guidelines.

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V	
Course Code: CED325 Course: Lab-V: Experience Based Learning **Teaching Scheme:** Practical: 2 Hrs/week	Credits: 0-0-1 Teacher Assessment: 25 Marks

Objectives	1. To promote professional skills and knowledge through hands on experience. 2. To inculcate independent learning by problem solving with social context.
Attributes	The following attributes are necessary in some combination, • The goal of experience-based learning involves something personally significant or meaningful to the students. • Students should be personally engaged. • Reflective thought and opportunities for students to write or discuss theirexperiences should be ongoing throughout the process. • The whole person is involved, meaning not just their intellect but also their senses,their feelings and their personalities. • Students should be recognised for prior learning they bring into the process.
	4 Stages of Experiential Learning Cycle **1. Concrete Experience:** It describes the hands-on experiences that it is learn from. It's here that to try new things,face problems and step out of our comfort zone. **2. Reflective Observation** Next, it is needed to reflect to learn from the experiences. The 'reflective observation' phase of the experiential learning cycle is all about reflection on the experiences which include both action and feelings. It is a stage get to reflect on what went right and what could be improved? It's also a chance to observe how it could have been done differently and to learn from each other. **3. Abstract Conceptualization** Once it has been identified and understood the defining characteristics of an experience, it can decide on what can be done differently next time. This is a time for planning and brainstorming

	steps for success.
	Active Experimentation The active experimentation phase of the learning cycle is where the experimentationwith the ideas is done. It's time to put the plan of action to the test in the real world. The active experimentation phase of the learning cycle is where there is need toexperiment with the ideas. It's time to put plan of action to the test in the real world. Following activities may be performed under experience-based learning. • Role Play • Case Studies • Field Visits • Undergraduate Research • Question generating activity • Fishbowl • Make a Mnemonic • Peer Group Learning • Group 'Change' Projects • Creative Problem-Solving Assessment: Assessment will be done through following ways. • Creating a reflective journal or a portfolio • Essay, report, or presentation (could be arts-based, multimedia or oral) on what has been learnt • Short answers to questions of a 'why' or 'explain' nature • One-on-one oral assessments with the instructor • A project that develops ideas further (individually or in small groups) • Self-evaluation and/or group evaluation of a task performed Rubrics shall be prepared for the activities in which the performance is to be evaluated. During process of monitoring and continuous assessment and evaluation the individualand team performance is to be measured. EBL is monitored and continuous assessmentis done by mentor and authorities.

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester V		
Course Code: CED326 Course: Lab-VI-Development of Skills (Computational) STAAD PRO **Teaching Scheme:** Practical: 2 Hrs/week		Credits: 0-0-1 Teachers Assessment: 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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Civil Engineering
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(Faculty of Science & Technology)

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

Course Code: CED351 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 Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Fluid Mechanics, Basics of water resources engineering.
Objectives	Knowledge of Environmental Engineering 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. This course acts as a foundation for water supply and sanitation engineering.
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. **(6 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. **(6 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, 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 on humans, property, plants & animals. **(6 Hrs)**

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Civil Engineering
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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, Appurtenances. **Quality and Characteristics of Wastewater:** Physical, Chemical and Biological Parameters, BOD and COD, first and second stage BOD, limitations of BOD, Numerical on BOD. **(6 Hrs)**
Unit-V	**Natural Methods of Wastewater Disposal:** Methods of disposal, disposal by dilution, self-purification & Zones of Pollution in streams, Oxygen Sag Curve, 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. **(6 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. **(6 Hrs)**

Reference

Sr. No.	Title	Author	Publication	Edition
1	Water supply Engineering	Santoshkumar Garg	Khanna Publishers	34th
2	Water Supply & Sanitary Engineering	G.S. Birdie, J. S. Birdie	Dhanpat Rai Publishing Company	4th
3	Water supply Engineering	B. C. Punmia, Ashok Jain, Arun Jain	Laxmi Publications	16th
4	Sewage Disposal and Air Pollution	S. K. Garg	Khanna publishers	40th
5	Waste-Water Engineering	B. C. Punmia, A. K Jain	Laxmi Publications	2005
6	Waste-Water Engineering	Metcalf and Eddy	Tata McGraw Hill	2017

