Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-
2015'B'Grade
(CGPA2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure of

Second Year B. Tech. (Mechanical Engineering)

w.e.f. Academic Year : 2021-2022

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Mechanical Engineering
S. Y. B. Tech. Semester-III

Choice Based Credit System (CBCS) Structure w.e.f. Academic Year 2021-2022

Theory Courses

Course Code	Name of Theory Course	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME211	Applied Thermodynamics	3	-	-	-	3	30	70	-	100
ME212	Mechanics of Materials	3	-	-	-	3	30	70	-	100
ME213	Manufacturing Processes	3	-	-	-	3	30	70	-	100
ME214	Machine Drawing & CAD	3	-	-	-	3	30	70	-	100
ME215x	Professional Elective-I	3	-	-	-	3	30	70	-	100
	Sub Total	**15**	**-**	**-**	-	**15**	**150**	**350**		**500**
MEV21	**Environmental Sciences**	**1**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**

Laboratory / Tutorial Courses

Course Code	Name of Laboratory/Tutorial Course	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
								POE	OE		
ME211	Applied Thermodynamics	-	-	2	-	1	-	-	-	25	25
ME212	Mechanics of Materials	-	1	-	-	1	-	-	-	25	25
ME213	Manufacturing Processes	-	-	2	-	1	-	-	25	25	50
ME214	Machine Drawing & CAD	-	-	-	4	2	-	50	-	50	100
ME215x	Professional Elective-I	-	-	2	-	1	-	-	-	25	25
	Sub Total	-	1	6	-	6	-	75		150	200
	Grand Total	**15**	**1**	**6**	**4**	**21**	**150**	**425**		**150**	**725**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE-In Semester Examination, ESE-End Semester Examination (University Examination for Theory & / POE & / Oral), ICA Internal Continuous Assessment.

Professional Elective-I: ME2151 Microprocessors in Automation, ME2152 Internal Combustion Engines, ME2153 Composite Materials

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Mechanical Engineering
S. Y. B. Tech. Semester-IV

Choice Based Credit System (CBCS) Structure w.e.f. Academic Year 2021-2022

Theory Courses

Course Code	Name of Theory Course	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME221	Engineering Mathematics –III	3	-	-	-	3	30	70	-	100
ME222	Manufacturing Technology	3	-	-	-	3	30	70	-	100
ME223	Fluid Mechanics & Fluid Machines	3	-	-	-	3	30	70	-	100
ME224	Kinematics & Theory of Machines	3	-	-	-	3	30	70	-	100
ME225y	Professional Elective-II	3	-	-	-	3	30	70	-	100
	Sub Total	**15**	**-**	**-**	-	**15**	**150**	**350**		**500**
MEV22	**Environmental Sciences**	**1**	**-**	**-**	-	**-**	**-**	**-**	**-**	**-**

Laboratory / Tutorial Courses

Course Code	Name of Laboratory / Tutorial Course	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
								POE	OE		
ME221	Engineering Mathematics –III	-	1	-	-	1	-	-	-	25	25
ME222	Manufacturing Technology	-		2	-	1	-	-	-	25	25
ME223	Fluid Mechanics & Fluid Machines	-	-	2	-	1	-	-	-	25	25
ME224	Kinematics & Theory of Machines	-	-	2	-	1	-	-	25	25	50
ME225y	Professional Elective-II	-	-	2	-	1	-	-	-	25	25
ME 226	Mechanical Workshop-I	-	-	2	-	1	-	-	-	50	50
ME 227	Electrical Technology	-	-	2		1	-	-	25	25	50
	Sub Total	-	1	**12**	**-**	**7**	**-**	**50**		**200**	**250**
	Grand Total	**15**	**1**	**12**		**22**		**400**		**200**	**750**

Abbreviations: L –Lectures, P –Practical, T– Tutorial, ISE– In Semester Examination, ESE – End Semester Examination (University Examination for Theory & / POE & / Oral), ICA– Internal Continuous Assessment.

Professional Elective-II: ME2251 Mechatronic Systems, ME2252 Power Plant and Energy Engineering,ME2253 Solid Mechanics

1. Batch size for the practical / tutorial shall be of 20 students. On forming the batches, if the strength of remaining student exceeds 9, then a new batch shall be formed.

2 Student is required to study Environmental Science subject in Second Year and passing in the same to become eligible for award of degree.

3 Industrial Training/Internship (evaluated at B. Tech Semester-VII) of minimum 30 days shall be completed in any vacation after S.Y. B. Tech. Semester-III, but before B. Tech. Semester-VII & the report shall be submitted and evaluated in B. Tech. Semester-VII.

4 ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions, as applicable.

Punyashlok Ahilyadevi Holkar Solapur University

Second Year B.TECH. (Mechanical Engineering)

Semester-III

ME211 :Applied Thermodynamics

Teaching Scheme	Examination Scheme
Lectures:03Hours/week, 03Credits	ESE: 70Marks
Practical :02Hours/week, 01Credit	ISE: 30Marks
	ICA: 25Marks

Course Introduction: Applied Thermodynamics is one of the core courses in the Mechanical Engineering curriculum, as well as one of the traditional courses, dating back from the last many centuries. In Applied Thermodynamics the significance moves from studying general concepts with illustrative examples to develop methods and performing analyses of real life problems. The objective of this subject is to apply knowledge of basic thermodynamic concepts to understand working and evaluate performance various cycles and devices used in thermal power plants and air compressors.

Course Objectives:

During this course, student is expected to:

1. To learn about of First law for reacting systems and heating value of fuels
2. To learn about vapor power cycles and their analysis.
3. To learn about flow of steam through nozzles.
4. To learn the about reciprocating compressors with and without intercooling.
5. To analyze the performance of steam boilers, steam turbines and steam condensers.

Course Outcomes:

At the end of this course, student will be able to:

1. Apply mathematics and laws of thermodynamics to solve real-life problems.
2. Evaluate steam properties and analyze the performance of steam generators using steam table
3. Apply knowledge of basic thermodynamic concepts for analysis of vapor power cycles
4. Understand thermodynamics of steam nozzles and analysis of steam turbine

5. Study of steam condensers for various applications.
6. Calculate various performance parameters of reciprocating air compressors.

Section I

Unit-1: Basic Laws of Thermodynamics **No. of lectures- 08**

Unit content: Review of basic concepts, Application of First law of Thermodynamics to chemically reacting system: the standard enthalpy (heat) of reaction, the standard enthalpy of formation**(Numerical Treatment)**

Second Law of Thermodynamics: Limitation of first law of thermodynamics, heat engine, refrigerator and heat pump, Kelvin- Plank and Clausius statements and their equivalence. Reversibility and Irreversibility, Carnot cycle. Principle of entropy increase ,Calculation of entropy change for: i) Phase change of pure substance ii) Change of state of an ideal gas iii) adiabatic mixing.**(Numerical Treatment)**

Unit-2: Formation of steam and Steam Generators **No. of lectures- 08**

Unit content: Properties of pure substance-Property diagram for phase – change processes SteamProperties (wet, saturated, superheated, degree of superheat and dryness fraction); Temperature-entropy and temperature-enthalpy diagrams, Mollier diagram.***(Theoretical Treatment)***

Classification of boilers , salient features of high pressure boilers, Evaporation, equivalent evaporation, Boiler efficiency, heat losses in boiler plant & heat balance sheet

(Numerical treatment).

Unit-3:Vapour Power Cycles **No. of lectures-04**

Unit content: Classification of cycles, vapour power cycles, Carnot vapour power cycle, simple Rankine cycle, actual Rankine cycle, Effect of operating conditions on Rankine cycle efficiency. **(Numerical Treatment)**

Section II

Unit-4: Steam Nozzles and Turbines **No. of lectures- 08**

Unit content: Types of Nozzles, flow of steam through nozzles (Theoretical Treatment)

Steam Turbines:- Advantages and classification of steam turbines, simple impulse turbine, compounding of steam turbines, Parson's reaction turbine, Velocity diagrams, work done and efficiencies (Numerical Treatment)

Unit-5: Steam Condensers **No. of lectures- 04**

Unit content: Elements of steam condensing plants, advantages of using condensers, types of

condensers, Mass of circulating water, vacuum efficiency, Condenser efficiency.(Theoretical Treatment)

Unit-6: Reciprocating Air Compressors **No. of lectures- 08**

Unit content: Uses of compressed air, classification of compressor, constructional detail of single & multistage compressor, computation of work, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical & actual indicator diagram, Need of multistage, work done, volumetric efficiency, condition for maximum efficiency, inter cooling. **(Numerical Treatment)**

Internal Continuous Assessment (ICA):

Any six of the following :

1. Study of Boilers
2. Study of Boilers Mountings and Accessories.
3. Study/ Trial on steam calorimeter
4. Two problemsusing Steam table software for finding steam properties.
5. Study/Trial on reciprocating air compressor
6. Flash & Fire point of a lubricant
7. Trial on Redwood viscometer
8. Study of different types of condensers.
9. Industrial visit to any process / power industry

Text Books:

1. A Course in Thermal Engineering -S. Domukundwar, Kothandraman, Dhanpat Rai &Co. Delhi.
2. Thermal Engineering -R. K. Rajput – Laxmi Publication – New Delhi (Sixth Edition)
3. Basic & Applied Thermodynamics -P.K. Nag Tata McGraw Hill Publication
4. An introduction to Thermodynamics - Y.V.C. Rao – Universities Presss.

Reference Books

1. Thermodynamics by C.P. Arora TMH New Delhi 1998 edition.
2. Thermodynamics & Heat Engine – Vol 1 &Vol 2 – R. Yadav Central Book Depot.
3. Thermodynamics- Cengel Boles, Tata McGraw Hill New Delhi.
4. Steam & Gas Turbines- R. Yadav, CPH Allahabad

Punyashlok Ahilyadevi Holkar Solapur University

Second Year B.TECH. (Mechanical Engineering)

Semester-III

ME213 :Manufacturing Processes

Teaching Scheme	Examination Scheme
Lectures:03Hours/week, 03Credits	ESE : 70Marks
Practical :02Hours/week, 01 Credit	OE : 25 Marks
	ISE : 30Marks
	ICA : 25Marks

Course Introduction:

This course covers all primary manufacturing processes like casting, forging, rolling, extrusion and Drawing along with Fabrication. These processes are basics of Mechanical Engineering Programme. The basics of this processes along with their applications and equipment and machinery required for the processes is covered in brief. This course also introduces Manufacturing Techniques for plastic products. Recent trends in various processes are also discussed in brief.

Course Objectives:

During this course, student is expected to:

1.To introduce to the students the casting technique and its significance in manufacturing.

2.To introduce to the students with various plastic deformation processes and their application

3.To introduce to the students the various fabrication techniques and their significance in Industry.

4.To introduce to the students with various plastic manufacturing processes.

5.To introduce to the students with recent trends in this processes

Course Outcomes:

At the end of this course, student will be able to

1.Demonstrate the different types of pattern and explain gating system used in casting process.

2.Identify appropriate melting and molding techniques with classification of different defects in casting.

3.Explain in brief about various joining processes engineering application.

4.Illustrate and compare the types of forming processes such as rolling, forging, extrusion,

drawing etc.

5.Make use of various advanced application.

6.Illustrate different rapid prototyping techniques.

Section I

Unit-1: Basics of Casting Processes **No. of lectures-06**

Definition of casting, Basic steps in casting processes, Advantages, limitations and applications of casting process, General introduction to patterns, Types of patterns, materials used, Allowances, types of cores and core boxes, molding materials and its properties, Gating system, types of risers, Function of riser, method to improve efficiency of risers. Riser design simple numerical problems.

Unit-2:Melting, Molding and Inspection processes **No. of lectures-09**

Construction and working in brief of melting furnaces such as Cupola, Arc furnaces, induction furnaces. Green sand molding (hand and machine molding), Shell molding, Investment casting, centrifugal casting, gravity and pressure die casting processes. Stages in fettling, Common important defects in castings. Inspection procedure, Computer applications in foundry processes, foundry Mechanization.

Unit-3:Introduction to Joining processes **No. of lectures-05**

Welding processes, classification of welding process, arc welding, welding rod selection, TIG welding & MIG welding, submerged arc welding, gas welding, resistance welding, Brazing and soldering.

Section II

Unit-4:Conventional Forming Processes **No. of lectures- 09**

Introduction to forming process, Classification of forming processes, forging, types of forging, simple numerical problem on upset forging. Extrusion, Types – direct extrusion, indirect extrusion, impact extrusion, hydrostatic extrusion, Wire drawing process, Methods of tube drawing, hot rolling, cold rolling of sheets, classification of Rolling mills, theory of rolling, simple numerical problems on rolling.

Unit-5:Advanced Forming Processes **No. of lectures- 06**

Introduction to advanced forming process, High energy rate forming process- explosive, Electro-hydraulic, magnetic pulse forming. Forming with hydrostatic pressure- hydro mechanical and hydro forming process

Unit-6:Advanced Manufacturing Processes **No. of lectures-05**

Introduction to Rapid prototyping (RP), Basic principles, Classification, Steps in RP,

Advantages, disadvantages and applications of RP, Stereo lithography - Selective Laser Sintering (SLS), Selective Powder Binding (SBP), Fused Deposition Modeling (FDM), Direct Metal Laser Sintering (DMLS), Advantages, disadvantages and applications

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Design of pattern and core for a simple component.
2. Testing of silica sand for grain fineness and clay content.
3. Testing of green sand for green compression strength, permeability.
4. Study of mold for moisture content and core hardness tester.
5. Study of VI characteristic of welding process.
6. Study of manufacturing sequence of upset forging with example.
7. Demonstration of any one rapid prototyping technique.
8. Visit to Foundry and Forging unit.

Text Books:

1. TV Ramana Rao, METAL CASTING Principles and Practice, NEWAGEINTERNATIONAL
2. N.D. Titov, Foundry Practice.
3. P.L. Jain, Principles of Foundry Technology.
4. P.N.Rao, Manufacturing Technology: Foundry, Forming and Welding.
5. Production Technology by P.C.Sharma

Reference Books

1. Metal Casting Principles and Techniques, 1st Edition, Publisher: American Foundry Society
   Editor: Ian Kay
2. Fundamentals of Modern Manufacturing, M. P. Groover,John Wiley & Sons.
3. Heine, Lopar, Rosenthal, Principles of Metal Casting.
4. Metal Forming: Technology and process modelling, McGraw-Hill Education
5. Rapid Prototyping: Principles and Applications, Chee Kai Chua, World Scientific.

Punyashlok Ahilyadevi Holkar Solapur University

Second Year B.TECH. (Mechanical Engineering)

Semester-III

ME2152 :Internal Combustion Engines

Teaching Scheme	Examination Scheme
Lectures:03Hours/week, 03Credits	ESE:70Marks
Practical :02Hours/week, 01Credit	ISE:30Marks
	ICA:25Marks

Course Introduction: I.C. Engines are widely used for passenger vehicles, transportation, agriculture purchases. They are available in different capacities and types. Its study is vital for a Mechanical Engineer.

Course Objectives:

During this course, student is expected to:

1. Distinguish the different types of engine constructions and their thermodynamic principles.
2. Differentiate the constructional details of various fuel systems used in different types of I. C. Engines and calculate major dimensions of carburettor and fuel injection system.
3. Apply the basic knowledge to infer the different methods for enhancing the performance of I. C. engines
4. Correlate the difference in SI and CI engine combustion processes with the design of combustion chambers used in these engines
5. Evaluate the performance parameters of I. C. engines to justify their use in different applications.
6. Categorize different alternative fuels suitable for different engine applications and compare the pollutants formed in these engines and their control methods

Course Outcomes:

At the end of this course, student will be able to:

1. Recognize and understand the reasons for differences in the **construction** of different types of internal combustion engines.
2. Evaluate differences among **operating characteristics** of different engine types and designs.
3. **Select** the appropriate **engine** for a given application.

4. Conduct **performance tests** on engines and Compare experimental results with Theoretical predictions.
5. Compare experimental results with theoretical **predictions** and make proper justifications.

Section I

Unit-1: *Introduction to I. C. Engines* **No. of lectures-05**

Introduction, Classification of I.C. Engines, Engine Cycles-Otto and Diesel Cycle, Valve timing diagram for high and low speed engines, Port timing diagram for two strokes S.I. Engines

Unit-2: *Fuel System for S. I. Engines* **No. of lectures-06**

Engine fuel requirements, Mixture requirements, Simple carburetor, and Additional systems in modern carburettor, compensating devices, Calculation of air fuel ratio (exact and approximate methods), Calculation of main dimensions of air and fuel supply (Numerical calculations of main dimensions of carburetor), Electronic Petrol injection system (MPFI).

Unit-3: *Fuel System for C. I. Engines* **No. of lectures-05**

Requirements of fuel injection system for C.I. Engines, Types of injection systems-Individual pump, Common rail and Distributor systems, Unit injector, Types of fuel nozzles- single hole, multihole, pintle and pintaux, CRDI.

Unit-4: *Supercharging* **No. of lectures-04**

Purpose of supercharging, Turbo charging, Thermodynamic cycle of supercharged and turbocharged Engines, Advantages and disadvantages, Limits of supercharging for S.I. and C.I. Engines.

Section II

Unit-5:*Combustion in SI Engines* **No. of lectures-05**

Stages of combustion in S.I. Engines, Ignition lag, Flame propagation, Factors affecting flame speed, Abnormal combustion, Octane number, HUCR, Requirements of combustion chambers of S.I. Engines and its types

Unit-6: *Combustion in C.I. Engines* **No. of lectures-05**

Stages of combustion in C.I. Engines, Delay period, Abnormal Combustion-Diesel knock, Requirements of combustion chambers for C.I. Engines and its types. Comparison of abnormal combustion in S I and C I Engines. Cetane number.

Unit-7: **Engine Testing and performance evaluation** **No. of lectures-05**

Performance parameters, Measurement of performance parameters like torque, power, and Volumetric Efficiency, Mechanical Efficiency, bsfc, Brake and Indicated Thermal efficiencies. Heat Balance Sheet. (Numerical on engine Performance and Heat Balance Sheet).