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CED352 Course: Highway Engineering Teaching Scheme: Theory: 3 Hrs/week Practical: 2 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs
Pre-requisites	
Objectives	• To provide a coherent development to the students for the courses in sector of Engineering like Transportation & Traffic Engineering etc. • To present the foundations of many basic Engineering tools and concepts related Highway Engineering. • To give an experience in the implementation of Engineering concepts which are applied in field of Transportation Engineering. • To involve the application of scientific and technological principles of planning, analysis, design, and management to highway engineering.
Unit-I	**Highway Development and Planning:** Historical Development of roads, development of highway planning in India, Road patterns, Engineering survey in highway alignment. Highway Materials: Soil, Aggregates, Bitumen, Futuristic Pavement Materials. **(6 Hours)**
Unit-II	**Geometric Design of Highway:** Cross sectional elements, Camber, Gradient, and Sight distance, PIEV Theory. Horizontal Alignment, Super elevation, Extra widening, transition curves, Set back distance. Vertical Alignment, Design of summit & valley curves. **(6 Hours)**
Unit-III	**Design of Flexible Pavement:** Design factors. ESWL for dual wheels. Tire and contact pressure. Group index method, CBR method, Bossiness's & Burmister's method. Marshall Mix Design. **(6 Hours)**
Unit-IV	**Design of Rigid Pavement:** Westergaard's stress equation for wheel load & Temperature stresses in rigid pavement, Combination of stresses, Design of Joints. WBM & WMM roads. **(6 Hours)**
Unit-V	**Traffic Engineering:** Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies. Accident studies. Traffic control devices. Types of intersection and their design concept. **(6 Hours)**
Unit-VI	**Highway Construction Machinery:**

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	Earth moving equipment's, application, and specification: Backhoe loader, Crawler Excavator, Motor Grader, Road Rollers machine, tippers, Cranes and Hydra machine, Paver machine and its type, Asphalt Mixing Plants. **(6 Hours)**				
Reference	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1	Highway Engineering	S.K. Khanna and Justo	Nem Chand & Sons Publisher	**1991**
	2	Traffic Engineering and Transport Planning	L. R. Kadiyali	Khanna Publishers	**2017**
	3	Traffic Flow Theory & Control	Drew, D.R	McGraw Hill	**1968**

Chairman Board of Studies
Civil Engineering
MIT Aurangabad

(Faculty of Science & Technology)

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

Course Code: CED353 Course: Design of RCC structures 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 Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Strength of materials and 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. **(6Hrs)**
Unit-II	**Limit state of collapse (flexure):** Analysis and Design of Singly and Doubly Reinforced rectangular sections, singly reinforced T and L beams. **(6Hrs)**
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. **(6 Hrs)**
Unit-IV	**Design of slabs:** Cantilever Slab, simply supported one-way slab, Two-way slab with different support conditions as per IS:456-2000. **Design of staircase:** Simply Supported single flight and Doglegged. **(8Hrs)**
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. **(6Hrs)**
Unit-VI	**Design of Footing:** Design of isolated rectangular column footing with constant depth and slops at ends subjected to axial load. **(4Hrs)**

References	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1	Design of R. C. structure	Dr. A. K. Jain	NEM chand, Roorkee	2015

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Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

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:4562000 and SP-16.	Bureau of Indian Standards	Bureau of Indian Standards	2000

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CED354 Course: Construction Management Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs
Prerequisite	Basics of analysis of construction site and quality of materials.
Objectives	1. Learn various basic concepts like safety, site layout related to Construction Management. 2. Understand important aspect of managing the construction project with the help of various networking techniques like Bar Chart / Milestone Chart, CPM, PERT and Precedence networks. 3. Apply various material management theories like ABC, EOQ, HML etc. 4. Understand economic analysis and financial management concepts to know economic feasibility of construction projects.
Unit-I	**Time Management:** Introduction, steps in Project Management – work break down structure, Bar Chart, Mile stone chart, Gantt Chart, Activity on Arrow and Activity On node. Introduction to PERT: Concept of probability, normal and Beta Distribution, Central limit theorem. Time estimates and calculations of project duration, critical path, slack, probability of project completion. **(6 Hrs)**
Unit-II	**Network Analysis:** Precedence network, Critical Path Method (CPM): Introduction, Time estimates, floats, critical path, Network compression – Least Cost and optimum duration, updating of networks– needs, steps, project duration, calculation for updated network. **(6 Hrs)**
Unit-III	**Resource Management:** Human Resource allocation – smoothening and levelling, Material Management- definition by international federation of purchasing and material management. Objectives, Role Functions, Qualities of material manager material forecasting. Inventory Control- Necessity, Techniques such as ABC and EOQ lead-time, safety stocks, Material Evaluation using differential indices. **(6 Hrs)**
Unit-IV	**Financial Management:** Introduction to Engineering economics, importance, demand and supply, types of costs, Types of interest such as – simple, compound, continuous, effective. Value of Money – time and equivalence, tangible and intangible factors, introduction to inflation. **(6 Hrs)**
Unit- V	**Economic Analysis:** Economic comparisons, Discounting methods: Present worth method, equivalent annual cost method, capitalized cost method, net present value, and internal rate of return. **(6 Hrs)**
Unit- VI	**Safety Engineering:** Site layout, Factors affecting, Typical layout of few major construction projects, Importance of Safety, Classification of Accidents, Causes of

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Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

	Accidents, Safety Policy, Safety Organization, Safety Plan, Safety Training, Various Safety Equipment used on site. **(6 Hrs)**				
References	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1	Construction Project Management	Jha K. N.	Pearson's publication.	3rd edition
	2	Construction Management and Planning	Sengupta, B. and Guha H.	Tata McGraw Hill Publication.	3rd edition
	3	PERT &CPM: Principles and Applications	Srinath. L. S	Affiliated East West Press, Delhi	1st edition
	4	Project Planning and Control with PERT and CPM	B. C. Punmia,	Laxmi Publications (P) Ltd.	1st edition
	5	Industrial Engineering & management	O. P. Khanna	Dhanpat Rai Publications.	3rd edition

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

(Faculty of Science & Technology)

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

Course Code: AED391 Course: Open Elective-III: (Fundamentals of Bioenergy) **Teaching Scheme:** Theory: 3 Hrs./week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	Basic knowledge of Bioenergy sources and biomass utilization
Objectives	1. Understand bioenergy technologies, processes, reactions and energy conversion rates for Anaerobic Digestion, gasification, pyrolysis (fast, intermediate and slow) 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, Basic Biomass Technology (Resources and Production) Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. **(6 Hrs)**
Unit-II	**Bioethanol**- Biofuels: Introduction, Ethanol production process, Biodiesel production process, Environmental Benefits, Bio-oil: Pyrolysis or Destructive distillation. **(6 Hrs)**
Unit-III	**Biogas**- Biogas: Introduction, process description, Constituents of biogas, main features of biogas plant, Classification & Popular designs, Applications, factors considered for selection of biogas plant, advantages, disadvantages. **(6 Hrs)**
Unit-IV	**Biodiesel**- Biodiesel production processes, Biodiesel characterization, Biodiesel feedstocks, Environmental permitting and safety considerations for biodiesel production. **(6 Hrs)**
Unit-V	**Thermo Chemical Processes:** Basic concepts in gasification and pyrolysis, chemistry of gasification, Gasification Types – Updraft Gasifier, downdraft, cross draft, applications, difference. **(6 Hrs)**
Unit-VI	**Biomass utilization:** Biomass densification technique (briquetting, pelletization, and cubing), environmental aspect of bio-energy, waste to energy conversion. **(6 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Introduction to Bioenergy (Energy and the Environment)	Vaughn C. Nelson, Kenneth L. Starcher	CRC Press	1st
2	Bioenergy: Biomass to Biofuels	Anju Dahiya	Elsevier Science	2nd
3	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal	Wiley	2nd

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CED391 Course: Open Elective III – Solid Waste Management 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 Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Environmental Science
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. **(6 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. **(6 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. **(6 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. **(6 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. **(6 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. **(6 Hrs)**

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

	Sr. No.	Title	Author	Publication	Edition
References	1	Integrated Solid Waste Management	Hilary Theisen and Samuel A, , Vigil, George Tchobanoglous	McGraw- Hill, New York	1993
	2	CPHEEO, Manual on Municipal Solid waste management,	Central Public Health and Environmental Engineering Organization	Government of India	2000
	3	Environmental Resources Management, , Hazardous waste Management	Michael D. LaGrega, Philip L Buckingham Jeffrey C. E vans	Mc-Graw Hill International edition	2001
	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	2nd

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Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CSE391 Course: Open Elective-III: RHCSA (RedHat Certified System Administration) **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2Hrs
Prerequisites	This course has prerequisites like previous system administration experienceon other operating systems is beneficial. Fundamental knowledge of Operating System.
Objectives	1. Develop a strong understanding of the command-line interface (CLI) and become proficient in using essential command-line tools and utilities for system administration tasks. 2. Understanding fundamental system administration tasks, such as managing file systems, users, and groups. 3. Ability to Install, update, and remove software packages using package management tools and service management. 4. Ability to identify and resolve common system issues, perform system analysis, and troubleshoot problems related to hardware, software. 5. Ability to configure and troubleshoot network interfaces and handlingsystem security. 6. Ability to manage storage devices and file systems and utilize containerization tools like Podman.
Unit-I	**Introduction to Red Hat Enterprise Linux (RHEL), Filesystem and File Permissions** Overview of RHEL and its features. Installation and deployment of RHEL, Filesystem hierarchy standard (FHS), Managing files and directories. **(6 Hrs)**
Unit-II	**User and Group Administration**

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MIT Aurangabad
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	Permissions and ownership User and group management, Password policies and authentication methods, User and group quotas user and group-level security measures, such as password policies and file permissions, to maintain system integrity. **(6 Hrs)**
Unit-III	**Package Management, System Initialization** Package installation, removal, and verification Managing software repositories, Dependency resolution and package querying, Boot process and run levels Managing services and daemons, Systemd and SysVinit. **(7 Hrs)**
Unit-IV	**System Maintenance, Troubleshooting and System Recovery** System updates and patching, Kernel management, Managing log files and system monitoring, System troubleshooting methodologies, Rescue and recovery techniques, Boot loader configuration and troubleshooting. **(7 Hrs)**
Unit-V	**Network Configuration** Network interfaces and configurations, IP addressing and routing, DNS configuration. configuring firewalls, securing SSH access, and implementing SELinux policies to protect the system from unauthorized access and potential threats. **(7 Hrs)**
Unit-VI	**Storage Administration & Run containers** Disk partitioning and formatting, Logical Volume Manager (LVM), Filesystem creation and mounting, Deploy Container, Manage Container Storage and Network Resources, Manage Containers as System Services. **(7 Hrs)**