Unit-8: **Alternative Fuels and Engine Emission** **No. of lectures-05**

Various alternative fuels and their suitability for I. C. Engines. S.I. Engine emissions (HC, CO, NOx),C.I. Engines Emissions (CO, NOx, Smog, Particulate), Bharat Norms

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

(minimum 3 from group A and B, and all from Group C)

Group A (Study group)

10. Constructional details of I.C. engines.
11. Study of Engine Cooling and Lubrication system
12. Study of Ignition systems and Starting systems
13. Study of fuel system for S.I. and C. I. engines

Group B (Trial group)

1 Constant Speed Test (Influence of load on performance)

2 Morse Test

3 Heat balance sheet

4 Test on computer controlled I.C. Engine/ Variable Compression Ratio Engine

5 Measurement of exhaust emissions of SI / CI engines

Group C

1 Assignment on recent trends in IC Engine.

2 Visit to an engine (or component) manufacturing company / repairing unit.

Text Books:

1. Internal Combustion Engines, Mathur and Sharma, DhanpatRai.
2. Engineering Fundamentals of the Internal Combustion EngineS, Willard Pulkrabeck, Prentice Hall
3. Internal Combustion Engines, R. K. Rajput, DhanpatRai Publications
4. Internal Combustion Engines, V. Ganesan, McGraw Hill

Reference Books

1. Internal Combustion Engines Fundamentals, John Heywood, McGraw Hill
2. Internal Combustion Engines Emission and Control, Eran Sher, SAE
3. Engine Emissions Purandir, Narosa
4. Alternative Fuels, S.S Thipse, Jaico
5. Internal Combustion Engines Fundamentals, Maleev, McGraw Hill
6. Internal Combustion Engines Vol. 1 and Vol. 2, C.F Taylor, MIT Press
7. Internal Combustion Engines, *Obert*, McGraw Hill
8. Internal Combustion Engines: AppliedThermo sciences, Fergusson & Kirkpatrick, Wiley
9. SAE Handbook, SAE, SAE.

Punyashlok Ahilyadevi Holkar Solapur University

Second Year B.TECH. (Mechanical Engineering)

Semester-IV

ME222 : Manufacturing Technology

Teaching Scheme	Examination Scheme
Lectures : 03 Hours/week, 03 Credits	ESE : 70 Marks
Practical : 02Hours/week, 01 Credit	ISE : 30 Marks
	ICA : 25 Marks

Section I

Unit-1: Conventional Lathe Machine **No. of lectures - 06**

Introduction to Centre Lathe, parts and functions, specifications, accessories and attachments. Lathe operations, Taper turning methods, simple Numerical on Thread cutting. Introduction to CNC machine tools, Classification of CNC, advantages, limitations and application.

Unit-2: Hole making machine tools **No. of lectures - 08**

Classification, construction and working of Pillar type and radial drilling machines, Job & Tool holding devices and accessories, various operations. Horizontal and vertical boring machines, construction and working, Boring tools and bars, Jig boring machines. Broaching, principal, classification, pull and push type broach, advantages, limitations and application.

Unit-3: Reciprocating motion machine tools **No. of lectures - 06**

Principle, types, specifications, operations on shaper, Types of shapers, Types of planers, standard double housing plainer, construction, and operations. Introduction to construction and working of slotting machine.

Section II

Unit-4: Milling & gear manufacturing **No. of lectures- 09**

Classification of Milling Machines, construction and working of column and knee type milling Machines, Milling methods – Up milling and down milling, milling operations, Gear cutting on milling machines, Gear Hobbing, gear shaving, gear burnishing, indexing methods, Numerical on Indexing Methods.

Unit-5: Finishing Processes **No. of lectures- 05**

Classifications – Cylindrical, Center less, Surface grinder etc. Selection mounting, glazing, loading, truing, balancing, Surface finishing process, Honing, Lapping, super finishing.

Unit-6: Non-conventional Machining **No. of lectures- 06**

Introduction, classification, significance of Unconventional machining, Electrical discharge machining (EDM), Electrochemical Machining (ECM), Ultrasonic machining (USM), Abrasive Water Jet Machining (AWJM), Principle, working, applications, advantages, limitations.

Internal Continuous Assessment (ICA):

1. Setting the lathe machine for taper turning by swiveling compound rest and set over of tail stock method.
2. Setting the lathe machine for thread cutting operation.
3. Study and demonstration of attachments on milling machine.
4. Study and demonstration of various types of milling cutters.
5. Setting the milling machine for gear cutting operation.
6. Study and demonstration of various types of grinding wheels and their specifications.
7. Study of non-conventional machining processes (ECM, EDM).
8. Visit to at least one machine shop and one CNC shop.

Text Books:

1. Workshop Technology (Volume II) by Hajra Chowdhary.
2. Workshop Technology (Volume II) by Raghuvanshi.
3. Production Technology (Volume II) by Gupte-Patel.
4. Workshop Technology (Volume II) by W. A. J. Chapman.
5. Manufacturing Technology-P. N. Rao Vol. II.

Punyashlok Ahilyadevi Holkar Solapur University

Second Year B.TECH. (Mechanical Engineering)

Semester-IV

ME2252 :Power Plant and Energy Engineering

Teaching Scheme	**Examination Scheme**
Lectures:03Hours/week, 03Credits	**ESE:70Marks**
Practical :02Hours/week, 01Credit	**ISE: 30Marks**
	ICA: 25Marks

Course Introduction:

Availability of power is the one key area where most of the Indian industry is facing problems. In India, even today, short fall of power generation is about 30 percent. Fuel supply and distribution is also an area where country is still developing smooth lines of supply. Since power and energy is required by every sector of economy, the growth in this sector is must if Indian economy grows in any sector. Many of the job opportunity in private as well as public sector are therefore waiting for students in this field. Hence, this course attempts to provide them basic knowledge of the technologies available at plant level and would also acquaint them with the latest technological advances taking place in this sector.

Course Objectives: During this course, student is expected to:

1. Study of Power Station performance evaluation & economic analysis.
2. Study of various non-conventional energy sources & principles of energy
3. Explain various loads on power plant.
4. Illustrate Significance of different load curves and load factors on power plant.
5. Explain variable load on power plant.
6. Study & explain economics of power plant.

Course Outcomes:

At the end of this course, student will be able to:

1. Describe forms of energy source and their impact on environment.
2. Calculate performance parameters related to power plant.
3. Explain the economics of power plant & categorize power plant as base load & peak load plant.
4. Compare various renewable energy sources with their features.
5. Recognize energy conservation opportunities and explain energy audit concept.

Section I

Unit-1:Introduction **No. of lectures- 5**

Classification of energy sources Organization of Power Sector in India, NTPC, NHPC, NPCIL and their role in Power development in India, Role of private sector in energy management, Power distribution, Power Grid Corporation of India (PGCIL)

Unit-2:Loads on Power Plant **No. of lectures- 8**

Introduction, classification of loads on power plant, Different load curves and load factors, Effect of variable load on power plant, design & operation, comparison of the thermal, hydroelectric, nuclear and diesel power plants. (Numerical treatment)

Classification of plants, Requirements of peak load plant, Pumped storage plants,

Compressed air storage plants, Load sharing between base load & peak load power stations.

Unit-3:Economic Analysis of Power Plants **No. of lectures- 7**

Introduction, Cost of electric energy, Fixed and operating cost, Methods of determining depreciation, Selection of site for Power station (thermal, hydro, nuclear), Tariff methods. (Numerical treatment) Selection of Boilers, Selection of Prime movers, selection of size and number of generating units

Section II

Unit-4:Solar Energy **No. of lectures-8**

a) Solar radiation outside the earth's atmosphere & at the earth's surface, Solar radiation measurement – Pyranometer & Pyrheliometer, solar radiation geometry. LAT & SCT, Solar concentrators-Method and classification, Types of concentrators.

b) Liquid flat plate collector – General, Performance analysis, Effects of various parameters. (Numerical treatment)

Solar Power Plant: Introduction, components, Types of Collectors & Solar Ponds, Low & High Temperature Solar Power Plant. Photovoltaic Power System, Heliostat

Unit-5:Other Non-Conventional Power Plants **No. of lectures-7**

Wind Power plant: Introduction, Power of wind, Basic components of 'WECS', Classification of WEC systems. Horizontal axis machines, Vertical axis machines, Advantages & Disadvantages of WECS,Application of wind energy.

Tidal energy, wave energy, OTEC, geothermal, magneto hydrodynamics, hybrid power plants, Challenges in commercialization of Non-Conventional Power Plants.

Unit-6:Energy conservation and Energy Audit **No. of lectures- 5**

Energy Conservation- Introduction, energy conservation act 2001 & its feature, energy conservation in industries

Energy Audit- Introduction, need of energy audit, Types of energy audit,Energy management (audit) approach-understanding energy costs, Bench marking, Role of Bureau of Energy Efficiency (BEE)

Internal Continuous Assessment (ICA):

Group - I: Any two Experiment from Expt. No. 1 to 5

14. Solar radiation & its measurement
15. Efficiency measurement of standalone solar P-V system
16. Test on solar water heater
17. Study of components of windmill
18. Trial on Diesel Power Plant.

Group - II: Minimum Six Assignments based on following topics

1. Study of typical load curve (Residential/Commercial/Industrial)
2. Economic Analysis of power plants (Numerical Treatment)
3. Study of Biogas plants
4. Study of Nuclear Power Plants.
5. Study of solar collectors
6. Study of solar thermal applications- solar water heating, space heating, power
7. Study of solar pond / solar photovoltaic
8. Study of various Energy storage devices.
9. Study of instruments of a power plant water purity, PH meter, Gas analysis, Measurement of smoke & dust.
10. **Industrial Visit:** The report based on any Industrial Visit to renewable energy appliances or power generation transmission station

Text Books:

5. A course in Power Plant Engineering – Arora Domkundwar, Dhanpat Rai & Co.
6. Solar Energy – S. P. Sukhatme, Tata McGraw Hill Co.
7. Solar Energy – G. D. Rai, Khanna Publisher.
8. Energy Technology – S. Rao & Dr. B. B. Purulekar, Khanna Publishers.
9. Power Plant Engineering – P. K. Nag, Tata McGraw Hill Publishing Co.

10. Power Plant Engineering- R. K. Rajput, Laxmi Publications, New Delhi.
11. Generation of Electrical Energy – B. R. Gupta, S. Chand & Co. Ltd.

Reference Books

5. Power Plant Technology – M. M. El Wakil
6. Bureau of Energy Efficiency Manual
7. Non-conventional Energy Sources- G. D. Rai, Khanna Publisher
8. Principles of Power System- V.K. Mehta
9. Power System Analysis - Grainger John J, and Stevenson Jr. W.D. Tata McGraw Hill

Punyashlok Ahilyadevi Holkar Solapur University

Second Year B.TECH. (Mechanical Engineering)

Semester-IV

ME 226 MECHANICAL WORKSHOP-I

Teaching Scheme	Examination Scheme
Practical : 02 Hours/week, 01 Credit	ICA : 50 Marks

Course Prerequisite:- fundamental machine shop instruction involving safety use and care of hand and measuring tools basic operation of all conventional machines and grinding of single pointtools, screw threads and taper turning and their application classes of fits and tolerances arestressed students will be provided the opportunity to learn and practice bench work skills.

Course Objectives:

1. To get hands on experience on conventional machines like lathe machine, drilling machine etc. and machining techniques such as drilling, turningetc., studied in theory subjects.
2. To develop skills to operate different machine tools.
3. To get hands on experience in pattern making, joining processes and forming processes.
4. To develop skills in pattern making and sheet metal work.

Course Outcomes:

At the end of this course, the student will be able

1. To operate different machine tools such as grinders, lathes, drilling machines etc.
2. To machine the component as per specified dimensions.
3. To develop the skills necessary for engineering practices like joining and forming processes.
4. To Choose and apply the appropriate methods for pattern making & sheet metal working I. Preparation of Wooden pattern (single piece) for a simple component:

Part A –This shall cover – Study of component drawing, preparing casting drawing, Allowancetable, Pattern drawing, Deciding parting line & Deciding pattern making process. (2 Turns)

Part B – Actual manufacturing of pattern. (2 Turns)

II. Study of gas welding & gas cutting equipment, Study of arc welding equipment, Study &demonstration of resistance welding, Study of various types of welding joints & demonstration of gas & arc welding, Manufacturing of one job on arc welding. (2 turns)

III. Demonstration Study of sheet metal operations like bending, shearing, lancing, perforating, punching etc...

IV. One sheet metal job consisting of at least 3 operations. (2 Turns)

(Either performed manually or on press) Demonstration:

OR

IV. Study of various hand forging operations like upsetting, drawing dawn, piercing, swaging etc...One job involving 3 operations. (Either performed manually or on press) (2 Turns)

V. One job in M.S. consisting of following basic operations shall be performed by students: Turning, Step turning, taper turning, Chamfering, Grooving and Knurling. At least one dimension of the job shall carry close tolerance. (4 Turns)

Note: Students shall prepare a work book involving brief write up regarding machine/machinesemployed for job. Students should prepare a work book which involves a process sheet for eachjob and inspection report of the job. Based on the job performed, attendance record, work book,internal viva, faculty members may evaluate the term work.

• Books:

1. Workshop Technology (Volume II) by Raghuvanshi.

2. Workshop Technology (Volume II) by HajraChowdhary.

3. Workshop Technology (Volume II) by W.A.J.Chapman.

4. Production Technology by P.C. Sharma.

5. Production Technology – HMT Handbook. 6. Production Technology (Volume II) by Gupte-Patel.

6. P.L. Jain, Principles of Foundry Technology.

7. P.N. Rao, Manufacturing Technology: Foundry, Forming and Welding.

8. Workshop Technology (Volume II) by W.A.J. Chapman. 6. Production Technology – HMTHandbook.

• Reference Books:

1. Manufacturing Processes & systems by Phillip F. Ostwald, Jairo Munoz-Wiley India.

2. Fundamentals of modern Manufacturing by Mikel P. Groover-Wiley India

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Credit System structure of T.Y. B. Tech. Mechanical Engineering W.E.F. 2022-2023 [Semester V]

Semester V: Theory Courses

Course code	*Name of Theory Course*	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME 311	Design of Machine Elements	3	-	-	-	3	30	70	-	100
ME 312	CAD-CAM-CAE	3	-	-	-	3	30	70	-	100
ME 313	Metallurgy	3	-	-	-	3	30	70	-	100
ME 314	Industrial Engineering	3	-	-	-	3	30	70	-	100
ME 315 P	Professional Elective -III	3	-	-	-	3	30	70	-	100
ME 316	Advanced Programming Concepts – I(Python)	1	-	-	-	1				
SLH31	Self Learning -HSS	-	-	-	-	#2	-	50	-	50
	Sub Total	16	-	-	-	16	150	400	-	550

Semester V: Laboratory / Tutorial Courses

Course code	*Name of Laboratory /Tutorial Course*	*Hrs./week*				*Credits*	*Examination Scheme*				
		L	*T*	*P*	D		*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME 311	Design of Machine Elements	-	-	2	-	1	-	-	-	25	25
ME 312	CAD CAM CAE	-	-	2	-	1	-	-	-	25	25
ME 313	Metallurgy	-	-	2	-	1	-	-	25	25	50
ME 315 P	Professional Elective -III	-	-	2	-	1	-	-	-	25	25
ME 316	Advanced Programming Concepts - I(Python)	-	-	2	-	1	-	-	-	25	25
Me 317	Workshop Practice - II	-	-	2	-	1	-	-	-	50	50
ME 318	Metrology	-	-	2	-	1	-	25	-	25	50
	Sub Total	-	-	14	-	07	-	50		200	250
	Grand Total	**16**	-	14	-	23	150	450		200	800

Note:# Indicates credits over and above

Abbreviations: *L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE- In Semester Examination, ESE - End Semester Examination (University Examination for Theory & / POE & / Oral), ICA- Internal Continuous Assessment.*

Professional Elective –III: A. Gas Turbines, B. Tool Engineering, C. Industrial Hydraulics Pneumatics D. Mechanical Vibrations

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Credit System structure of T.Y. B. Tech. Mechanical Engineering W.E.F. 2022-2023 [Semester VI]

Semester VI : Theory Courses

Course code	*Name of Theory Course*	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME 321	Transmission System Design	3	-	-	-	3	30	70	-	100
ME 322	Instrumentation and Control Engineering	3	-	-	-	3	30	70	-	100
ME 323	Heat Transfer	3	-	-	-	3	30	70	-	100
ME 324	Industrial & Quality Management	3	-	-	-	3	30	70	-	100
ME 325 P	Professional Elective - IV	3	-	-	-	3	30	70	-	100
ME 327	Advanced Programming Concepts – II(Java)	1	-	-	-	1	-	-	-	-
	Sub Total	**16**	**-**	**-**	**-**	**16**	**150**	**350**	**-**	**500**

Semester VI : Laboratory / Tutorial Courses

Course code	*Name of Laboratory / Tutorial Course*	*Hrs./week*				*Credits*	*Examination Scheme*				
		L	*T*	*P*	D		*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME 321	Transmission System Design	-	-	2	-	1	-	-	25	25	50
ME 322	Instrumentation and Control Engineering	-	-	2	-	1	-	-	-	25	25
ME 323	Heat Transfer	-	-	2	-	1	-	25	-	25	50
ME 324	Industrial & Quality Management	-	1	-	-	1	-	-	-	25	25
ME 325 P	Professional Elective - IV	-	-	2	-	1	-	-	-	25	25
ME 326	Workshop Practice - III	-	-	2	-	1	-	-	-	50	50
ME 327	Advanced Programming Concepts – II (Java)	-	-	2	-	1	-	-	-	25	25
ME 328	Mini Project	-	1	-	-	1	-	-	-	50	50
	Sub Total		02	12	-	08	-	50		250	300
	Grand Total	**16**	02	12	-	24	150	400		250	800

Abbreviations: *L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE- in Semester Examination, ESE - End Semester Examination (University Examination for Theory & / POE & / Oral), ICA- Internal Continuous Assessment.*

Professional Elective – IV: A. Project Management, B. Industrial Product Design C. Plastic Engineering, D. Railway Transportation System.