Sr. No.	Title	Author	Publication	Edition
1.	Linux System Programming	Robert Love	O'Reilly, SPD	10th
2.	UNIX Network Programming	W.R. Stevens	McGraw-Hill	5th

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MIT Aurangabad
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Textbooks / Reference Books	3.	Linux Command Lineand Shell Scripting Bible	Richard Blum and Christine Bresnahan	McGraw Hill	6th
	4.	UNIX and Linux System Administration Handbook	Evi Nemeth, Garth Snyder, Trent R. Hein	Ben Whaley	3rd
	5.	RHCSA/RHCE Red Hat Linux Certification Study Guide	RedHat Student Guide	RedHat	9th

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Civil Engineering
MIT Aurangabad
(An Autonomous)

(Faculty of Science & Technology)

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

Course Code: CSE392 Course: Open Elective-III: Digital Marketing **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisites	Basic Understanding of Digital Marketing
Objectives	1. To understand the basic concept of digital marketing 2. To understand the concept of search engine optimization. 3. Implement Social Media Optimization 4. Discuss the concept of google advertising
Unit-I	**Digital Marketing Introduction** Concept of Digital Marketing, Use of Digital Marketing, Digital Marketing Platform, Digital Marketing Strategy, Types of Digital Marketing – Organic & Paid, Digital Marketing VS Traditional Marketing. How is it different from traditional marketing, ROI between Digital and traditional Marketing. **(7 Hrs)**
Unit-II	**Search Engine Optimization (SEO)** Introduction of SEO, Search Engine working, SEO Tools Web positionAnalysis, Competition Analysis, Google Algorithms and Updates. **(6 Hrs)**
Unit-III	**Social Media Optimization (SMO)** **Facebook** - Profile Creations, Creating groups and pages, Tips and Guides, Posts And promotions, Events Creations, Video Marketing, Promotional Techniques, Integration Techniques. **Twitter** -Set-up and usage Tips, Promoted Tweets, Video Marketing, Promotional Techniques, Integration Techniques, Analytics.

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Civil Engineering
MIT Aurangabad

	LinkedIn-Profile Creations, Company Page Creations, Tips and Guides, LinkedIn posts LinkedIn promotions LinkedIn Groups, Video Marketing, Promotional Techniques, Integration Techniques, **Instagram** -Integration Techniques, Promotional Techniques. **(5 Hrs)**
Unit-IV	**Introduction to SEM** Google AdWords, Search Advertising, Display Advertising, Mobile Advertising, Video Advertising, Shopping Advertising, Report generation, Google AdWords Express, Setup, Google Mapping Ads. **(6 Hrs)**
Unit-V	**E-Commerce Management** Maintenance of an online product-listing website through product keyword research, product pricing, positive reviews, and customer retention. **(6 Hrs)**
Unit-VI	**Email Marketing** How to create and send product-based emails in bulk and ensure that all of the emails have a good open rate and conversion rate. **(6 Hrs)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Digital Marketing For Dummies	Ryan Deiss & Russ Henneberry	Tata McGraw Hill	6th
2.	Social Media Marketing All-in- one Dummies	Jan Immerman, Deborah Ng	Prentice Hall	3rd
3.	Digital Marketing	Seema Gupta	Tata McGraw Hill	1st

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Course Code: ECE391 Course: **Data Science** **Teaching Scheme:** Lectures: 3 Hrs./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisites	Programming Concepts, Data Structure, Basic Linear Algebra, Basic Probability and Statistics.
Objectives	The objectives of the course are • Give an introduction to data science and its applications. • Understand use of statistics in data science • Use data science to analyze large and unstructured data with different tools
Course Outcomes	At the end of the course the student will be able to 1. Demonstrate the fundamental concepts and principles of data science. 2. Apply data preprocessing techniques to clean and prepare data for analysis. 3. Perform statistical analysis and interpret the results. 4. Implement and evaluate machine learning algorithms for data prediction and classification.
Unit-I	**Introduction to Data Science:** Overview of Data science and its terminologies, Applications of Data Science, Role of Data science in emerging technologies. Data types and Data sources, Data preprocessing techniques, Statistical concepts for Data Science. **(6 Hrs.)**
Unit-II	**Machine Learning for Data Science:** Introduction to machine learning algorithms, Supervised learning: linear regression, logistic regression, decision trees, and random forests, Unsupervised learning: clustering algorithms, dimensionality reduction, Feature generation and selection using Machine learning. **(6 Hrs.)**

Chairman Board of Studies
Civil Engineering

Unit-III	**Data Visualization and Communication:** Principles of data visualization, Exploratory data analysis using visual techniques Tools and libraries for data visualization. Mining Social Networks: Social Networks graphs, clustering of graphs, direct discoveries of communities in graphs, analyze the portioning of graphs, the neighborhood properties of graphs. **(6 Hrs.)**
Unit-IV	**Big Data Analytics and cloud computing for Data Science:** Introduction to big data and its challenges, Distributed computing frameworks: Hadoop and Spark, Big data processing and analysis. Cloud concept and computing for data science. **(6 Hrs.)**
Unit-V	**Programming Languages and libraries for Data Science:** Python for Data Science, Python libraries for data science. R programming language for Data science. Implementation examples in Python and R language. **(6 Hrs.)**
Unit-VI	**Ethical Considerations in Data Science**: Privacy, security, and ethical considerations in data science, Bias, fairness, and interpretability in machine learning algorithms, Legal and regulatory aspects of data science. **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Python for Data Analysis	Wes McKinney	O'Reilly Media	2nd
2.	The Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome Friedman	Springer	2nd
3.	Data Science for Business	Foster Provost, Tom Fawcett	O'Reilly Media	1st
4.	Hands-On Machine Learning with Scikit-Learn and TensorFlow	Aurélien Géron	O'Reilly Media	2nd
5.	Doing Data Science: Straight Talk from The Frontline	Cathy O 'Neiland Rachel Schut	O'Reilly Media, Inc	3rd

Chairman Board of Studies

(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: ECE392 Course: **Control Systems** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: - Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisites	Linear algebra and calculus
Objectives	The objectives of the course are • The objective of this course is to introduce students to the fundamental concepts and principles of control systems. • Students will develop an understanding of the analysis and design of control systems, including time-domain and frequency-domain techniques.
Course Outcomes	At the end of the course the student will be able to 1. Understand the basic concepts and terminology of control systems. 2. Analyze linear time-invariant (LTI) systems using Laplace transforms and transfer functions. 3. Design and analyze feedback control systems using time-domain techniques. 4. Analyze control system stability using Routh-Hurwitz and Nyquist criteria.
Unit-I	**Introduction to Control Systems** Definition and classification of control systems, Feedback and feedforward control, Open-loop System, closed-loop control and their examples. Distinguish between open and close system. Laplace transforms. **(6 Hrs.)**
Unit-II	**Mathematical Modeling of Dynamic Systems** Differential equations and transfer functions, Advantages, Disadvantages and Properties of Transfer function, transfer function representation, Block diagrams and signal flow graphs, State-space representation. **(6 Hrs.)**
Unit-III	**Time-Domain Analysis** Time response analysis, Step response analysis. Time constant and system behavior. Transient and steady-state response, Second-order system characteristics: Step response analysis. Natural frequency and damping ratio. Undamped, underdamped, critically damped, and overdamped systems

Chairman Board of Studies
Civil Engineering
MIT Aurangabad
(An Autonomous)

	Performance specifications: Rise time, settling time, peak time, and peak overshoot. Steady-state error and error constants. Introduction to error analysis. **(6 Hrs.)**
Unit-IV	**Stability Analysis:** Definition of stability, Stability conditions based on the Routh array, Application of the Routh-Hurwitz criterion to analyze system stability. Nyquist stability criterion, Application of stability criteria to determine system stability. **(6 Hrs.)**
Unit-V	**Frequency-Domain Analysis:** Frequency response analysis, Relationship between time-domain and frequency-domain representations, Bode plots, Nyquist stability criterion, Stability margins, gain margin and phase margin. **(6 Hrs.)**
Unit-VI	**Controller Design:** Sensors and actuators, Sampling and discrete-time control systems, Proportional-Integral-Derivative (PID) controllers, Frequency response design (lead, lag, and lead-lag compensation), Digital controllers and hardware implementation. **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Modern Control Engineering	Katsuhiko Ogata	--	--
2.	Control Systems Engineering	Norman S. Nise	--	--
3.	Feedback Control of Dynamic Systems	Gene F. Franklin, J. David Powell, and Abbas Emami-Naeini	--	--
4.	Automatic Control Systems	Benjamin C. Kuo and Farid Golnaraghi	--	--

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Civil Engineering
MIT Aurangabad
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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: EED391 Course Title: Special Purpose Electric Machines **Teaching Scheme:** Theory: 3 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs
Prerequisite	Basic electrical Engineering, magnetic circuit, conventional electrical machines
Objectives	1. To understand different types of motors for particular application 2. To examine behaviour of machines for specific applications 3. To compare different machines 4. To develop knowledge in regards of control and use of machines
Unit-I	**Induction Generators** Construction, operating principle, types, operating characteristics, Applications. **(6 Hrs)**
Unit-II	**Doubly fed induction Machines** Construction, operating principle, types, operating characteristics, Applications to grid connected wind and mini/micro hydel systems. **(6 Hrs)**
Unit-III	**Switched Reluctance Motor**: Construction, operating performance, control and applications. **Variable reluctance stepper motor:** Construction, operating performance, control and applications. **(6 Hrs)**
Unit-IV	**Linear Machines:** Linear Induction Machines and Linear Synchronous Machines: Construction, operation, performance, control and applications. **(6 Hrs)**