- **Note** –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining students exceeds 07, then a new batch shall be formed.
2. Industrial Training (evaluated at Final Year Sem.-I) of minimum 30 days shall be completed in any vacation after S.Y. Sem.-IV but before Final Year Sem.VII & the report shall be submitted and evaluated in Final Year Sem.-VII.
3. Students shall select one Self Learning Module at T.Y. Sem. V from Humanities and Social Sciences.
4. Curriculum for Humanities and Social Sciences Self Learning Modules is common for all under graduate programmes of faculty of Engineering and Technology.

5. **For T. Y. Sem. V**

A. Student can select a Self Learning Course from PAH Solapur University, Solapur HSS Course List and appear for its examination as and when conducted by PAH Solapur University, Solapur

OR

B. Student can enroll for National Programme on Technology Enhanced Learning (NPTEL) course, complete its assignments and Appear for certificate examination as and when conducted by NPTEL.

For more details about Self Learning Course (HSS), please refer to separate rule document available from PAH Solapur University, Solapur (http://sus.ac.in/uploads/engineering/Eng%20Revised%20Semester%20Pattern/Self%20Learning-%20H.S.S.%20courses%20All%20Engg.Branches_2014-15.pdf). More details about NPTEL are available at http://nptel.ac.in

6. ICA assessment shall be a continuous process based on student's attendance and performance in class tests, assignments, homework, seminars, quizzes, case studies and journals, as applicable.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 312 : CAD-CAM-CAE

Teaching Scheme	**Examination Scheme**
Lectures: 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

Now-a-days industries cannot survive worldwide competition unless they introduce new products with better quality, at lower cost, and with shorter lead time. Accordingly, they have tried to use the computer's huge memory capacity, fast processing speed, and user-friendly interactive graphics capabilities to automate and bind together thus reducing the time and cost of product development and production. Computer-Aided Design (CAD), Computer-Aided Manufacturing (CAM), and computer-aided engineering (CAE) are the technologies used for this purpose during the development of mechanical product with best quality and lowest cost. Students must have knowledge of CAD, CAM and CAE. Therefore, this course contains syllabus related to CAD, CAM and CAE activities.

Course Objectives:

The course aims to :

1. Create an awareness regarding Geometric Modeling activities in Industries.
2. Create an awareness regarding CAM activities in Manufacturing Industries.
3. Develop part programming capabilities for CNC machines.
4. Empower students to learn advanced tools in Automation.
5. Utilize modern tools for design, analysis and manufacturing activities.

Course Outcomes:

At the end of this course, student will be able to:

1. Solve CAD related problems from industries.
2. Elaborate the concept of geometric modelling
3. Create solid model in CAD/CAM/CAE environment according to predefined parameters
4. Analyze Geometric transformations and FEA applications to mechanical component.
5. Solve CAM related problems of manufacturing industries.
6. Develop CNC part programming to operate CNC milling & turning machine to manufacture a Mechanical part.

Section I

Unit-1: Introduction to CAD / CAM/CAE **No. of lectures- 04**

Product Cycle and CAD / CAM/CAE, Advantages of CAD / CAM/CAE, Hardware used for CAD/CAM/CAE system, List of input/output devices, Functions of Graphics Software, `Selection of CAD / CAM/ CAE Software.

Unit-2: Computer Graphics and Geometric Modeling **No. of lectures- 08**

Geometric Transformations, Homogeneous Coordinates, Windowing and Viewing Transformations, Coordinate Transformations, Standardization in Graphics Software, CAD / CAM Data Exchange. Introduction to Geometric Modeling and its types, Parametric representation of basic entities like line and circle, Introduction to basic curves - Bezier, B-Spline, NURBS, concept of CSG and Boolean operations, Feature based modeling.

Unit-3: Finite element method and Automation **No. of lectures- 08**

Finite element method: Definition, Types of analysis, terms used in FEM, types of nodes and elements, General Steps of the FEM, Structural and thermal analysis of 1-D bar elements, Introduction to latest FEA software.

Automation: Concept & Definition of Automation, Types, Advantages and Limitations of Automation, Automation and CAD/CAM, CIM and CAD / CAM, Group Technology, part family, Classification and Codification System, Merits and Demerits of Group Technology, CAPP, Retrieval and Generative type of CAPP, MRP, concept of ERP, concept of Rapid Prototyping.

Section II

Unit-4: Fundamentals of NC system **No. of lectures- 06**

Evolution of NC and Retrofitting, Elements of NC Manufacturing System, concept of work zero and machine zero, Types of NC systems, Structure, Drives and other devices, Steps in NC Manufacturing, Advantages and Disadvantages of NC Technology, Flexible Manufacturing System (FMS), Elements of FMS, Applications of FMS, Merits and Demerits in FMS.

Unit-5: CNC- DNC Technology and Tooling **No. of lectures- 06**

Classification of CNC machine tools, CNC controllers, Features and Advantages of CNC, Adaptive Control, Advantages of Adaptive Control, Direct Numerical Control, Types of Direct Numerical Control, Advantages and Disadvantages of Direct Numerical Control, Tool holders, Adapters, Tool magazines, Automatic tool changers, Pallets, Tool setting, Modular tooling.

Unit-6: Manual Part Programming **No. of lectures- 08**

Principles of an NC Program, Word Address Format (WAF), Machining Formulas, Tool Length and Cutter Diameter Compensation, Canned Cycles for Lathe, Milling and Drilling, Introductory treatment of Subprogram, Subroutines, DO Loop, Macros.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Assignment on Modeling & Drafting of any two mechanical components.
2. Assignment on Modeling of simple Assembly of around 3-5 machine components.
3. Assignment on Elements used in FEM analysis
4. Assignment on Rapid Prototyping
5. Assignment on FEA based structural analysis of simple mechanical component.
6. Assignment on FEA based thermal analysis of simple mechanical component.
7. Part programming of one job using CAM software or Programming and manufacturing of one job on CNC lathe or CNC Milling machine.
8. Assignment based on Industrial visit and its report based on CNC/FMS/Automation.

Text Books:

1. Introduction to CAD/CAM, Rao P.N., -Tata McGraw Hill Publishing Co.
2. Automation, Production Systems and Computer Integrated Manufacturing, Grover M.P.- Prentice Hall of India
3. Numerical Control -Computer Aided Manufacturing, Kundra, Rao, Tiwari- TMHillPub.Co.
4. CAD/CAM/CAE, Chougule N.K.- SCITECH Publications (I) Pvt. Ltd.
5. CAD/CAM/CIM, P. Radhakrishanan.

Reference Books

1. Introduction to CAD/CAM, Rao P.N., -Tata McGraw Hill Publishing Co.
2. Automation, Production Systems and Computer Integrated Manufacturing, Grover M.P.- Prentice Hall of India
3. Numerical Control -Computer Aided Manufacturing, Kundra, Rao, Tiwari- TM Hill Pub. Co.
4. CAD/CAM/CAE, Chougule N.K.- SCITECH Publications (I) Pvt. Ltd.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester-V

Professional Elective - III

ME 315 (C) : Industrial Hydraulics & Pneumatics

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

This course introduces hydraulic system & pneumatic system. Initially it covers the construction & working of various components of fluid power systems. Preparation of hydraulic & pneumatic circuit diagrams for various applications using the ISO symbols of hydraulic & pneumatic components is covered. Inclusion of use of catalogues of hydraulic & pneumatic component manufacturers for selection of components is also done in this course. Students will be made familiar with use of software for hydraulic & pneumatic circuit design.

Course Objectives:

The course aims to:

1. Understand advantages & disadvantages of fluid power systems.
2. Become familiar with the construction and function of the different hydraulic & pneumatic components/ devices.
3. Know suitability of any hydraulic & pneumatic components for specific application.
4. Understand the operation of basic circuits

Course outcomes:

At the end of this course, students will be able to

1. Choose hydraulic & pneumatic systems for proper applications
2. Explain construction & working of hydraulic & pneumatic system components/ devices
3. Select appropriate actuators for a particular application
4. Draw symbols of hydraulic & pneumatic system components/ devices
5. Prepare hydraulic & pneumatic circuits for various applications
6. Identify process flow on a hydraulics or pneumatic schematic

Section I

Unit-1: Introduction to Fluid Power System & Hydraulic Actuators **No. of lectures-06**

Fluid Power System: Introduction, Types, advantages, limitations & applications. Basic components of Hydraulic system, Hydraulic Actuators- Linear & Rotary, Types, Working, Construction, Cushioning effects, Calculation of velocity & force, Seals & Packing- Types, materials, applications

Unit-2: Pumps, Accumulators, Intensifiers & Valves **No. of lectures-08**

Pumps- Classification, construction, operation, advantages, applications, Pump performance, Characteristics. System components: Accumulators, Intensifiers, their types, working, applications,

Hydraulic Pressure control valves- Direct acting type, pilot operated, sequence, counter balancing, unloading, pressure reducing, Construction & Working, Direction control valves- Types, construction & working, Spool actuationmethods, spool centre positions. Flow control valves- Compensated & Non-Compensated, Construction & Working, One way valve. Symbols of above components/ devices

Unit-3: Hydraulic circuits **No. of lectures-06**

Simple circuit, Speed control circuits: Meter in, Meter out & bleed off circuits, Regenerative circuit, Sequencing circuit, Counter balancing, Synchronizing, Circuits with accumulator & intensifier

Section II

Unit-4: Introduction to Pneumatic system & Actuators **No. of lectures-06**

Pneumatic system: Advantages, limitations & applications of pneumatic system, Comparison of hydraulic & pneumatic system, ISO symbols used in pneumatic circuits, pneumatic cylinders and air motors, types, construction and working

Unit-5: Pneumatic System Elements & Valves **No. of lectures-08**

Air compressors, types, working, selection criteria, FRL unit, construction and working, Direction control valves, Flow control valves and pressure control valves – types and working, Quick Exhaust valve, time delay valve

Unit-6: Pneumatic circuits **No. of lectures-06**

Simple Pneumatic circuits, time delay circuit, Pneumatic clamping system, Pneumatic braking systems, Pneumatic power tools

Internal Continuous Assessment (ICA): Any 8 from given list of experiments

1. ISO symbols for different components of Hydraulic and Pneumatic system
2. Study of hydraulic valves
3. Study of pneumatic valves
4. Demonstration of Hydraulic speed control circuits
5. Demonstration of hydraulic speed control circuits
6. Demonstration of Traverse & feed circuit
7. Demonstration of sequencing circuit
8. Demonstration of pneumatic circuits
9. Test on Gear/Vane/Piston pump and plotting of performance characteristic
10. Software use for hydraulic & pneumatic circuit design
11. Design of hydraulic/pneumatic circuit for practical application, Selection of different components such as reservoir, various valves, actuators, filters, pumps based on design. (Students are advised to refer manufacturers' catalogues)
12. Visit to Service station of Earth Moving equipment (Note: Students should write visit report based on the observations made during the visit)

Text Books:

1. Oil Hydraulics- Principle & Maintenance, S. R. Majumdar, Tata McGraw Hill
2. Hydraulics and Pneumatics H.L.Stewart – Industrial Press
3. Pneumatics- Principle & Maintenance, S. R. Majumdar, Tata McGraw Hill
4. Fluid Power with Applications, Anthony Esposito, Pearson Education

Reference Books

1. Eaton-Vickers Industrial Hydraulics Manual
2. Festo's Manual on Pneumatic Principle, applications
3. Hydraulics And Pneumatics, Jagadeesha T, Dreamtech Press

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.TECH. (Mechanical Engineering)

Semester- V

ME 317: Mechanical Workshop – II

Teaching Scheme
Practical: 02Hours/week, 01 Credit

Examination Scheme
ICA: 50 Marks

Course Introduction:
This course is important to understand fundamentals of machine shop starts from safety measures, practical use of measuring tools, use of all conventional machine tools, operations of all conventional machines, use of tolerances, fits and finally their practical use and applications.

Course Objectives:
The course aims to:

1. Learn and understand different machining operations practically studied in theory subjects.
2. Get hands on experience of machining operations such as grinding, drilling, shaping, turning etc.
3. Develop skills to operate different machine tools.
4. Apply tolerances on job.

Course Outcomes:
At the end of this course, student will be able to:

1. Grind the tools.
2. Operate different machine tools such as grinders, lathes, milling, drilling machines etc.
3. Machine the component as per specified dimensions.
4. Apply tolerances on job.

Course Contents

1. Tool grinding demonstration and actual grinding to understand the tool geometry (01 turns)
2. One composite job in M.S. consisting of one component and inclusive of following operation shall be performed by students (Any 5 Operations)
3. Facing, Turning, Step turning, Chamfering, Grooving, drilling, Knurling.
4. At least one dimension of the job shall carry close tolerance (04 turns)
5. Preparation of process sheet for the above job (01 turn)

Note : Students shall prepare a work book involving brief write up regarding machine/machines employed for job. Students should prepare a work book which involves a process sheet for each job and inspection report of the job. Based on the job performed, attendance record, work book, internal viva, faculty may carry internal assessment.

Text Books:

1. Workshop Technology (Volume VI) by Raghuvanshi.
2. Workshop Technology (Volume VI) by Hajra Chowdhary.
3. Workshop Technology (Volume VI) by W.A.J. Chapman
4. Production Technology by P. C. Sharma.
5. Production Technology – HMT Handbook.
6. Production Technology (Volume VI) by Gupte - Patel.
7. P. L. Jain, Principles of Foundry Technology.
8. P.N. Rao, Manufacturing Technology: Foundry, Forming and Welding.

Reference Books

1. Manufacturing Processes & systems by Phillip F. Ostwald, Jairo Munoz-Wiley India.
2. Fundamentals of modern Manufacturing by Mikel P. Groover-Wiley India

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.TECH. (Mechanical Engineering)

Semester-V

ME 318 : Metrology

Teaching Scheme
Practical : 02Hours/week, 01 Credit

Examination Scheme
POE : 25 Marks
ICA : 25 Marks

Course Introduction:

The students of Mechanical Engineering branch are basically concerned with manufacturing various machine components in shops as per given drawing. Today the industrial processing and manufacturing techniques have become complex and complicated and their control is very much difficult by human judgment only. Therefore, the exact and precise measurements are the basic need of the industries. This course of Metrology & Instrumentation, therefore, provides required knowledge and skills and creates self confidence in students so that they can work on shop floor independently for accurate and precise measurements and manufacturing.

Course Objectives:

The course aims to:

1. Calibrate the instruments like vernier calliper and micrometer.

2. Perform angle measurement using a sine bar.

3. Measure various gear tooth elements using gear tooth vernier caliper.

4. Use dial indicator to check Lathe machine parameters like parallelism, squareness, alignment

5. Measure effective diameter of a screw thread.

6. Select adequate limits and fits for various applications.

Course Outcomes:

At the end of this course, student will be able to:

1. Calibrate the instruments like vernier calliper and micrometer.

2. Perform angle measurement using a sine bar.

3. Measure various gear tooth elements using gear tooth vernier caliper.

4. Use dial indicator to check Lathe machine parameters like parallelism, squareness, alignment etc.

5. Measure effective diameter of a screw thread.

6. Select adequate limits and fits for various applications.

Internal Continuous Assessment (ICA):

Any six from the following to be completed and two assignments are compulsory

1. Calibration of Vernier caliper and micrometer.
2. Angle measurement using Sine bar or sine centre in combination with slip gauges
3. Measure gear tooth elements using gear tooth vernier caliper.
4. Use dial indicator to check Lathe machine parameters like parallelism, squareness, alignment or measure run out of a cylindrical component.
5. Use of floating carriage micrometer to measure minor, major and effective diameter of screw thread.
6. Measure effective diameter of a screw thread using a profile projector
7. A visit to a metrology laboratory in an industry

List of Assignments:

1. Assignment based on Limits, Fits
2. Assignment based on gauge design.

Text Books:

1. Gupta. I.C., Engineering Metrology", Dhanpatrai Publications, 2005.
2. Jain R.K., Engineering Metrology", Khanna Publishers, 2009.
3. Rajput R K, Measurement and Metrology", S K Kataria and Sons, 2013.
4. A K Bewoor and V A Kulkarni, Metrology and Measurement, McGraw Hill Education (IND) Pvt Ltd, 2017

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.TECH. (Mechanical Engineering)

Semester-VI

Professional Elective – IV

ME 325 (C) : Plastic Engineering

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hours/week, 03 Credits	**ESE : 70 Marks**
Practical : 02Hours/week, 01 Credit	**ISE : 30 Marks**
	ICA : 25 Marks

Course Introduction:

During this course, student is exposed to following knowledge-

1. Study of extraction, manufacturing of plastic material and classification.
2. Study of various properties of plastic materials, comparative study of the plastics on the basis of parameters like structure, cost and processing time etc.
3. Study and Comparison of the different processes on the basis of parameters like design of plastic part, cost and processing time etc.
4. Design of plastic part, die/molds, correct selection & design leads to compact & less cost of systems.

Course Objectives:

The course aims to:

1. To understand the mechanism of polymerization, techniques of polymerization
2. To provide the depth knowledge about different kinds of plastic materials based on their structure and properties.
3. To make the students familiar about properties and processing of plastics and use it for different applications.
4. To provide the depth knowledge about plastic product design and different kinds of die/mould design.

Course Outcomes:

At the end of this course, student will be able to:

1. Predict the structure and properties of different kind of plastic material and select the plastic materials for particular end user application.
2. Know the processing of different plastic material based on the end user requirement.
3. Design the plastic products
4. Design compression and transfer molds
5. Design Injection Moulds
6. Design plastic injection mould for cooling

Section I

Unit-1: Study of *Plastic Materials* **No. of lectures - 06**

Definition and Classification of Plastic Materials, Properties of plastics, applications, Testing methods for plastics, additives in plastics, Monomers & Polymers, Polymerization - Types of Polymerization.

Introduction to composite plastics, Introduction of polymer degradation and biodegradable plastics, advanced application like Agriculture, Packaging, Building, Transport, Electrical, Electronics, Medical and Furniture.

Unit-2: Processing of Plastics and Welding of Plastics **No. of lectures - 07**

Processing of Plastics:

Injection molding, Extrusion molding, sheet forming processes, calendaring, Blow molding, Processing of thermosetting plastics, compression molding, Transfer molding, rotational molding.

Welding of Plastics:

Hot gas welding, hot tool welding, High frequency induction welding, laser welding, Infrared welding, ultrasonic welding, friction welding.

Unit-3: Design of Plastic Parts **No. of lectures - 07**

Basic design features, Tolerances of molded plastics parts, allowances in plastics, Design corners, undercuts, curing time, ribs, minimum wall thickness, design of inserts, cores mold materials.

Section II

Unit-4: Design of compression and transfer molds **No. of lectures – 08**

a) Design and main parts of compression mould, standard insert mould body, design of loading chamber, design of punch, ejectors, stripper guided pin.

b) Technology of transfer mould, types, main parts, automation in transfer mould.

Unit-5: Injection Mould Design **No. of lectures – 06**

Injection mould design, Single, multi cavity, semi-automatic and automatic moulds. Types of injection mould, detailed structure and working. Feed system, Temperature control system, Ejection System, application.

Unit-6: Cooling of plastic injection mould **No. of lectures – 06**

Determining the heat quantity dissipated with cooling, heat dissipation with natural cooling, mean temperature, thermal resistance of mold body, summery of dimension and construction of correct cooling system.

Internal Continuous Assessment (ICA):
List of Experiments/Assignments/Case Studies, etc.

1. Study of plastic material- Polymerization, properties and specific applications in wide areas.
2. Design of Plastic product.
3. Injection mould design for simple component.
4. Design of Compression mould.
5. Design of Blow Mould.
6. Two Case studies for mould manufacturing-At least one case study with any CAD/CAM software.
7. Study and applications of advanced Plastics.
8. Industry Visit to Plastic part manufacturing Units (Min. Two Units).

Text Books:

1. Prof.(Dr.) Sanjay K Nayak, Fundamentals of Plastics Mould Design, Tata McGraw Hill Education Private Limited, New Delhi.

Reference Books

1. J. A. Brydson, “Plastics Materials”, Butter worth Heinemann Oxford,1999
2. Schwartz & good man “Plastics materials and processing”
3. Irwin Rubin “Hand book of Plastic Materials and Technology”
4. Fred W. Billmeyer, JR., “Text Book of Polymer Science”, John Wiley & Sons, Singapore, 1994
5. Charles A. Harper, “Handbook of Plastic Processes”, WILEY India Pvt.Ltd.,2014
6. R.C.Batra, “Comprehensive Injection Moulding”, CBS Publishers and Distributors Pvt. Ltd., 2011

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Third Year B.Tech. (Mechanical Engineering)

Semester- VI

ME 327: Mechanical Workshop – III

Teaching Scheme **Examination Scheme**
Practical: 02Hours/week, 01 Credit **ICA: 50 Marks**

Course Introduction:
This course is important to make the students aware of various skills involved in manufacturing & assembly, develop skills to operate different machine tools and make students aware of operation sequence, speed, feed selection for different materials & operations along with their operational set up.

Course Objectives:
The course aims to:

1. Set the manufacturing set up of different machining operations and study the corresponding set up parameters while working on actual machine tools.
2. Select appropriate and proper process parameter for obtaining desired requirement on work piece.
3. Identify the operational / processing problems and suggest remedial solution for adopted manufacturing processes.

Course Outcomes:
At the end of this course, student will be able to:

1. Understand the working of various machines
2. Operate various machine tools.
3. Perform various machining operations.
4. Selection of operational and process parameters during machining operations.
5. Manufacture a small assembly of components.
6. Understand various attachments on various machines.

Course Contents
Any one noncommercial assembly consisting of at least three components with tolerance involving use of lathe, drilling, milling, grinding and any additional machine tool or processes as per requirement. Use machining operations like boring, slotting, tapping, tapering, external taper turning, shaping, milling etc. (Any 5 Operations)

or

Development and Execution of one simple turning/milling job on CNC (Trainer) including geometric and dimensional tolerances.

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Note

1. Students shall prepare a work book involving brief write up regarding machine/machines employed for job.
2. Students should prepare a work book which involves a process sheet for each job and inspection report of the job.
3. Based on the job performed, attendance record, work book, internal viva, faculty may carry internal assessment.
4. Material specification for conventional practical job is Φ32mm MS bar and Material for CNC is as per machine requirement.
5. 5. Development and Execution of CNC job need to cover all fundamentals of CNC programming and its execution.

Text Books:

1. Workshop Technology (Volume VI) by Raghuvanshi.
2. Workshop Technology (Volume VI) by Hajra Chowdhary.
3. Workshop Technology (Volume VI) by W.A.J. Chapman
4. Production Technology by P. C. Sharma.
5. Production Technology – HMT Handbook.
6. Production Technology (Volume VI) by Gupte - Patel.
7. Introduction to CAD/CAM, Rao P.N.
8. CAD/CAM/CAE, Chougule N.K.

Reference Books

1. Manufacturing Processes & systems by Phillip F. Ostwald, Jairo Munoz-Wiley India.
2. Fundamentals of modern Manufacturing by Mikel P. Groover-Wiley India
3. Theory and Practice, Ibrahim Zeid – CAD/CAM - Tata McGraw Hill Publishing Co.
4. CAD/CAM - Mastering, Ibrahim Zeid –-Tata McGraw Hill Publishing Co.

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Punyashlok Ahilyadevi Holkar Solapur University

Third Year B.Tech. (Mechanical Engineering)

Semester-V

ME 328 : Mini Project

Teaching Scheme	**Examination Scheme**
Tutorial : 01 Hour/week, 01 Credit	**ICA : 50 Marks**

Course Introduction: The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and society. This course will also develop investigative, research and report writing skills and will provide an opportunity to investigate a chosen topic in considerable depth. Mini Project provides the opportunity for students to demonstrate the application of their research skills, and to apply their knowledge to complex computing problems. A mini project is an assignment that strengthens the understanding of fundamental knowledge through effective application of theoretical concepts.

Course Objectives:

The course aims to:

1. To identify potential problems in engineering.
2. To Carry out Research about the selected topic.
3. To provide a solution for the problem identified.
4. To express technical ideas, strategies and methodologies in written form.

Course Outcomes:

At the end of this course, student will be able to:

1. Identify and analyze the potential technical problems.
2. Carry out research about the selected topic
3. Seek suggestions from subject experts
4. Carry out planning and its execution with teammates
5. Develop solution for a set of requirements for the problem identified.
6. Write a report with all the contents in logical order and do Quality Presentation

6 Steps to do Successful Mini Project:

1. Selection of Topic

Selection of topic is a huge and important task in a Mini Project. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition.

As a graduate you should select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. Your project must play its role towards a positive growth/development in that specific field.

2. Research about the selected topic online

Do some online research about the selected topic. Go through the research papers from different researchers around the world on the topics related to Mini Project. Find some websites containing the information about the materials used for Mini Project.

3. Suggestions from subject experts

Go to the subject experts in institution and interact with them about the Mini Project topic. You can also meet many subject experts from various parts of India through social media and some discussion forums. This helps you in getting suggestions in different possible ways, through which you can get a clear idea on your Mini Project topic.

4. Planning

After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation, analysis, simulation, survey, fabrication etc. along with your teammates. Make a rough schedule, adapt to it and distribute the work among your teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Mini Project rather than any individual (leader) taking full responsibilities.

5. Execution of plans

Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.

6. Presentation

Experimentation/Fabrication does not make a Mini Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of your Mini Project.

The mini project shall be evaluated in two stages, Intermediate review and End Semester Review. Below points are considered for evaluation:

Sr.No.	Title
1	Quality of the presentation
2	Quality of the report
3	The quantum of the work
4	Understanding of the subject selected
5	Deal with questions

Internal Continuous Assessment (ICA)-

Guidelines for Mini-Project content & Mark Distribution

1. A group of maximum 04 students be formed for Mini-Project work.

2. Work diary and reporting to guide as per prescribed contact hours.

3. The contents of work diary shall reflect the efforts taken by project group for

i. Searching suitable mini-project work

ii. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring out the mini-project area.

iii. Brief report of feasibility studies carried to implement the conclusion.

iv. Rough Sketches/ Design Calculations, etc.

4. The mini-project may be based on software/experimental/analysis/fabrication work.

5. It will be preferable if student will work on the area of mini project in line with their proposed final year project.

6. The group has to give a power point presentation in front of the faculty members / panel of department at the end of semester along with the spiral bound report (Limited to 20 Pages).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited2015 'B'Grade (CGPA2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus: Mechanical Engineering

Name of the Course: Final Year B. Tech.

(Syllabus to be implemented from w.e.f. June : 2021-2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Mechanical Engineering
Semester-VII

Choice Based Credit System (CBCS) Structure of Final Year B.Tech. Mechanical Engineering w.e.f. 2021-2022

Theory Courses

Course Code	*Name of Theory Course*	*Hrs./week*				*Credits*	*Examination Scheme*			
		L	*T*	*P*	*D*		*ISE*	*ESE*	*ICA*	*Total*
ME411	Refrigeration and Air Conditioning	3	-	-	-	3	30	70	-	100
ME412	Automobile Engineering	3	-	-	-	3	30	70	-	100
ME413	Robotics and Artificial Intelligence	3				3	30	70		100
ME414x	Professional Elective-V	3	-	-	-	3	30	70	-	100
ME415y	Open Elective	3	-	-	-	3	30	70	-	100
	Sub Total	**15**	**-**	**-**	**-**	**15**	**150**	**350**		**500**

Laboratory / Tutorial Courses

Course Code	*Name of Laboratory/Tutorial Course*	*Hrs./week*				*Credits*	*Examination Scheme*				
		L	*T*	*P*	D		*ISE*	*ESE*		*ICA*	*Total*
								POE	*OE*		
ME411	Refrigeration and Air Conditioning	-	-	2	-	1	-	25	-	25	50
ME412	Automobile Engineering	-	-	2	-	1	-	-		25	25
ME413	Robotics and Artificial Intelligence			2		1				25	25
ME414x	Professional Elective-V	-	-	2	-	1	-	-		25	25
ME415y	Open Elective	-	1	-	-	1	-	-	-	25	25
ME416	Project Work Stage-I Seminar	-	-	4	-	2	-	-	-	25	25
ME417	Industrial Training	-	1	-	-	1	-	-	25	50	75
	Sub Total	-	2	12	-	8	-	50		200	250
	Grand Total	**15**	**2**	**12**	**-**	**23**	**150**	**400**		**200**	**750**

Abbreviations: *L- Lectures, P –Practical, T- Tutorial, D-Drawing, ISE-In Semester Examination, ESE-End Semester Examination (University Examination for Theory & / POE & / Oral), ICA-Internal Continuous Assessment.*

Professional Elective-V:	***Open Elective:***
ME4141 Production and Operations Management	ME4151 *Costing and Cost Control*
ME4142 Computational Fluid Dynamics	ME4152 *Entrepreneurship Development*
ME4143 Process Engineering	ME4153 *Business Development*
ME4144 Finite Element Method	ME4154 *Product Life Cycle Management*
ME4145 Tribology	ME4155 Business *Economics*
ME4146 Railway Systems Management	ME4156 *Reliability Engineering*

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Mechanical Engineering

Semester-VIII

Choice Based Credit System (CBCS) Structure of Final Year B.Tech. Mechanical Engineering w.e.f. 2021-2022

Theory Courses

Course Code	Name of Theory Course	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
ME421	Project Work Stage-II Seminar	-	-	-	-	-	-	-	-	-
ME422	Project Work Stage-III Seminar	-	-	-	-	-	-	-	-	-
ME423	Project Work (Report Submission &	-	-	-	-	-	-	-	-	-
	Sub Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**

Laboratory / Tutorial Courses

Course Code	Name of Laboratory / Tutorial Course	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
								POE	OE		
ME421	Project Work Stage-II Seminar	-	-	2	-	1	-	-	-	50	50
ME422	Project Work Stage-III Seminar	-	-	2	-	1	-	-	-	50	50
ME423	Project Work (Report Submission & Presentation)	-	-	4	-	2	-	50	-	50	100
	Sub Total	**-**	**-**	**8**	**-**	**4**	**-**	**50**		**150**	**200**
	Grand Total			**8**		**4**		**50**		**150**	**200**

Abbreviations: *L –Lectures, P –Practical, T– Tutorial, D-Drawing, ISE– In Semester Examination, ESE – End Semester Examination (University Examination for Theory & / POE & / Oral), ICA– Internal Continuous Assessment.*

Note:

1. At Final Year B-Tech level Batch Size for the practical/tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Industrial Training (evaluated at B. Tech Semester-VII) of minimum 30 days shall be completed in any vacation after B. Tech. Semester-III, but before B. Tech. Semester-VII & the report shall be submitted and evaluated at B. Tech. Semester-VII.
3. Project group for B. Tech. Semester-VII and Semester-VIII shall not be of more than 4 students, however in exceptional cases group size may be of 5 students.
4. ICA assessment shall be a continuous process based on student's performance in–class tests, assignments, homework, seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions, as applicable.
5. In Semester - VIII, students/project groups are expected to undergo internship in any industry and should complete a project sponsored by the same industry. In case students are unable to get industry internship and sponsored project, such students/project groups can undergo any other project work of their choice or assigned by concerned guide. Such students are required to complete one audit course in any emerging area in the field of Engineering from the list given below.
    i. Electric Vehicles
    ii. 3-D printing
    iii. Renewable energy
    iv. Automation and Robotics
    v. CNC Programming
    vi. Artificial Intelligence
    vii. Machine Learning
    viii. CAD/CAM/CAE

    Teaching-learning process and method of assessment of such course will be decided by concerned institute. Evaluation will be done at institute level itself. Project Assessment of the concerned students be done after satisfactory completion of the course.

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VII

ME411 : Refrigeration and Air Conditioning

Teaching Scheme	Examination Scheme
Lectures:03Hours/week, 03Credits	ESE:70Marks
Practical :02Hours/week, 01Credit	POE : 25 Marks
	ISE: 30Marks
	ICA: 25Marks

Course Introduction:

The **course** consists of different **refrigeration** cycles such as Air refrigeration cycle, Vapour Compression cycle, Vapour absorption cycle. It also covers properties of refrigerants and various alternative refrigerants and understanding of psychrometric and psychrometric processes used for the purpose of **air-conditioning**. Further, the comfort **air-conditioning** and indoor environment health are also addressed in this **course**.

CourseObjectives:

During this course, student is expected to:

1. Learning the fundamental principles and different methods of refrigeration and air conditioning.
2. To understand basic refrigeration processes.
3. Comparative study of different refrigerants with respect to properties, applications and environmental issues.
4. Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
5. To acquire the skills required to design and analyze refrigeration and air conditioning components and systems.

CourseOutcomes:

At the end of this course, student will be able to:

1. Evaluate performance of various types of refrigeration systems.

2. Select appropriate refrigerant considering necessary properties.

3. Use Psychrometric chart and tables and analyze psychrometric process for obtaining required air

conditions.

4. Describe comfort chart and compare duct design methods.

Section I

Unit-1:Basic Refrigeration Cycles and Refrigerant No. of lectures- 7

A) Air Refrigeration

Refrigeration, Units of refrigeration, Reversed Carnot cycle with vapour as refrigerant, Air Refrigeration Systems, Bell Coleman Cycle (B.C.C), Calculation of C.O.P., Advantages and Disadvantages of B.C.C. (Numerical Treatment).

B) Air Craft Refrigeration

Necessity, Simple, Boot Strap, Regenerative and Reduced ambient systems. **(Descriptive Treatment).**

C) Refrigerant

Classification, Desirable Properties, Nomenclature of Refrigerants, Selection of refrigerant, Secondaryrefrigerants, Effect on Ozone depletion and Global warming, Total equivalent warming impact (TEWI),Alternative Refrigerants, Use of any Software for Refrigerants' properties.

Unit-2: Vapour Refrigeration Systems No. of lectures- 8

A) Vapour Compression Refrigeration Systems

Vapour compression systems Working of simple vapour compression system, representation of different vapour compression cycle (VCC) on T-s and P-h diagram, Vapour compression cycle, Sub cooling, Superheating, Analysis and Performance calculations of above cycles. Effect of operating parameters on performance of VCC, actual VCC, methods of improving COP**(Numerical Treatment).**

B) Vapour Absorption Refrigeration Systems

Introduction, Working of simple vapour absorption system (VAS), Practical vapour absorption system,desirable properties of binary mixture (aqua-ammonia), COP of an ideal Vapour Absorption Refrigeration System, Li-Br absorption system, three fluid system (Electrolux refrigeration), applications of VAS, comparison between VCRS and VARS.**(Descriptive Treatment).**

Unit-3:Multiple pressure Refrigeration Systems No. of lectures- 5

A) Introduction, Multistage compression, Flash gas removal, Flash inter cooling, Complete Multi stagesystem, Multi evaporator systems

B) Introduction to cryogenics Limitations of vapour compression systems for the production of low temperature, Cascade Refrigeration System, Linde System for liquefaction of air. Applications ofCryogenics. (Descriptive Treatment).

Section II

Unit-4:Psychrometry **No. of lectures-7**

Introduction, Psychometrics terms, Dalton's law of partial pressure, Psychometrics relations, Enthalpy of moist air, Use of psychometric tables and Charts, Psychometrics Processes, Combinations And Calculations, SHF, BPF, ADP Coil condition line, Air Washer and it's applications. (Numerical Treatment)

Unit-5: Heating and Cooling Load Calculations **No. of lectures-8**

A) Representation of actual air conditioning process by layout and on Psychometric chart.

Load analysis by RSHF, GSHF, Enumeration and brief explanation of the factors forming load on refrigeration and air conditioning systems. ***(Numerical Treatment).***

B) Comfort Conditions

Human Comfort Thermodynamics of human body, comfort and comfort chart, factors affecting human comfort, concept of infiltration and ventilation, indoor air quality requirements.

No. of lectures- 5

Unit-6: Air Distribution Systems

A) Ducts Classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct (friction losses, dynamic losses), air flow through simple duct system, equivalent diameter, Methods of duct system design: equal friction, velocity reduction, static regain method (numerical on duct system design)

B) Air handling unit Air handling unit, Fan coil unit, types of fans used air conditioning applications, fan laws, filters, supply and return grills, sensors (humidity, temperature, smoke).