Chairman Board of Studies
Civil Engineering
MIT Aurangabad

Unit-V	**BLDC Machine :** Construction, magnetic materials used, types of motors ,control and applications. Recent developments in BLDC motors. **(6 Hrs)**
Unit-VI	**Permanent Magnet Machines:** Construction, magnetic materials used, types of motors e.g. PMDC and PM Synchronous Machine, control and applications. Recent developments in electrical machines. **(6 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Switched Reluctance motor drives'	R.Krishnan,	CRC press, 2001	1st Edition
2	Permanent magnet and Brushless DC motors'	T.Kenjo and S.Nagamori	Clarendon press. London, 1988	1st Edition
3	Special Electrical Machines	Simmi P Burman	S.K. Kataria& Sons	2nd Edition
4	Permanent Magnet Synchronous and Brushless DC Motor Drives	R. Krishnan.	New Delhi, Prentice, Hall of India, 2009	2nd Edition
5	Special Electrical Machines	Venkataratnam	Taylor and Francis, 2009	1st Edition

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

Course Code: AID391 Course: Business Intelligence **Teaching Scheme:** Theory: 03 Hrs/week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15 Marks Continuous In-semester Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs

Prerequisites	No Prerequisites
Objectives	1. Student should learn fundamental concepts of Business Intelligence. 2. To learn analytics framework to support decision making in business intelligence.
Unit-I	**Understanding Business Intelligence** The Challenge of Decision Making, What Is Business Intelligence?, The Business Intelligence Value Proposition, The Combination of Business and Technology (6 Hrs)
Unit-II	**Business Intelligence Technology Counterparts** Data Warehousing: What Is a Data Warehouse?, Data Marts and Analytical Data, Organization of the Data Warehouse Enterprise Resource Planning: Distributing the Enterprise, First ERP, then Business Intelligence, The Current State of Affairs Customer Relationship Management: CRM, ERP, and Business Intelligence Customer Decisions, Decisions About Customers, Business Intelligence and Financial Information (6 Hrs)
Unit-III	**The Spectrum of Business Intelligence** Enterprise and Departmental Business Intelligence, Strategic and Tactical Business Intelligence, Power and Usability in Business Intelligence, Finding the Right Spot on the Continuum, Business Intelligence: Art or Science? (6 Hrs)

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Civil Engineering

Unit-IV	**Business Intelligence User Interfaces** Querying and Reporting, Reporting and Querying Toolkits, Basic Approaches: Building Ad-Hoc Queries, Building On-Demand Self-Service Reports, Enhancing and Modifying, Data Access: Pull-Oriented Data Access, Push-Oriented Data Access, Dashboards: EIS Is the Engine, Metric System and KPIs, Business Intelligence Dashboards (6 Hrs)
Unit-V	**On-Line Analytical Processing (OLAP)** OLAP:OLAP and OLTP, Operational Data Stores, Variations in Data and Approach, OLAP Applications and Functionality, Multi-Dimensions: Thinking in More Than Two Dimensions, What Are the Possibilities?, Drilling and Pivoting, OLAP Architecture: Cubism, Tools, ROLAP, MOLAP, HOLAP, Data Mining (6 Hrs)
Unit-VI	**Visualization, Guided Analysis and** Visualization: The Basics, Unconstrained Views, Guided Analysis: The Business Intelligence Two-Step, How to Guide the Guides, Handling Unstructured Data (6 Hrs)

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1	Decision Support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, Jay Aronson, David King	Pearson Education, 2009.	9th
2	The Savy Manager's Guide Getting Onboard with Emerging IT,	David Loshin, Business Intelligence	Morgan Kaufmann Publishers.	2009

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Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: MED391 Course: Open Elective III (Industry 4.0) **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Course 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.
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. **(6 Hrs)**
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). **(6 Hrs)**
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. **(6 Hrs)**
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. **(6 Hrs)**
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.

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Civil Engineering
MIT Aurangabad
(An Autonomous Institute)

	(6 Hrs)
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. **(6 Hrs)**

Textbook/ 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	1st
3	Automated Manufacturing System	Hugh Jack	Lulu.com	7th
4	Industry 4.0- Opportunities Behind The Challenge	Dr. Mirjana Stankovic, Ravi Gupta and Dr. Juan E. Figueroa	UNIDO General Conference 2017	-
5	Handbook of Ind. Automation	Richard L. Shell Ernest L. Hall	CRC Press	1st

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MIT Aurangabad
(An Autonomous Institute)

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: MED392 Course: OE-III Operations Research **Teaching Scheme:** Theory: 03 Hrs/week Credits: 3-0-0	Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continues Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs
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. **(2 Hrs)**
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. **(8 Hrs)**
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 stepping stone method or MODI method. Degeneracy in Transportation Problem. **(8 Hrs)**
Unit-IV	**Assignment Problem:** Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem. **(4 Hrs)**

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. **(6 Hrs)**
Unit-VI	**Network Models:** Fulkerson's rule, concept and types of floats, float calculations, CPM and PERT, Crashing cost and crashing Network. **(8 Hrs)**

Text Book/ Reference Books

Sr. No.	Title	Author	Publication	Edition
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.	12th 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 and Applications	S. D. Sharma, Himanshu Sharma	Kedar Nath Ram Nath	Fourth Edition
8.	PERT and CPM: Principles and Applications	L. S. Srinath	East-West Press Private Limited,	Third Edition
9.	Project Planning and Control with PERT & CPM	Dr. B.C. Punmia & K.K. Khandelwal	Firewall Media	Fourth Edition

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Civil Engineering
MIT Aurangabad
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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: PPE391 Course: Open Elective III: Waste Management and Circular Economy Teaching Scheme: Theory: 3 hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Plastic materials, processing, rheology, basics of polymer technology and designing
Objectives	• It aims to provide students with a comprehensive understanding of sustainable practices and the principles of the circular economy within the context of polymer engineering. • Students will explore various strategies, technologies, and policies for achieving sustainability, reducing environmental impact, and promoting circularity in the polymer industry. • The course will emphasize the importance of integrating sustainable principles in the design, production, and disposal of polymer materials.
Unit-I	**Topic Title: Introduction to Waste Management and Circular Economy** Definition and significance of sustainability in polymers, basics of waste management, principles and goals of the circular economy, environmental, social, and economic dimensions of waste management, life cycle thinking and assessment in plastics **(4 Hrs)**
Unit-II	**Topic Title: Waste generation, composition, and management** Sources and types of plastic and polymer waste, composition analysis and characterization of waste, quantification and assessment of waste generation, waste management and treatment methods: MSWM processing and plastics waste management comprising of waste hierarchy

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	i.e., prevention, minimization, reuse, recycling, energy recovery, and disposal. **(8 Hrs)**
Unit-III	**Topic Title: Sustainable Polymer Processing** Energy-efficient processing techniques, clean and green manufacturing practices, waste reduction and recycling in polymer processing, sustainable additives and processing aids **(6 Hrs)**
Unit-IV	**Topic Title: Sustainable Waste Management and Disposal** Waste characterization and classification in polymers, mechanical recycling, waste-to-energy conversion technologies, biological treatment methods for polymer waste, hazardous waste management and regulations, sustainable landfilling and waste disposal practices **(6 Hrs)**
Unit-V	**Topic Title: Circular Economy Strategies** Design for recycling and upcycling principles, closed-loop supply chains and reverse logistics, extended producer responsibility and product stewardship, circular economy business models and initiatives, case studies on successful implementation of circular economy strategies **(6 Hrs)**
Unit-VI	**Topic Title: Policy and Regulatory Framework for Sustainability** International and national policies promoting sustainability in polymers, Environmental regulations and standards for the polymer industry, corporate social responsibility and sustainability reporting, challenges, and opportunities in implementing sustainable practices, future trends and emerging technologies in sustainable polymer engineering **(6 Hrs)**

Textbooks / Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Waste Management and the Circular Economy in Selected OECD Countries	OECD	OECD Publishing	1st Edition, 2019
	2.	Plastics and Sustainability: Towards a Peaceful Coexistence between Bio-	Michael Tolinski	Wiley	1st Edition 2011

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		based and Fossil Fuel-based Plastics			
	3.	Plastics and Sustainability: Towards a Deeper Understanding of the Environmental Role of Plastics in Today's World	Conor P Carlin	Wiley-Scrivener	1st Edition 2021
	4.	Strategic Management for the Plastics Industry: Dealing with Globalization and Sustainability	Jones, Roger F.	CRC Press	1st Edition 2013
	5.	Plastics in the Circular Economy	Vincent Voet, Jager, Rudy and Folkersma	De Gruyter	1st Edition 2023
	6.	A Practical Guide to Plastics Sustainability: Concept, Solutions, and Implementation	Michel Biron	William Andrew Publishers	1st Edition, 2020
	7.	Circular Economy and Waste Valorisation: Theory and Practice from an International Perspective	Jingzheng Ren, Long Zhang	Springer	1st Edition, 2022

Chairman Board of Studies
Civil Engineering

(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: : CED371 Course: Lab: Environmental Engineering Teaching Scheme: Practical: 02Hrs/week	Credits: 0-0-1 Teachers Assessment: 25 Marks
Prerequisite	Fluid Mechanics, Basics of water resources engineering.
Objectives	Knowledge of Environmental Engineering 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. This course acts as a foundation for water supply and sanitation engineering.
Assigned Work	List of practical (Any 8): 1. Determination of pH using pH meter. 2. Determination of turbidity of water sample. 3. Determination of alkalinity of given water sampleby titration method. 4. Determination of hardness of given water sampleby titration method. 5. Determination of chloride in a given water sampleby titration method. 6. Visit to water treatment plant. 7. Determination of Total solids in sewage sample. 8. Determination of SVI. 9. Determination of COD and BOD @ 3 days and 5 days for given waste water sample. 10. Visit to waste water treatment plant.
	The assessment of term work shall be done based on the following: • Continuous Assessment. • Performing the experiments in the Laboratory.