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

Group 1 (Study, Demonstration of any four assignments on following)

1. Study of Refrigeration methods
2. Study of Refrigeration Equipments
3. Study of Refrigeration Systems–Domestic refrigerator, Split air conditioner, IcePlant, Deep freezer etc.
4. Study of charging, leak testing of refrigeration systems
5. Case Study (Any One of the following)
    a) Refrigeration and Air-Conditioning systems used in Space Station/Satellites/ Rockets/Submarines
    b) Refrigeration and Air-Conditioning systems used in Automobiles
    c) Methods used for cooling Super Computers and Servers

Group II (Any three experiments out of the following)

1. Trial on Refrigeration primer / bench
2. Trial on mini ice plant
3. Trial on Vapour Absorption system
4. Trial on Air conditioning tutor
5. Trial on Heat Pump

Group III(Any oneout of the following)

1. Visit to Refrigeration plant or Central Air Conditioning plant
2. Performance evaluation of any one trial of Group-II by using MATLAB/C Programming

Text Books:

1. Refrigeration and Air Conditioning by R.S. Khurmi& J.K. Gupta
2. 'Refrigeration & Air Conditioning' by C.P. Arora
3. Refrigeration & Air Conditioning' by Arora&Domkundwar
4. Refrigeration and Air-conditioning' by S. N. Sapali

Reference Books

1. Principles of Refrigeration 'by Roy J Dossat
2. Air Conditioning Applications & design' by W.P.Jones
3. Refrigeration &Air Conditioning by Stocker
4. Refrigeration &Air Conditioning byManohar Prasad

Punyashlok Ahilyadevi Holkar Solapur University
Final Year B.TECH. (Mechanical Engineering)
Semester-VII
ME412 : Automobile Engineering

TeachingScheme
Lectures:03 Hours/week, 03 Credits
Practical : 02Hours/week, 01 Credit

Examination Scheme
ESE: 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Course Introduction:

Automobile engineering is an important automotive sector component. An automobile engineer helps to design and ensure the standard and efficient working of existing automobile and invent new technologies in this area. This area of engineering is intensive in research and requires professionals in their automotive engineering specialties to be educated and committed. Their efficiency, comfort and safety have been greatly improved. The worldwide manufacturing and use of automobiles has increased dramatically. This has given mechanical engineers the opportunity to work in the automobile sector.

CourseObjectives:

During this course, student is expected to:

1. To make the students conversant with fundamentals of Automobile system
2. To develop the competencies of students in performance analysis of Automobiles
3. To make the students conversant with Automobile safety and Electrical Systems.
4. To understand the students importance of emerging trends of Hybrid Vehicles like Electric and Solar Vehicles.

CourseOutcomes:

At the end of this course, student will be able to:

1. Demonstrate various systems in an automobile
2. Describe importance and features of different elements like axle, differential, brakes, steering, suspension, wheel balancing, electrical systems etc.
3. Explain principle of operation, construction and applications of various sensors used in modern automobiles.

Section I

Unit-1: ***Introduction to Automobiles:*** **No. of lectures-04**

Broad classification of Automobiles. Major Components and their functions. Types of vehicle layouts, Front engine rear wheel drive, Front engine front wheel drive, Rear engine rear wheel drive, All wheel drive**,** specifications of vehicles. Types of bodies, Body construction and materials, and safety devices.

Unit-2: ***Performance of Automobiles &Electrical Systems*** **No. of lectures-08**

Resistance to vehicle motion, Air, Rolling and Gradient resistance, Acceleration, Grade ability and draw bar pull, Traction and Tractive effort, Distribution of weight, Power required for

vehicle propulsion, Selection of gear ratio, Rear axle ratio. (Numerical).Automotive batteries, automotive lighting system, Starting system, charging system, Electric horn, Electric fuel Gauge-thermostatic & balancing coil type, Wiper & side indicator circuit, electric Speedo meter.

Unit-3: ***Transmission System*** **No. of lectures-08**

Requirements of transmission system, Automobile clutch- requirements, types & functions,Single plate, Multi-plate, Centrifugal, Electromagnetic & Fluid flywheel. Types of automotivegearboxes, Working of sliding mesh, Constant mesh and Synchromesh gearbox, Overdrive,Principle of operation of automatic transmission, Torque converter, Epicyclical gear trains,Propeller shaft, Universal and slip joint, Final drive and its types, Differential, Construction andtypes of rear axles, Introduction to wheels and tyres.

Section II

Unit-4: ***Steering System:*** **No. of lectures-06**

Function of steering, Steering system layout, Automotive steering mechanism- Ackerman and Davis, Types of steering gear boxes, Condition for true rolling, Steering geometry-Camber, Caster, King pin inclination, Included angle, Toe-in and Toe-out, Wheel alignment, Slip angle, Under steer & over steer, Types and working of power steering (Numerical).

Unit-5: ***Braking System:*** **No. of lectures-06**

Function of automotive brake system, Types of braking mechanism, internal expanding & Disc brake, Mechanical, Hydraulic & Air brake system, power brakes, Anti lock braking, Calculation of braking force required, stopping distance and dynamic weight transfer.(Numerical).

Unit-6: ***Suspension System & Modern trends in Automobiles*** **No. of lectures-08**

Suspension requirements, Sprung and Unsprung mass, Types of automotive suspension systems. Conventional and Independent, Shock absorber, Types of springs, Hotch- kiss and Torque tube drive, Reaction members-Radius rod, Stabilizer bar, Air suspension system.Engine electronic control modules, Introduction to Sensors and actuators used in automobile controls, Electronic Control Unit, traction control devices, fuel cells Hybrid vehicles- Electrical vehicles, Solar vehicles.

Internal Continuous Assessment (ICA):

List of Experiments/Assignments/Case Studies, etc.

1. Study and demonstration of four wheeler chassis layout. Two-wheel & four wheelsdrive layouts.
2. Study and Demonstration of working of single plate automobile clutch.
3. Study and demonstration of synchromesh gearbox, final drive and differential.
4. Study and demonstration of working Hydraulic braking system.
5. Study and demonstration of front wheel steering geometry and steering mechanism.
6. Study and demonstration of suspension system of a four-wheeler.
7. Study and demonstration of battery and electrical starting system

8. Study and demonstration of (a) Electric horn. (b) Electric fuel Gauge. (c) Flasher unit. (d) Wiper circuit
9. Experiment on wheel balancing & front wheel alignment.
10. Visit to servicing station for study of vehicle maintenance, repairs and report.

Text Books:

1. Kirpal Singh - Automobile Engineering – Standard publisher.
2. Automobile Mechanics -.N. K. Giri
3. Automobile Electrical Equipment -P. S. Kohli

Reference Books

1. K. Newton and W. Seeds, T.K. Garrett,Motor Vehicle, Elsevier publications
2. Hans Hermann Braess, Ulrich Seiffen, handbook of Automotive Engineering, SAEPublications
3. William H. Crouse. Automotive Mechanics - Tata McGraw Hill Publishing House
4. Joseph Heitner, Automotive Mechanics -C.B.S Publishers And Distributors
5. SAE Manuals and Standard

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VII

ME416 : Project Work Stage-I Seminar

Teaching Scheme **Examination Scheme**

Practical:04Hours/week, 02Credits **ICA: 25Marks**

Course Introduction: Project work is kept in the final year of engineering so that students' will apply their knowledge gained through previous classes to create and evaluate innovative things. In this it is expected to solve some pressing problem related to industry or society. While carrying out the work many qualities are developed in students such as problem solving ability, modern tool usage, leadership, ethics, communication, project management & finance and lifelong learning etc.

CourseObjectives:

During this course, student is expected to:

1. Understand the basic concepts & broad principles of Industrial projects.
2. Demonstrate a sound technical knowledge of their selected project topic.
3. Demonstrate the ability to locate and use technical information from multiple sources.
4. Apply fundamental principles of science and engineering to design and fabricate models for diversified applications.
5. Select the suitable material and manufacturing process and approach for solving an engineering problem with minimum cost.

CourseOutcomes:

At the end of this course, student will be able to:

1. Identify the complex problem which is related to industry or society.
2. Apply basic engineering knowledge for solving the identified problem.
3. Carry out state of the art related to the problem identified.
4. Plan the work for solving the problem identified.

Guidelines for Project content & Mark Distribution:

a. Work diary and weekly reporting -05 marks

b. Synopsis- 10 marks

c. Progress report submission and presentation-10 marks

Project Term Work:

The term work under project submitted by students shall include:

a. Work diary and weekly reporting:

Work Diary maintained by group and countersigned by the guide weekly. The contents of work diary shall reflect the efforts taken by project group for:

1. Searching suitable project work
2. Brief report, preferably on Journals/ research or conference papers/ books or literature surveyed to select and bring out the project.
3. Brief report of feasibility studies carried to implement the conclusion.
4. Proposed diagram/ Design calculations, etc.

b. Synopsis:

The group should submit the synopsis (of 4-5 pages) in following form.

1. Title of Project
2. Names of Students
3. Name of Guide
4. Proposed work (Must indicate the scope of the work & weekly plan up to March end)
5. Approximate Expenditure (if any)

The synopsis shall be signed by the each student in the group, approved by the guide and endorsed by the Head of the Department.

Note:-1. The project group should consist not more than four students.

c. Progress report submission and presentation:

The group has to give a power point presentation in front of the faculty of department onthe progress completed till end of first semester along with the progress report.

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VII

ME417 : Industrial Training

Teaching Scheme	**Examination Scheme**
Tutorial : 01Hours/week, 01 Credit	**ICA : 50 Marks**
	OE : 25 Marks

Course Introduction: Industrial training is must for every engineering student. Students know the theoretical knowledge but practical application of same in industry need to be understood. Students should understand working of industry, machinery, quality process, manufacturing process etc for which training is important. Student has to undergo a training of Two weeks at core Mechanical Industry either in summer vacation after second year Part – I or Third year Part - I or after Third year Part - I, i. e in winter vacation/summer vacation. This will help student to understand industrial culture, working, role of an engineer in industry.

Course Objectives:

During this course, student is expected to:

1.Be aware of Industrial culture.

2. Be aware about technical report writing.

3. Be aware about organization structure.

4. Be aware about various departments in Industry.

5. Be aware about professional ethics.

6. Be aware about functions of management

Course Outcomes:

At the end of this course, student will be able to:

1. Write technical report and give presentation.

2. Correlate theoretical knowledge with the practical things in Industry

3.Understand Responsibility and role of Engineer in Industry

4. Understand the Industrial culture & Organizational setup

Procedure for Assessment of Industrial Training done by student

· Every student should do Industrial Training of minimum Two Weeks.

· Student should prepare a report of training done in a prescribed format before end of Part I Semester of BE. (along with a certificate from the concerned industry)

· Format of the report will be decided by the concerned guide.

· The report shall be comprehensive and presented in duplicate, typed on a standard A4 size sheet and bound.

· Every student should give presentation to project guide on industrial Training Report.

· The University oral examination will be based on the training report.

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VIII

ME421 :Project Work Stage-II Seminar

TeachingScheme **Examination Scheme**

Practical:02Hours/week, 01Credits **ICA: 50Marks**

CourseObjectives:

During this course, student is expected to:

1. Understand concept of project and production management.
2. Design the basic components by applying various design theories and principles.
3. Apply various softwares to develop model and analyze it.
4. Apply knowledge of various manufacturing processes to develop the model.
5. Understand various design of experiment techniques.
6. Understand various statistical techniques for analysis of results.
7.

CourseOutcomes:

At the end of this course, student will be able to:

1. Communicate with various stakeholders and perform the work in team.
2. Find out various dimensions of the various parts of the model.
3. Analyze various types of stresses and failures which will exist in the model using suitable software.
4. Select suitable manufacturing process to fabricate the model.
5. Apply suitable design of experiment technique.
6. Apply suitable statistical technique for analysis of results.

In project work stage-II following work is expected from the students:

1. Students should complete online course on research methodology and course on modeling and simulation by employing suitable software.
2. Development of virtual and physical model
3. Carry out testing by applying suitable Design of Experiment technique.

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VIII

ME422 :Project Work Stage-III Seminar

TeachingScheme **Examination Scheme**

Practical:02Hours/week, 01Credits **ICA: 50Marks**

CourseObjectives:

During this course, students is expected to:

1. Apply suitable statistical technique.
2. Analyze the results.
3. Develop technical writing skills.
4.

CourseOutcomes:

At the end of this course, students will be able to:

1. Select appropriate statistical technique for their work.
2. Interpret the results of experimentation.
3. Write project report and technical paper.

In project stage-III, following work is expected from the students:

1. Students should complete online audit course on statistical tools used in research with case study.
2. Carry out analysis of results by employing suitable statistical technique.
3. Interpretation/Analysis of the results.
4. Report writing and preparing presentation.
5. Students should write a technical paper and present it in the conference/journal.
6. Students should be able to commercialize their project in the society.

Project Report format:

Project report should be of 25 to 50 pages (More pages can be used if needed). For Standardization of the project reports the following format should be strictly followed.

1. Page size: Trimmed A4
2. Top Margin: 1.00 Inches
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inches

6. Para Text: Times New Roman 12 point font

7. Line Spacing: 1.5 Lines

8. Page Numbers: Right aligned at footer, font 12 point Times New Roman

9. Headings: New Times Roman, 14 point, Boldface

10. Certificate:

All students should attach standard format of Certificate as described by the Department. Certificate should be awarded to batch and not individual student Certificate should have signatures of Guide, Principal, and External Examiner. Entire Report has to be segmented chapter wise as per the requirement.

11. Index of Report:

i) Title Sheet

ii) Certificate from Guide/ College

iii) Acknowledgement

iv) Abstract (Brief content of the work)

v) List of Figures

vi) List of Table

1. Introduction (History, Importance of Project Area, Problem identification, Objective of the Project)

2. Literature Review

3. Design/ Experimentation/ Fabrication/ Production/ Actual work carried out for the same.

4. Observation/ Analysis/ Findings/Results

5. Discussion on Results and Conclusion

References:

12. References or Bibliography: References should have the following format

For Books: “Title of Book”; Authors; Publisher; Edition;

For Papers: Authors, Year of Publication, “Title of Paper”; Conference Details/General Details; Page No.

b) Presentation:

The group has to prepare a power point presentation on project report, project and present itin front of the faculty of department along with the demonstration of the project.

One copy of the report should be submitted to Institute/ Department, One copy to Guide andone copy should remain with each student of the project group.

(Sample Format for Project WorkDiary):

Project Progress Sheet

Activity Week: Date from…… to……..

Description of the Work Performed by the student:

(Literature Survey /Design/ Drawings /Purchase/ Manufacturing / Testing/Data Collection/Analysis/Algorithm/Flowchart/Simulation)

……

Space for Drawings:

Constraint / Problem Found:

……

……

……

Activity to be carried out in next week:

……

……

Remarks by the Guide/ Co - Guide:

……

……

……

Date: Sign of Guide/Co - Guide:

Punyashlok Ahilyadevi Holkar Solapur University

Final Year B.TECH. (Mechanical Engineering)

Semester-VIII

ME423 :Project Work (Report Submission & Presentation)

TeachingScheme	**Examination Scheme**
Practical:04Hours/week, 02Credits	**ICA: 50Marks**
	POE : 50 Marks

CourseObjectives:

During this course, student is expected to:

1. Develop effective presentation skills.
2. Communicate effectively both in verbal/non-verbal and written form.
3. Defend their research work in front of the experts.
4.

CourseOutcomes:

At the end of this course, student will be able to:

1. Acquire various skills related to the presentation.
2. Demonstrate their work in front of various stakeholders.
3. Gain confidence and ability of lifelong learning.

In Project Work (Report Submission & Presentation), students are expected to complete the following work:

1. Students should submit the project report in the prescribed format.
2. Students should prepare the power point presentation and present it in front of examiners.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Name of the Course: Final Year B. Tech (Sem.– I & II)

(Syllabus to be implemented from w.e.f. July 2021)

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology

Choice Based Credit System (CBCS) Curriculum of

Final Year B. Tech Electronic & Telecommunication Engineering **W.E.F. 2021-22**

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET411	Machine Learning	4	---	--	4	30	70		100
ET412	Data Communication	4	---	--	4	30	70		100
ET413	Internet of Things	4		--	4	30	70		100
ET414	Database Management System	3	1	--	4	30	70	25	125
ET415A & ET415B	Elective-II * Image & Video Processing *Wireless Sensor Network	3	1	--	4	30	70	25	125
Sub Total		**18**	**2**	**--**	**20**	**150**	**350**	**50**	**550**

Course Code	***Laboratory Course Name***									
							ESE			
							POE	***OE***		
ET411	Machine Learning	--	--	2	1	--	25	--	25	50
ET412	Data Communication	--	--	2	1	--	--	25	25	50
ET413	Internet of Things	--	--	2	1	--	25		25	50
ET416	Project Phase I	--	--	4	2	--	--	25	50	75
ET417	Vocational Training	--	--	--	1	--	--	--	25	25
Sub Total				**10**	**6**		**100**		**150**	**250**
Grand Total		**18**	**2**	**10**	**26**	**150**	**450**		**200**	**800**

Abbreviations: L: Lectures, P: Practical, T: Tutorial, ISE: In Semester Exam., ESE: End Semester Exam, ICA: Internal Continuous Assessment ESE - University Examination (Theory &/ POE &/Oral examination)

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology

Choice Based Credit System (CBCS) Curriculum of

Final Year B. Tech Electronic & Telecommunication Engineering **W.E.F. 2021-22**

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET421	Microwave Engineering	4	--	--	4	30	70		100
ET422	CMOS VLSI Design	4	--	--	4	30	70		100
ET423A & ET423B	Elective- III *Industrial IOT *Artificial Intelligence & Applications	3	1	--	4	30	70	25	125
ET424A & ET424B	Elective-IV *Network Security * Data Analytics	3	1	--	4	30	70	25	125
Sub Total		14	2	--	16	120	280	50	450
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET421	Microwave Engineering	--	--	2	1	--	--	50	25	75
ET422	CMOS VLSI Design	--	--	2	1	--	50	--	25	75
ET425	Project Phase II	--	--	8	4	--	100	--	100	200
Sub Total		--	--	12	6	--	200		150	350
Grand Total		**14**	**2**	**12**	**22**	**120**	**480**		**200**	**800**