Chairman Board of Studies
Civil Engineering
MIT Aurangabad

(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: : CED372 Course: Lab: Highway Engineering Teaching Scheme: Practical: 02Hrs/week	Credits: 0-0-1 Teachers Assessment: 25 Marks

Prerequisite	None
Objectives	Student would be able to perform various test related to highway engineering and would be able to develop to good highways in future
Assigned Work	Term work shall be based on the following (any ten): 1. Aggregate Impact Test. 2. Aggregate Crushing Test. 3. Los Angles Abrasion Test. 4. Shape & Size Test: Flakiness Index & Elongation Index. 5. Specific Gravity & Water Absorption. 6. Penetration Test. 7. Softening Point. 8. Ductility Test. 9. Viscosity Test. 10. Flash & Fire Point Test. 11. Marshall Stability Test. 12. CBR Test. 13. Mixed Traffic Volume Study. (Fast and Slow vehicles) 14. Traffic Speed Study.
	The assessment of term work shall be done based on the following: • Continuous Assessment. • Performing the experiments in the Laboratory.

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CED373 Course: Laboratory of Design of RCC structure Teaching Scheme: Practical: 2Hrs/week	Credits:1-0-0 Oral/Practical:25Marks
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.
List of Practical	**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. or 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 termwork shall be done based on the following. • Continuous assessment • Performing the experiments in the laboratory • Oral examination conducted on the syllabus and termwork mentioned above.	

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CED374 Course: Laboratory Non Destructive Testing Teaching Scheme: Practical:2Hrs/week	Credits:1-0-0 Oral/Practical:25Marks
Objectives	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 ofPractical	List of Practical (Any 8) 1. Rebound hammer test to determine compressive strength of concrete and itscomparison with destructive test in the laboratory. 2. Rebound hammer test to determine compressive strength of cement mortar and itscomparison with destructive test in the laboratory. 3. Rebound hammer test to determine compressive strength of concrete in existingconcrete 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 termwork shall be done based on the following. • Continuous assessment • Performingthe experiments in the laboratory • Oral examination conducted on the syllabus and termwork mentioned above.	

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Civil Engineering

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(Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (Civil Engineering) Semester VI	
Course Code: CED375 Course: Lab-V: Major Project-I **Teaching Scheme:** Practical: 04 Hrs/week	Credits: 0-0-2 Teachers Assessment: 25 Marks End Semester Examination/Oral: 25 Marks
Objectives	Solve a real life societal problem through research based approaches
Course Outcome	Upon the completion of this course the students will be expected to: 1. Formulate an analytical model for an engineering problem and obtain its solution with necessary tools. 2. Perform and manage as an individual or as a member of a team with ethical values. 3. Examine the concepts of environment and sustainability. 4. Write effective reports and communicate effectively on civil engineering problems. 5. Present the conclusions in a way to benefit the society.
Instructions to Students	Solving a real life problem should be the focus of under graduate projects. Faculty members should prepare project briefs (giving scope and references) well in advance which should be made available to the students at the departmental level. The project may be classified as hardware / software / modelling / simulation. It may comprise any elements such as analysis, design, synthesis, validation etc. Interdisciplinary/Multidisciplinary projects are encouraged.

Chairman Board of Studies
Civil Engineering
MIT Aurangabad

Guidelines	The department will appoint a project coordinator who will coordinate the following. 1. Grouping of students (a maximum of 3/4 in a group) 2. Allotment of projects and project guides 3. Project monitoring at regular intervals. All projects allotments are to be completed as given in the Academic Calendar. All projects will be monitored at least twice in a semester through students' presentation and will be conducted as per Academic Calendar. Distribution of marks for TA shall be as follows: Problem Statement 10; Literature Review 10; Group formation and identification of individual responsibility10; Objective of Project activity 10; Knowledge of domain, technology and tools being used 10.
	For TA 50 Marks to be converted to 25 Marks. Distribution of marks for ESE/Oral shall be as follows: Realization of project as per problem statement 10; Design & Testing 30; Documentation and Report Writing 20; Quality of Work 15; Performance in Question & Answers Session 15; Timely Completion of Project work 10 **For ESE/Oral – 100 Marks to be converted to 25 Marks.** Efforts be made to carry out industry based/ Societal Projects. Problems can also be invited from the industries/Society to be worked out through undergraduate projects. In case of Interdisciplinary/Multidisciplinary Projects, as per the requirements, a greater number of Guides may be appointed. A Joint committee of involved departments shall conduct the review of the students. 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: Need Statement, Literature Review, data collection, Problem Statement, Objectives, Scope, Analysis/Framework/ Algorithm Phase II: Details of Hardware & Software, Methodology, and Implementation plan for next semester. Phase III: Submission of report of project work.

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