Abbreviations: L: Lectures, P : Practical, T: Tutorial, ISE: In Semester Exam., ESE : End Semester Exam, ICA: Internal Continuous Assessment ESE - University Examination (Theory &/ POE &/Oral examination)

Note –

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Project group for Final Year B.Tech - Semester I and Semester II shall not be of more than three students.
3. Minimum strength of the students for Elective is 15.
4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction, attendance for theory and lab sessions as applicable.
5. Project phase-I shall cover Literature survey, Problem statement finalization, and Synopsis submission of proposed work. Student shall submit hard copy of synopsis only after delivering seminar.
6. Project phase-II shall cover Simulation work, Software programming, and Hardware implementation. A hard copy of the final report shall be submitted to the department after successfully completion of project.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Name of the Course: Third Year B. Tech (Sem. – I & II)

(Syllabus to be implemented from Academic Year 2022-23)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech. Electronics & Telecommunication Engineering ***W.E.F. 2022-23***

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET311	Electromagnetic Field Theory	3	1	--	4	30	70	25	125
ET312	Microcontrollers and Applications	3	--	--	3	30	70	25	125
ET313	Digital Signal Processing	3	-	--	3	30	70	25	125
ET314	Open Elective-I	3	1	--	4	30	70	25	125
SLM31	Self Learning Module–I (HSS Course)	--	--	--	2	--	50	--	50
Sub Total		12	2	--	16	120	330	100	550
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET312	Microcontrollers and Applications	--	--	2	1	--	50	--	--	50
ET313	Digital Signal Processing	--	--	2	1	--	50	--	--	50
ET315	Electronic Software Lab-III	1	--	4	3	--	50	--	50	100
Sub Total		--	--	8	5	--	150		50	200
Grand Total		**13**	**2**	**8**	**21**	**120**	**480**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Credit System structure of T.Y. B.Tech..Electronics& Telecommunication Engineering ***W.E.F. 2022-23***

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET321	Antenna & Wave Propagation	3	1	--	4	30	70	25	125
ET322	Embedded System	3	--	--	3	30	70	25	125
ET323	Electronic System Design	3	--	--	3	30	70	25	125
ET324	Professional Elective-I	3	--	--	3	30	70	25	125
ET325	Open Elective-II	3	--	--	3	30	70	25	125
Sub Total		15	1	--	16	150	350	125	625
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET322	Embedded System	--	--	2	1	--	25	--	--	25
ET323	Electronic System Design	--	--	2	1	--	--	25	--	25
ET324	Professional Elective-I	--	--	2	1	--	--	--	--	--
ET325	Open Elective-II	--	--	2	1	--	--	--	--	--
ET327	Mini Project	--	--	2	1	--	50	--	25	75
Sub Total		--	--	10	5	--	100		25	125
Grand Total		**15**	**1**	**10**	**21**	**150**	**450**		**150**	**750**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, OE-Oral Examination, POE- Practical Oral Examination, ICA-Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T. Y. B.Tech (Electronics& Telecommunication Engineering)
Semester-II

ET326: MINI HARDWARE PROJECT

Teaching Scheme:
Practical – 2 Hours/week, 1 Credit

Examination Scheme:
ICA – 25 Marks
Practical- 25 Marks
POE – 50 Marks

This course is introduced to enable students to apply the knowledge and skills learned out of courses studied to solve/implement predefined practical problem. The Project work may be beyond the scope of curriculum of courses for learning additional skills, developing the ability to define, design, analysis and implementation of the problem and lead to its accomplishment with proper planning.

Course Prerequisite:
Student shall have knowledge of PCB designing, circuit designing, testing, soldering.

Course Objectives:
1. To produce PCB artwork using an appropriate EDA tool.
2. To practice good soldering, testing, fault detection and effective trouble-shooting.
3. To design and implement application based hardware project.
4. To present technical seminar and display the project.

Course Outcomes:
At the end of this course, Students will be able to,
1. Produce PCB artwork using an appropriate EDA tool.
2. Practice good soldering, testing, fault detection and effective trouble-shooting.
3. Design and implement application based hardware project.
4. Present technical seminar and display the project.

- **Guidelines for project implementation:**

  1) Project group should be not more than 3 students per group.

  2) Domains for projects may be based on a particular application from the following, but not limited to:

     i. Instrumentation and Control Systems

     ii. Electronic Communication Systems

iii. Biomedical Electronics

iv. Power Electronics

v. Audio, Video Systems

vi. Embedded Systems

vii. Mechatronics Systems

3) Week 1 & 2: Formation of groups, searching of an application based hardware project

4) Week 3 & 4: Finalization of Mini project & Distribution of work.

5) Week 5 & 6: PCB artwork design using an appropriate EDA tool & Simulation.

6) Week 7 & 8: Procurement of electronic components for the project & PCB manufacturing.

7) Week 9, 10 & 11: Hardware assembly, testing, fabrication

8) Week 12: Demo, Group presentation & report submission

- **Internal Continuous Assessment (ICA):**

1. The seminar shall consist of the Literature Survey, Market survey, Basic project work and applications of Mini project.
2. Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
3. A certified copy of seminar/ project report shall be required to be presented at the time of final submission.

- **Text Books:**

1. Thomas C Hayes, Paul Horowitz, ―The Art of Electronics, Newens Publication
2. Jim Williams (Editor) ― Analog Circuit Design: Art, Science and Personalities, EDN series for Design Engineers
3. M Ashraf Rizvi ― Effective Technical Communication, Tata McGraw Hill Education Pvt. Ltd.

- **Reference Books:**

1. Robert Boylested, ― Essentials of Circuit Analysis‖, PHI Publications
2. Meenakshi Raman, Sangeeta Sharma ― Technical Communication, Principles and Practice, Oxford University Press
3. A.E. Ward, Angus ― Electronic Product Design, Stanley thornes Publishers, UK.
4. C Muralikrishna, Sunita Mishra, ― Communication Skills for Engineers, Pearson

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-
2015'B' Grade
(CGPA 2.62)

Name of the Faculty: Engineering & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRICAL ENGINEERING

Name of the Course: S.Y. B.Tech

(Syllabus to be implemented from w.e.f. June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B.Tech (Electrical Engineering)
PROGRAMME: BACHELOR OF ELECTRICAL ENGINEERING
PROGRAMME OBJECTIVES

A. PROGRAM EDUCATIONAL OBJECTIVES

1. Deliver fundamental as well as advanced knowledge with research initiatives in the field of electrical engineering with emphasis on state-of-the-art technology.
2. Graduates will demonstrate measurable progress in the fields they choose to pursue.
3. Design and develop technically feasible solutions for real world applications which are economically viable leading to societal benefits.
4. To nurture Graduates to be sensitive for ethical, societal and environmental issues while conducting their professional work.

B. PROGRAMME OUTCOMES

Students attain the following outcomes: -

1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. PROGRAMME SPECIFIC OUTCOMES

1 An ability to specify, design and analyze Power System, Electrical Machinery, Electronic Circuits, Drive Systems, Lightning Systems and deliver technological solution by adapting advances in allied disciplines.

2 Apply knowledge of electrical engineering to meet the desired needs within realistic constraints viz. economical, ethical, and environmental and safety.

3 Apply modern software tools for design, simulation and analysis of electrical systems to successfully adapt in multi-disciplinary environments.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
S.Y. B Tech. (Electrical Engineering

Choice Based Credit System Syllabus Structure of S.Y. B. Tech. Electrical Engineering W.E.F. 2021-22 ***Semester I***

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 211	Engineering Mathematics-III	2	1		3	30	70	25	125
EL 212	Electrical Machines-I	3	-		3	30	70	-	100
EL 213	Electrical Measurement and Instrumentation	3	-		3	30	70	-	100
EL 214	Power System I	3	1		4	30	70	25	125
EL 215	Electronic Devices and Circuits	3	-		3	30	70	-	100
EL 216	Object Oriented Programming with C++	1	-		--	--	--	-	--
Sub Total		**15**	**2**	**-**	**16**	**150**	**350**	**50**	**550**
Environmental Science		1							
Laboratory Course Name									
							ESE		
							POE	OE	
EL 212	Electrical Machines-I	-	-	2	1	-	50	-	25	75
EL 213	Electrical Measurement and Instrumentation	-	-	2	1	-	50	-	25	75
EL 215	Electronic Devices and Circuits	-	-	2	1	-		-	25	25
EL 216	Object Oriented Programming with C++	-	-	2	1	-	50	-	25	75
Sub Total		**-**	**-**	**8**	**4**		**150**		**100**	**250**
Grand Total		**15**	**2**	**8**	**20**	**150**	**500**		**150**	**800**

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In semester Exam, ESE - End Semester Exam, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
S. Y. B. Tech. (Electrical Engineering)

Choice Based Credit System Structure of S.Y.B.Tech. Electrical Engineering W.E.F. 2021-2022 ***Semester II***

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 221	Numerical Methods and Linear Algebra	2	1	-	3	30	70	25	125
EL 222	Electrical Machines-II	3	-	-	3	30	70	-	100
EL 223	Power System II	3	1	-	4	30	70	25	125
EL 224	Analog & Digital Integrated circuits	3	-	-	3	30	70	-	100
EL 225	Network Analysis	3	-	-	3	30	70	-	100
Sub Total		**14**	**2**	**-**	**16**	**150**	**350**	**50**	**550**
Environmental Science		1	-	-	-	-	-	-	-
Laboratory Course Name									
							ESE		
							POE	OE		
EL 222	Electrical Machines-II	-	-	2	1	-	50	-	25	75
EL 225	Network Analysis	-	-	2	1	-	50	-	25	75
EL 224	Analog & Digital Integrated circuits	-	-	2	1	-	-	-	25	25
EL 226	Computer Aided Design and Simulation	-	-	2	1	-	50	-	25	75
Sub Total		**-**	**-**	**8**	**4**	**-**	**150**		**100**	**250**
Grand Total		**14**	**2**	**8**	**20**	**150**	**500**		**150**	**800**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-I
POWER SYSTEM-I

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces power plant which deals with generation of electrical energy The course also introduces economic aspects of different power plants

Course Prerequisite:

Knowledge of Basic Electrical Engineering, simple mathematical calculations Student shall have knowledge of energy conversion Student shall also have basic knowledge types of energy sources

---

Course Objectives:

- To develop conceptual understanding of operation of different power plants
- To learn economic aspects of power system.
- To study necessity and types of non-conventional energy sources
- To make students understand overhead structure of power system.

Course Outcomes:

After successful completion of this course,

- Student will be able to understand operation of different power plants
- Student will be able to analyze economic aspects of power system
- Student will be able to investigate need and areas of application for non-conventionalenergy sources
- Students will be able to understand overhead structure of power system.

SECTION-I

Unit 1 Economic Aspects of Power Generation **No of lectures-08**

- **Prerequisite:**
  Knowledge of Basic Electrical Engineering, simple mathematical calculations

- **Objectives:**
  1. To introduce to student basic terms used in power system operation
  2. To make student understand load curve
  3. To introduce student to types of loads
  4. To familiarize the students with the tariff methods for electrical energy consumptions

- **Outcomes:**
  After completing this unit, students –

1. Can define different terms in power system operation
2. Can analyze selection of generating units
3. Can calculate usage of electrical power & tariff

- **Unit Content:**
  Review of terms commonly used in system operations, Variable load on power station, Peak load, Base load, Diversity factor, Plant utility factor, Maximum demand, Load curves, load duration curves, Types of loads, Selection of generation units, Interconnected grid systems, Cost of electrical energy, Tariff & different types of tariff

- **Content Delivery Methods:**
  Chalk and talk, power point presentation

- **Assessment Methods:**
  Numerical problems related to cost of electrical energy and tariff, Theory questions related to above content

Unit 2 Base Load Power Plants **No of lectures-08**

- **Prerequisite:**
  Energy sources, Energy conversion methods

- **Objectives:**

1. Revision of Energy Sources.
2. To introduce student to different Conventional & non-Conventional Energy sources.
3. To make student understand different base load power plants.

- **Outcomes:**
  After completing this unit, students -

1. Can define conventional & non-conventional sources
2. Can compare different base load power plants

- **Unit Content:**
  Different types of conventional and non-conventional energy sources, Structure of power industry,
  Hydro Power Plant: Typical layout, Site selection, Classification, Hydrograph, Flow duration curves, Hydrology, Types of turbines.
  Thermal Power Plant: Typical layout, Site selection, Fuels & their handling, Combustion process, Ash handling, Dust collection.
  Nuclear Power Plant: Typical layout, Site selection, Nuclear reaction, Classification of nuclear reactor (AGR, PWR, BWR), Nuclear waste disposal, Environmental Aspects

- **Content Delivery Methods:**
  Chalk and talk, Power point presentations on Energy Sources

- **Assessment Methods:**

Theory questions related to above content.

Unit 3 Peak Load Power Plants **No of lectures-5**

- **Prerequisite:**
  Knowledge of Basic Electrical Engineering & nuclear reaction

- **Objectives:**

1. To introduce student to Diesel & Gas Turbine Power Plants
2. To introduce student to solar & Wind Power Plants
3. To make student analyze typical layout of solar & Wind Power Plants

Outcomes:
After completing this unit, students –

1. Can apply the operation of Diesel & Gas Turbine Power Plants
2. Can apply the operation of solar & Wind Power Plants

- **Unit Content:**
  Review of Diesel Plants (advantages & disadvantages), Typical layout of power plant, site selection, Review of Gas Turbine Plants (advantages & disadvantages), Typical layout of power plant, Site selection, Review of Solar Energy (advantages & disadvantages), Typical layout of solar thermal power plant, Site selection, Review of wind energy (advantages & disadvantages), Typical layout of wind power plant, Site selection

- **Content Delivery Methods:**
  Chalk and talk, power point presentation

- **Assessment Methods:**
  Theory questions related to above content

SECTION - II

Unit 4– General structure of power system **No of lectures – 08**

- **Prerequisite:**
  DC system, single phase & three phase systems, ohms law

- **Objectives:**
  1. To learn basic structure of power systems
  2. To make student understand different transmission systems

- **Outcomes:**

After completing this unit, students -

1. Can distinguish between different supply systems
2. Can compare between AC and DC transmission System.
3. Can compare between overhead and underground System.

Unit Content:
Review of Electrical supply system, typical AC power supply scheme, Comparison DC and AC systems, comparison between overhead and underground system

- **Content Delivery Methods:**

Chalk and talk, power point presentations

- **Assessment Methods:**
  Theory questions related to above content

Unit 5– Economic Aspects of Transmission System **No of lectures – 08**

- **Prerequisite:**
  DC system, single phase & three phase systems, ohms law

- **Objectives:**
  1) To make student understand conductor cost of different AC transmission systems
  2) To make student understand Economics of power transmission

- **Outcomes:**
  After completing this unit, students -
  1. Can calculate voltage, conductor cost for various transmission systems
  2. Can calculate Economic conductor size for given transmission system (Kelvin's law)

- **Unit Content:**
  Comparison of conductor cost for various Overhead AC transmission systems, comparison of conductor cost for various Underground AC transmission systems, Economic choice of conductor size by kelvins law

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**

  Numerical problems and derivation related to conductor cost for different transmission systems and Kelvin's law Theory questions related to above content

Unit 6– Mechanical design of overhead lines **No of lectures – 05**

- **Prerequisites:**
  Electrical Material**s** & their properties**,** Capacitance

- **Objectives:**
  1. To introduce concept of overhead transmission line
  2. To introduce different conducting material & their application
  3. To introduce different insulators & their application
  4. To make student understand string efficiency & methods to improve it

- **Outcomes:**
  After completing this unit, students -
  1. Can describe construction and use of different insulators, conductor, line supports
  2. Can calculate string efficiency of given string insulators

- **Unit Content:**
  Review of overhead transmission line, main components, conductor materials, line supports, overhead line insulators, types- pin type, suspension type, strain type insulators, string efficiency, methods of improving string efficiency

- **Content Delivery Methods:**

Chalk and talk, power point presentations, videos lectures on insulators, line supports

- **Assessment Methods:**
  Numerical problems and derivation related to string efficiency, Theory questions related to above content

- **Internal Continuous Assessment (ICA):**
  ICA shall consist of Minimum **FOUR** drawing Sheets on above syllabus and **report on visit** to any one of the generating power plant

- **Text Books:**

1. "A course in Electrical Power", S K Kataria & Sons, J B Gupta
2. "Generation of Electrical Energy", S Chand Publication, B R Gupta
3. "Power System Engineering", Laxmi Publications, R K Rajput
4. "Power Plant Engineering", New Age International Publication, A K Raja

- **Reference Books:**

1. "Power Plant Technology", Tata Mc Graw Hill,MMEI-Wakil
2. "Power Plant Engineering", S Chand Publications, Samsher Gautam

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. Electrical Engineering Semester-II
POWER SYSTEM-II

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week,3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hrs/Week, 1 Credit	**ICA-**25Marks
	ISE- 30Marks

This course introduces elements of power systems which deals with structure of power system & constants of Transmission lines The course also introduces theoretical and analytical aspects of overhead & underground transmission lines, DC & AC distribution systems and substation

Course Prerequisite:
Student shall have knowledge of circuit theory Student shall also have basic knowledge of Transformers, single phase & three phase systems

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Course Objectives:
- To learn basic structure of power systems and mechanical design of overhead lines
- To study various effects related to overhead transmission lines
- To gain knowledge about need of power transmission using underground cables, types of underground cables
- To understand DC & AC distribution systems and substations

Course Outcomes:
- Students will be able to understand overall structure of power system
- Students will be able to understand mechanical design of transmission lines
- Students will be able to implement the knowledge to design underground power distribution system
- Students will be able to analyze various performance parameters of transmission lines

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SECTION-I

Unit 1– Corona & Sag in overhead lines **No of lectures – 07**

- **Prerequisites:**
  Electric field Intensity, phasor addition rule, concept of moment & force
- **Objectives:**
  1. To introduce corona phenomenon and its effects
  2. To introduce concept of sag in design of transmission line
  3. To make student understand about corona & sag in overhead lines
  4. To introduce concept of stringing chart
- **Outcomes:**
  After completing this unit, students -
  1. Can describe phenomenon of corona & sag
  2. Can describe factor affecting corona & method's to reduce corona
  3. Can calculate sag & different voltages related to corona

- **Unit Content:**
  Corona-principle, terms- definitions and empirical formulae related corona, factor affecting corona, advantages and disadvantages of corona, methods of reducing corona effect Sag in overhead lines, calculation of sag

- **Content Delivery Methods:**
  Chalk and talk, power point presentations, animation on corona phenomenon

- **Assessment Methods:**
  Numerical problems and derivation related to sag & corona, Theory questions related to above content

Unit 2– Constants of transmission lines **No of lectures – 07**

- **Prerequisite:**
  Resistance, inductance, capacitance, fundamental electrical concepts

- **Objectives:**
  1. To introduce constants of transmission lines
  2. To analyze transmission lines by its constants
  3. To introduce concept of GMR and GMD

- **Outcomes:**
  After completing this unit, students-
  1. Can describe constants of transmission lines
  2. Can derive and calculate resistance, inductance, and capacitance of transmission lines

- **Unit Content:**
  Resistance of line, skin effect and proximity effect, inductance of single phase 2 wire line, GMR and GMD, inductance of three phase line with equilateral spacing, unsymmetrical spacing, effect of transposition, line capacitance, capacitance of 1ph and 3ph line, effect of earth on the capacitance of overhead lines

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems and derivation related resistance, capacitance, and inductance of transmission lines, Theory questions related to skin effect and proximity effect

Unit 3– Underground cables **No of lectures – 07**

- **Prerequisite:**
  Electrical Materials, resistance, capacitance

- **Objectives:**
  1. To introduce construction and classification of cable
  2. To make student understand effect of voltage on performance of cable
  3. To introduce economic size of conductor in cable

- **Outcomes:**
  After completing this unit, students -
  1. Can describe construction and classification of cable
  2. Can describe insulation resistance, capacitance & advantages of grading of cable
  3. Can derive and calculate resistance, capacitance, and potential gradient of cable

- **Unit Content:**
  General construction of cables, insulating materials for cables, classification of cables, insulation resistance of a single core cable, capacitance of a single core cable, dielectric stress in a single core cable, grading of cables, and capacitance of 3-phase cables

- **Content Delivery Methods:**
  Chalk and talk, power point presentations, video lectures on types of cable

- **Assessment Methods:**
  Numerical problems and derivation related resistance, capacitance, dielectric stress, grading of cables, Theory questions related to above content

SECTION-II

Unit 4– Performance of transmission lines **No of lectures – 07**

- **Prerequisite:**
  AC circuits, Power Factor, complex notations, phasor representation

- **Objectives:**
  1. To analyze performance of transmission lines
  2. To make student understand types of transmission lines
  3. To make student understand power factor improvement

- **Outcomes:**
  After completing this unit, students –
  1. Can describe performance of different transmission line
  2. Can describe generalized constants of different transmission line
  3. Can calculate parameters of different transmission lines

- **Unit Content:**
  Review of transmission line, classification of overhead transmission lines, important terms, performance of short transmission line, effect of load PF on regulation and efficiency, medium transmission lines-end condenser method, nominal T method, nominal π method, long transmission lines-rigorous solution, generalized circuit constants of a transmission line, Ferranti effect, derivations of generalized constants (A, B,C,D) of short, medium & long transmission lines

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems and derivation related to different types transmission line, generalized Constants, power factor improvement

Unit 5– Distribution systems **No of lectures – 07**

- **Prerequisite:**
  DC circuits, Kirchhoff's laws, generator, transformer

- **Objectives:**
  1. To make student understand types of Distribution systems
  2. To analyze performance of Distribution systems

- **Outcomes:**
  After completing this unit, students -
  1. Can describe performance of different Distribution systems
  2. Can calculate parameters of different Distribution systems
- **Unit Content:**
  Classification & types, connection schemes of distribution systems, DC distribution calculations-DC distributor fed at one end and both ends with concentrated load, Ring main distributor, AC distribution and its calculations, 3phase 3wire and 3 phase 4 wire connected loads

- **Content Delivery Methods:**
  Chalk and talk, power point presentations

- **Assessment Methods:**
  Numerical problems and derivation related to different types Distribution systems**,** Theory questions related to above content

Unit 6– Substations and Grounding **No of lectures – 07**

- **Prerequisite:**
  Transformer, bus bar, generator, Earthing, electrical safety measures

- **Objectives:**
  1. To introduce student to substation and its types
  2. To make student understand substation equipment
  3. To make student understand Grounding & its types
  4. To make student understand about importance of Grounding

- **Outcomes:**
  After completing this unit, students –
  1. Can describe different equipment used in substation
  2. Can describe different types of Grounding

- **Unit Content:**
  Substations: classification, symbols for equipment in substations, equipment's in substation
  Grounding: Introduction, Grounding of transformer neutral, resistance grounding, reactance grounding, solid grounding

- **Content Delivery Methods:**
  Chalk and talk, power point presentations, videos on Substations installation & working

- **Assessment Methods:**
  Theory questions related to Substation, Grounding

- **Internal Continuous Assessment (ICA):**
  ICA shall consist of one substation visit related to syllabus and report based on it and Any 6 drawing sheets from the following
  1. Typical AC power supply system
  2. Types of line supports
  3. Types of insulators
  4. Classification of cables
  5. Connection schemes of Distribution system
  6. Substation equipment's and symbols
  7. Types of Substation
  8. Methods of grounding

- **Text Books:**
  1. "A course in Electrical power", S K Kataria and sons, J B Gupta
  2. "Principles of power system", S Chand Publication V K Mehta, Rohit Mehta
  3. "Power system engineering", Dhanpat Rai and sons , M L Soni, P V Gupta, U S Bhatnagar
  4. "*Power System Engineering"*, Laxmi Publications, R K Rajput

- **Reference Books:**
  1. "Electrical power system", New age international, C L Wadhwa
  2. "Electrical power generation transmission and distribution", PHI New Delhi, S M Singh
  3. "Elements of power system design", AH wheeler and Co, M V Deshpande
  4. "Power System operation & Control", Wiley India, Dr.K.Uma . Ra

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015 'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ELECTRICAL ENGINEERING

Name of the Course: T.Y. B. Tech (Sem I & II)

(Syllabus to be implemented from w.e.f. June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
T.Y. B.Tech. (Electrical Engineering)

Choice Based Credit System Syllabus Structure of T. Y. B.Tech. Electrical Engineering W.E.F. 2022-2023

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 311	Power System III	3	-	-	3	30	70	-	100
EL 312	Linear Control System	3	-	-	3	30	70	-	100
EL 313	Advanced Microcontroller System	3	-	-	3	30	70	-	100
EL 314	Electromagnetic Engineering	3	1	-	4	30	70	25	125
EL 315	Open Elective-I	2	1	-	3	30	70	25	125
EL 316	Self-Learning Module-I			-	2		50		50
Sub Total		**14**	**2**	**-**	**18**	**150**	**400**	**50**	**600**
Laboratory Course Name							***ESE***		
							POE	***OE***	
EL 311	Power System III	-	-	2	1	-	-	25	25	50
EL 312	Linear Control System	-	-	2	1	-	-	25	25	50
EL 313	Advanced Microcontroller System	-	-	2	1	-	50	-	25	75
EL 317	Electrical Workshop	-	-	2	1	-	-	-	25	25
Sub Total		**-**	**-**	**8**	**4**	**-**	**100**		**100**	**200**
Grand Total		**14**	**2**	**8**	**22**	**150**	**500**		**150**	**800**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
T.Y. B.Tech. (Electrical Engineering)

Choice Based Credit System Syllabus Structure of T.Y.B. Tech. Electrical Engineering W.E.F. 2022-2023

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 321	Electrical Machine Design	3	-	-	3	30	70	-	100
EL 322	Electrical Utilization	3	1	-	4	30	70	25	125
EL 323	Power Electronics & Industrial Drives	3	-	-	3	30	70	-	100
EL 324	Advanced Control Systems	3	-	-	3	30	70	-	100
EL 325	Open Elective-II	2	1	-	3	30	70	25	125
EL 326	Self-Learning Module-II	-	-	-	2	--	50	-	50
Sub Total		**14**	**2**	**-**	**18**	**150**	**400**	**50**	**600**
Laboratory Course Name							***ESE***		
							POE	***OE***	
EL 321	Electrical Machine Design	-	-	2	1	-	-	25	25	50
EL 323	Power Electronics & Industrial Drives	-	-	2	1	-	50	-	25	75
EL 324	Advanced Control Systems	-	-	2	1	-	-	-	25	25
EL 327	Mini Hardware Project	-	-	2	1	-	-	25	25	50
Sub Total		**-**	**-**	**8**	**4**	**-**	**100**		**100**	**200**
Grand Total		**14**	**2**	**8**	**22**	**150**	**500**		**150**	**800**

Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

Self-Learning Module-II:

1. Hybrid Electric Vehicle Design
2. Electrical Safety
3. Solar Photovoltaic System Design & Installation
4. NPTEL Course/MOOC/University Defined Courses

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-I
Electrical Workshop

Teaching Scheme	Examination Scheme
Practical: - 2 Hrs/Week, 1 Credit	**ICA-**25Marks

Course Objectives:

1. To develop practical workshop skills in the students.
2. To provide students a widespread knowledge and understanding of the workshop tools and other facilities.

Course Outcomes:

At the end of the course student –

1. can apply workshop equipment, wiring accessories and print circuit boards
2. can prepare the PCB in the practical field.
3. can install the earthing for different equipment
4. can find the faults in the circuits by troubleshooting

Electrical workshop

To perform and record any six of following experiments

1. Understanding of different types of switches such as SPST, SPDT, DPST, DPDT, TPST, TPDT
2. Understanding of different types of switchgears such as MCCB, MCB, ELCB, Isolators, HRC fuses
3. Understanding Different types of meters such as analog multimeter, clamp meter, trivector meter, power quality analyser, RLC meters etc.
4. Measurement of insulation resistance and earth resistance.
5. Understanding Different types of power supply, function generator, DSO, CRO.
6. Study and performing of motor winding.
7. Installation of plate, pipe, and grid earthing.
8. Types of wiring, Industrial, domestic wiring and panel wiring etc.
9. PCB design and fabrication
10. Soldering and desoldering of components on PCB.
11. Troubleshooting in electronic circuits.

Carry out at least one activity of the following to give the students an insight to their practical approach in diverse electrical field.

1. Site visit to nearby apartments/industries to understand the electrical wiring.
2. Workshop on PCB design using any suitable and available software like ORCAD, eagle, Proteus etc.
3. Workshop on Solar panel installation.
4. Workshop on motor rewinding.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B.Tech. (Electrical) Semester-II
Electrical Utilization

Teaching Scheme	Examination Scheme
Theory: - 3 Hrs/Week, 3 Credits	**ESE –** 70 Marks
Tutorial: - 1 Hr/Week , 1 Credit	**ICA -** 25 Marks
	ISE - 30 Marks

Course Prerequisite:
Basics of Electrical Engineering, Effects of electric current, Control circuit design basics, awareness about artificial lighting, Characteristics and application of different electric motors, awareness about traction, awareness about energy conservation.

Course Objectives

1. To provide the students the fundamental concepts of traction system, train movement, tractive effort used in electric traction and controlling of traction motors.
2. To analyze the accessing techniques for braking system implementation in traction.
3. To comprehend the different issues related to heating, welding and illumination.
4. To make the students aware about the importance of maximizing the energy efficiency by optimum utilization of electrical energy.
5. To develop self and lifelong learning skills, introduce professionalism for successful career.

Course Outcomes

1. Students will be able to design a suitable scheme of speed control for the traction systems.
2. Students will be able to understand different controlling methods, transition methods in traction.
3. Students will be able to identify a heating/ welding scheme for a given application.
4. Students will be able to identify/ Trouble shoot various lamps and fittings in use.
5. Students will be able to understand the importance of maximizing the energy efficiency by its optimum utilization and mould their practical work in professional world accordingly

SECTION-I

Unit-1 Traction Systems **No of Lectures- 08**

- **Prerequisite:**
  Awareness about traction
- **Objectives:**
  1. To introduce to student basic terms used in traction system.
  2. To introduce different types of traction systems.
  3. To introduce student to types of speed time curve.
- **Outcomes: After completing this unit student-**
  1. Can define different terms in traction system.
  2. Can understand different types of traction systems.
  3. Can analyze selection of speed time curves for different services.
- **Unit Content:**
  Introduction, different system of traction, systems of electric traction, speed time curve for different services, calculation by trapezoidal and quadrilateral speed time curve, mechanics of train movement, tractive effort for propulsion of train, determination and factors effecting specific energy consumption using speed time curve, dead weight, accelerating weight and adhesive weight, introduction to metro system, monorail system.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical, Theoretical questions on above unit content.

Unit-2 Control of Traction Motors and Train Lighting **No of Lectures- 08**

- **Objectives:**
  1. To introduce to student about different types of motors used for traction, different braking systems and lighting systems.
  2. To introduce student to speed control, control and auxiliary equipment.
- **Outcomes: After completing this unit student-**
  1. Can define different types of motors, braking systems and lighting systems.
  2. Can analyze selection of control and auxiliary equipment.
- **Unit Contents:**
  Desirable characteristic of traction motors, suitability of dc series motor, 3 phase induction motor for traction, control of traction motors -series-parallel control, shunt and bridge transition, electrical breaking, regenerative breaking in traction, control equipment and auxiliary equipment, drum controller, master controller, train lighting system.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Derivation, Numerical, Theoretical questions on above unit content.

Unit-3 Selection of Motors for Industrial Applications **No of Lectures- 05**

- **Objectives:**
  1. To make students to understand concepts and operation of different types of motors.
  2. To make students to understand application of different motors.
- **Outcomes:**
  After completing this unit student-
  1. Can understand operation of different motors.
  2. Can analyze for application of motors.
- **Unit Contents:**
  Motor selection in textile industries, machine tools, rolling mills, sugar mills, cranes and Lifts
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Theoretical questions

SECTION-II

Unit-4 Electric Heating and Welding **No of Lectures- 08**

- **Objectives:**
  1. To ensure that the knowledge acquired can be applied in various fields of electric Heating.
  2. To ensure that the knowledge acquired can be applied in various fields of electric Welding.
- **Outcomes: After completing this unit student-**
  1. Students will get technical knowledge of modern heating techniques in practical world.
  2. Students will get technical knowledge of modern welding techniques in practical world.
- **Unit Contents:**
  Electric heating- types, advantages, disadvantages & applications, electric welding- types, advantages, disadvantages & applications
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation, Video lectures
- **Assessment Methods:**
  Theoretical questions, Numerical on resistance heating

Unit-5 Illumination **No of Lectures- 08**

- **Objectives:**
  1. To develop ability amongst the students to analyze the performance of different sources of light.

2. To develop ability amongst the students to analyze the performance of different illumination schemes.

- **Outcomes: After completing this unit student-**
  1. will be able to design simple illumination schemes
  2. Can analyze selection of sources of light
- **Unit Contents:**
  Introduction, terms used in illumination, laws of illumination, factors to be considered for design of illumination scheme, source of light, discharge lamps, MV and SV lamps, comparison between tungsten filament lamps and fluorescent tubes, basic principles of light control, street lighting and flood lighting, CFL & LED Lamps.
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation
- **Assessment Methods:**
  Numerical, Theoretical questions

Unit-6 Energy Conservation **No of Lectures- 05**

- **Objectives:**
  1. To make the students aware about the importance of Energy Conservation.
  2. To make the students aware about the importance of maximizing the energy efficiency by optimum utilization of electrical energy.
- **Outcomes: After completing this unit-**
  1. Students will be able to define the importance of Energy Conservation.
  2. Students will be able to define the importance of maximizing the energy efficiency by its optimum utilization
- **Unit Contents:**
  Introduction, Motivation for Energy Conservation, Principles of Energy Conservation, Energy Conservation Planning, Energy Conservation in Industries, Energy Conservation in Household and Commercial Sectors, Energy Conservation in Transport and Agriculture
- **Content Delivery Methods:**
  Chalk and talk, Power point presentation
- **Assessment Methods:**
  Theoretical questions

Text Books: -

1. J.B. Gupta, “A course in Electrical Power” by, S K Kataria And Sons
2. Dr. S.L. Uppal, “Electrical power”, Khanna Publishers

References Books: -

1. B.R. Gupta, “Generation of Electrical Energy”, S Chand
2. E. O. Taylor, “Utilizations of electrical energy”, Orient Longman Pvt Ltd.
3. H Partab, “Art & Science of Utilization of Electrical Energy” Dhanpat Rai & Co

Internal Continuous Assessment (ICA):-

There should be minimum 6 assignments on the above syllabus and one industrial visit. Visit to any one location from the following-

1. Railway station (Control room)
2. Loco shed
3. Traction substation
4. Forging Industry

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech. (Electrical) Semester-II
Mini Hardware Project

Teaching Scheme	Examination Scheme
Practical: - 2Hrs/week 1 Credits	**ICA -** 25Marks
	OE – 25Marks

This course encourages student for project-based learning through development of hardware mini project in applied areas. The course aims to apply acquired skills of electronic circuit designing, digital design, instrumentation, microcontroller, electrical & electronic components specifications and their testing. The hardware project also provides experience of working in a team with set target. The project report writing allows student to gain knowledge of technical documentation of certain product. The entire experience in the project may be useful for entrepreneurship development.

Course prerequisite: Electrical & Electronic component identification and their testing, fundamentals of electronic circuit designing, concepts in digital designing, knowledge of various sensors, knowledge of control systems fundamentals, microcontrollers.

Course Objectives:

1. To encourage student to undertake and execute mini hardware project in a group which includes selection of appropriate hardware components, understanding their specifications and testing procedures.
2. To make student acquaintance with computer aided PCB designing tool
3. To develop electronic hardware assembly, soldering and testing skills amongst student
4. To nurture technical report witting skills amongst student
5. To understand the product development cycle through mini project.

Course Outcomes:

After successfully completing this course, the student shall be able to:

1. Understand, plan and execute a mini project with team.
2. Device electronic hardware by implementing knowledge of PCB design techniques, soldering techniques and hardware debugging techniques
3. Prepare technical report based on the mini project
4. Estimate cost of the mini project, deliver technical seminar over mini project.

Guidelines:

Project group shall consist of not more than 3 students. The mini project plan shall include phases group formation, mini project topic selection, circuit component selection, pre-testing of project over breadboard, PCB artwork designing using EDA tool, simulation, hardware assembly, testing, enclosure design, testing and analysis, presentation and report writing.

Domains for mini projects (but not limited to following):

Instrumentation and control systems
Automation and protective system
Application of electronics to power system
Electric drives
Electronics communication systems
Embedded systems
Renewable Energy systems
Disaster management systems

- ***Assessment Methods:***

Below scheme is recommended for ICA marks –

Selection of the project and pre circuit testing	20 %
Circuit design, simulation, PCB and assembly	30%
Results / Output from final assembly	10%
Mini project presentation seminar	20%
Project report	20%

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited – 2015
B-Grade CGPA- 2.62

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

SYLLABUS: ELECTRICAL ENGG

Name of the Course: Final Year B. Tech

(Syllabus to be implemented w.e.f. June 2021-22)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B.Tech (Electrical Engineering)
PROGRAMME: BACHELOR OF ELECTRICAL ENGINEERING
PROGRAMME OBJECTIVES

A. PROGRAM EDUCATIONAL OBJECTIVES

1. Deliver fundamental as well as advanced knowledge with research initiatives in the field of electrical engineering with emphasis on state of the art technology.
2. Graduates will demonstrate measurable progress in the fields they choose to pursue.
3. Design and develop technically feasible solutions for real world applications which are economically viable leading to societal benefits.
4. To nurture Graduates to be sensitive for ethical, societal and environmental issues while conducting their professional work.

B. PROGRAMME OUTCOMES

Students attain the following outcomes:-

1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3 **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12 **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. PROGRAMME SPECIFIC OUTCOMES

1 An ability to specify, design and analyze Power System, Electrical Machinery, Electronic Circuits, Drive Systems, Lightning Systems and deliver technological solution by adapting advances in allied disciplines.

2 Apply knowledge of electrical engineering to meet the desired needs within realistic constraints viz. economical, ethical, and environmental and safety.

3 Apply modern software tools for design, simulation and analysis of electrical systems to successfully adapt in multi-disciplinary environments.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B.Tech (Electrical Engineering)

Choice Based Credit System Syllabus Structure of B.Tech Electrical Engineering W.E.F. 2021-2022

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
EL 411	Industrial Drives Control	3	-	-	3	30	70	-	100
EL 412	Power System and Operation Control	3	1	-	4	30	70	25	125
EL 413	Renewable Energy Sources	3	-	-	3	30	70	-	100
EL 414	Switchgear and Protection	3	-	-	3	30	70	-	100
EL 415	Elective-I	3	1	-	4	30	70	25	125
Sub Total		**15**	**2**	**-**	**17**	**150**	**350**	**50**	**550**
Laboratory Course Name									
							ESE		
							POE	**OE**	
EL 411	Industrial Drives Control	-	-	2	1	-	50	-	25	75
EL 413	Renewable Energy Sources	-	-	2	1	-	-	-	25	25
EL 414	Switchgear and Protection	-	-	2	1	-	-	25	25	50
EL 416	Seminar on Industrial Training	-	-	-	-	-	-	-	25	25
EL 417	Project Phase-I	-	-	4	2	-	-	50	25	75
Sub Total		**--**	**-**	**10**	**5**	**-**	**125**		**125**	**250**
Grand Total		**15**	**2**	**10**	**22**	**150**	**475**		**175**	**800**

- *Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Engineering & Technology
B.Tech (Electrical Engineering)

Choice Based Credit System Syllabus Structure of B.Tech Electrical Engineering W.E.F. 2021-2022

Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	ICA	***Total***
EL 421	Power Quality & FACTS	3	-	-	3	30	70	-	100
EL 422	Extra High Voltage AC Transmission	3	-	-	3	30	70		100
EL 423	Elective -II	2	1	-	3	30	70	25	125
EL 424	Elective III	2	1	-	3	30	70	25	125
Sub Total		**10**	**2**	**-**	**12**	**120**	**280**	**50**	**450**
Laboratory Course Name									
							ESE		
							POE	**OE**		
EL 421	Power Quality & FACTS	-	-	2	1	-		50	25	75
EL 422	Extra high voltage AC transmission			2	1			50	25	75
EL 425	Project Phase-II	-	-	8	4	-	100		100	200
Sub Total		**-**	**-**	**12**	**6**	**-**	**200**		**150**	**350**
Grand Total		**10**	**2**	**12**	**18**	**120**	**480**		**200**	**800**

Abbreviations: L - Lectures, P –Practical, T - Tutorial, ISE - In Semester Exam, ESE - End Semester Exam, ICA - Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Structure & Syllabus

Name of the Course: B. Tech. (Computer Science & Engineering)

(Syllabus to be implemented from June 2022)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE AND TECHNOLOGY
Structure of T.Y. B. Tech. (CSE) w.e.f. 2022-2023 Semester-I

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS311	Artificial Intelligence	3			3	70	30		100
CS312	Operating Systems	3			3	70	30		100
CS313	Database Engineering	3			3	70	30		100
CS314	Design and Analysis of Algorithm	3			3	70	30		100
CS315	Mobile Application Development	2			2		25		25
SL31	Self-Learning Module I (HSS)				1	50			50
	Sub Total	**14**			**15**	**330**	**145**		**475**
	Laboratory/Workshop					**ESE** / **POE**			
CS311	Artificial Intelligence			2	1			25	25
CS312	Operating Systems			2	1			25	25
CS313	Database Engineering			2	1	50		25	75
CS314	Design and Analysis of Algorithm			2	1	50		25	75
CS315	Mobile Application Development			2	1	50		25	75
	Sub Total			**10**	**5**	**150**		**125**	**275**
	Grand Total	**14**		**10**	**20**	**480**	**145**	**125**	**750**

Note :

1. Batch size for the practical/tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B. Tech. Semester VII) of minimum 15 days shall be completed in vacation/s after S.Y. B. Tech. Semester IV but before Final Year B.Tech. Semester VII & the report shall be submitted and evaluated in Final Year B.Tech. Semester VII
3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

4. **Self-Learning Module I at T.Y. B.Tech. – I**
   Curriculum for Humanities and Social Sciences, Self Learning Module - I is common for all under graduate engineering programs.

A. Student can select & enroll a Self Learning Module I Course from PAH Solapur University, Solapur HSS Course List (SL31-A) and appear for university examination.

SL31-A: P. A. H. Solapur University, Solapur: HSS Course List

1. Economics	4. Stress and Coping
2. Intellectual Property Rights for Technology Development and Management	5. Professional Ethics & Human Value
3. Introduction to Sociology	

OR

B.Student can select and enroll for university approved minimum eight weeks NPTEL HSS course (SL31-B), complete its assignments and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-B will be updated from time to time by University authorities. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.
More details about NPTEL are available at http://nptel.ac.in

SL31-B: University approved NPTEL- HSS course List

1. Soft skills	15. Management of Inventory Systems
2. Introduction to Modern India Political Thought	16. Economic Growth and Development
3. Intellectual Property	17. Ethic in Engineering Practice
4. Technical English for Engineers	18. Corporate Social Responsibility
5. Developing Soft Skills and Personality	19. Marketing Management –I
6. Educational Leadership	20. Marketing Research and Analysis
7. Microeconomics: Theory & Applications	21. Selected Topics in Decision Modeling
8. Engineering Economics	22. Innovation, Business Models and Entrepreneurship
9. Human Resource Development	23. Simulation of Business Systems: An Applied Approach
10. Project Management for managers	24. Sustainability through Green Manufacturing Systems: An Applied Approach
11. Data Analysis and Decision Making - I	25. Total Quality Management - I
12. E-Business	26. Introduction to Operations Research
13. Working Capital Management	27. Knowledge Management
14. Industrial Safety Engineering	

Course Code	Theory Course Name	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
CS321	System Programming	3			3	70	30		100
CS322	Internet of Things	3			3	70	30		100
CS323	Software Engineering	3	2		5	70	30	25	125
CS324	Professional Elective-I	3			3	70	30		100
CS325	Web UI and UX Technology	2			2		25		25
CSO326	Open Elective	2			2	50			50
	Sub Total	**16**	**2**		**18**	**330**	**145**	**25**	**500**
	Laboratory/Workshop					**ESE / POE**			
CS321	System Programming			2	1			25	25
CS322	Internet of Things			2	1			25	25
CS324	Professional Elective-I			2	1			25	25
CS325	Web UI and UX Technology			2	1	50		25	75
CS327	Mini Project			2	1	50		25	75
	Sub Total			**10**	**5**	**100**	**0**	**125**	**225**
	Grand Total	**16**	**2**	**10**	**23**	**430**	**145**	**150**	**725**

Professional Elective – I	**Open Elective**
Cloud Computing	Principles of Management: Practicing Ethics, Responsibility,Sustainability
Augmented Reality/Virtual Reality	Engineering Economics and Management
Network Security	Disaster Management

Note

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.
2. Vocational Training (evaluated at Final Year B. Tech. Semester VII) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Semester IV but before Final Year B.Tech. Semester VII & the report shall be submitted and evaluated in Final Year B.Tech. Semester VII
3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.
4. Mini Project shall consist of developing software, based on various tools & technologies.
5. Project groups shall not be of more than **five** students.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
Third Year B. Tech (Computer Science & Engineering)
Semester – II
CS327 : MINI PROJECT

Teaching Scheme
Practical: 2 Hrs/week, 1 Credit

Examination Scheme
ICA : 25 Marks
POE – 50 marks

Course Outcomes :

At the end of this course, student will be able to

1. Select mini project problem of societal relevance in selected domain
2. Design system architecture with due consideration of environment, sustainability and ethics.
3. Develop the solution to the problem using tools, resources and frameworks.
4. Engage in teamwork and communicate effectively, while observing professional ethics.
5. Inculcate habit of self study and lifelong learning.

Note :

1. There should be a group of preferably 4/5 students.
2. Students should be given projects in Hardware, Software, Embedded or any contemporary topic.
3. One guide should be allocated per group.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus : Computer Science and Engineering

Name of the Course: Final Year B.Tech (CSE)

(Syllabus to be implemented from w.e.f. June 2021)

- Semester II : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C122	Engineering Mathematics II	3			3	70	30		100
C123	Engineering Graphics & Design	3			3	70	30		100
C124	Basic Civil Engineering	3			3	70	30		100
C125	Programming for Problem Solving	2			2		25		25
C126	Professional Communication	1			1		25		25
	Total	**15**			**15**	**280**	**170**		**450**
C127	Democracy, Elections and Good Governance					30			30

- Semester II : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE (POE)*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C122	Engineering Mathematics II		1		1			25	25
C123	Engineering Graphics & Design			4	2			50	50
C124	Basic Civil Engineering			2	1			25	25
C125	Programming for Problem Solving			4	2	50#		50	100
C127	Professional Communication			2	1			25	25
	Total		1	14	8	50		200	250
	Grand Total	**15**	**1**	**14**	**23**	**330**	**170**	**200**	**700**
C128	Democracy, Elections and Good Governance							20	

- Legends used –

L	Lecture	FA	Formative Assessment
T	Tutorial	SA	Summative Assessment
P	Lab Session	ESE	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Assessment

- **Notes-**
  1. $ - Indicates approximately half of the total students at F.Y B.Tech. will enroll under Group A and remaining will enroll under Group B.

     Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

     Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II

  2. # - Indicates the subject 'Programming for Problem Solving' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.

  3. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

     Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions

  4. Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However student must complete ICA of 20 marks and End Semester Examination (ESE) of 30 marks (as prescribed by university, time to time) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree

  5. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C128)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economical, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

An induction program for the new UG entrant students is proposed at the commencement ofthe first semester. It is expected to complete this induction program before commencement of the regular academic schedule.

Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital / Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Civil Engineering

Name of the Course: S. Y. B. Tech

(Syllabus to be implemented from w.e.f. June 2021)

PUNYASHLOK AHILYADEVI HOLKARSOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. Tech. Civil Engineering

Program Educational Objectives (PEOs)
B. Tech. Civil Engineering

The Program Educational Objectives for B. Tech. Civil Engineering program are designed to produce competent civil engineers who are ready to contribute effectively to the advancement of civil engineering and to fulfill the needs of the community. These objectives are as follows:

PEO1: Practice civil engineering in construction industry, public sector undertaking or as an entrepreneur for successful professional career.

PEO2: Pursue higher education for professional development.

PEO3: Exhibit leadership qualities with demonstrable attributes in lifelong learning tocontribute to the societal needs.

Program Outcomes (POs)
B. Tech. Civil Engineering

The program outcomes of B. Tech. Civil Engineering Program are as following:

i) **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

ii) **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

iii) **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

iv) **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complexproblems:

v) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

vi) **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

vii) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

ix) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

x) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

xi) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

xii) **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)
B. Tech. Civil Engineering

The program specific outcomes of B. Tech. Civil Engineering Program are as following:

1) Students will be able to survey, conduct geo-technical investigations, plan, analyze, design, estimate and construct residences, public buildings, industrial buildings, townships and infrastructural projects by adopting appropriate construction methods.

2) Students will be able to analyze and design the water resources systems, municipal and industrial waste treatment plants with due consideration to pollution free environment.

3) Students will be able to use appropriate application software, develop skills necessary for professional practice as a Civil Engineer and prepare themselves for education & for Public service commissions

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology
Credit System structure of S. Y. B. Tech. Civil Engg. - I, Semester- III, (W.E.F. 2021-2022)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CE 31 C	Surveying & Geomatics	3	-	-	-	3	30	70		-	100
CE32C	Fluid Mechanics and Fluid Machines	3	-	-	-	3	30	70		-	100
CE33C	Concrete Technology, Material Testing & Evaluation	2	-	-	-	2	30	70		-	100
CE34C	Building Construction & Drawing	2	-	-	-	2	30	70		-	100
CE35C	Structural Mechanics-I	3	-	-	-	3	30	70		-	100
	Total	**13**	**-**	**_**	**-**	**13**	**150**	**350**		**-**	**500**
	Laboratory/Drawings							**POE**	**OE**		
CE36L	Surveying & Geomatics	-	-	2	-	1	-	50	-	25	75
CE37L	Fluid Mechanics and Fluid Machines	-	-	2	-	1	-	25	-	25	50
CE38L	Concrete Technology, Material Testing & Evaluation	-	-	2	-	1	-	-	-	25	25
CE39L	Building Construction & Drawing	-	-	-	2	1	-	-	-	25	25
CE 410 L	Lab Practice	-	-	2	-	1	-	-	-	25	25
	Total	**-**	**-**	**8**	**-**	**5**	**-**	**75**		**125**	**200**
	Grand Total	**13**	**1**	**8**	**2**	**18**	**150**	**425**		**125**	**700**
	Environmental Science	1	_	_	-	_	_	_		_	_

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE -Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

Note:

(1) The number of students in a practical/Tutorial batch shall be 20. New batch shall be formed if the number of remaining students (after forming batches of 20) exceeds 9.

(2) Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable

(3) Student is required to study and pass Environmental Science subject in Second Year of B. Tech. Civil Engineering to become eligible for award of degree.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology

Credit System structure of S. Y. B. Tech. Civil Engg.- II, Semester – IV, W. E.F. 2021-2022

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CE41C	Environmental Engineering-I	3	-	-	-	3	30	70		-	100
CE42C	Building Planning & Design	2	-	-	-	2	15	35		-	50
CE43C	Structural Mechanics-II	3	1	-	-	4	30	70		25	125
CE44B	Engineering Mathematics-III	3	1	-	-	4	30	70		25	125
CE45B	Engineering Geology	2	-	-	-	2	30	70		-	100
	Total	**13**	**2**	**-**	**-**	**15**	**135**	**315**		**50**	**500**
	Laboratory/Drawings:							**POE**	**OE**		
CE46L	Environmental Engineering-I	-	-	2	-	1	-	-	-	25	25
CE47L	Building Planning & Design	-	-	-	2	1	-	50	-	25	75
CE48L	Computer Programming & Numerical Methods	2	-	2	-	3	-	50	-	25	75
CE49L	Engineering Geology	-	-	2	-	1	-	25	-	25	50
	Total	**2**	**0**	**6**	**2**	**7**	**-**	**125**		**100**	**225**
	Grand Total	**15**	**2**	**6**	**2**	**22**	**135**	**440**		**150**	**725**
	Environmental Science	1	–	–		–	–	–		–	–

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE -Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

Note:

(1) The number of students in a Practical/Tutorial batch shall be 20. New batch shall be formed if the number of remaining students (after forming batches of 20) exceeds 9.

(2) Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable.

(3) Student is required to study and pass Environmental Science subject in Second Year of B. Tech. Civil Engineering to become eligible for award of degree

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CV31 – SURVEYING & GEOMATICS

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credits	**ISE –** 30 Marks
Practical – 2 Hr/Week, 1 Credit	**ESE –**70 Marks
	POE-50 Marks
	ICA – 25 Marks

Course Outcomes:

On completion of the course students will be able to:

1. Carry out temporary adjustments of modern surveying equipments.
2. Use the surveying instruments namely levels, theodolite, EDM, total station for surveying measurements such as horizontal/ vertical/inclined distance, horizontal/ vertical angles, bearings, reduced levels, and coordinates.
3. Develop plans, draw maps and draft reports for surveying projects of Civil Engineering works.
4. Use the modern surveying techniques namely remote sensing, Global positioning system and Geographic information system for Civil Engineering applications.
5. Demonstrate the attributes of leadership, working in the team and professional ethics while performing the surveying projects.

Section- I

Unit 1: Leveling instruments and applications (8 Hrs)

a) **Levels:** Construction, temporary adjustments and use of Auto Level and Tilting Level.
b) **Contouring:** Direct and Indirect methods, Interpolation techniques and uses of contour maps.

Unit 2: Angles and Directions (8 Hrs)

a) Theodolite: Construction, temporary adjustments and use for measurement of horizontal angle, deflection angle, vertical angle, bearing, prolonging a line, lining in, setting out angles.

b) Theodolite Traversing: Field work, computation of consecutive and independent coordinates, Gale's traverse table and adjustment of closed traverse.

Unit 3: Modern Surveying Instruments (7 Hrs)

a) **Laser Level and Digital level**: Introduction to construction, temporary adjustments and use.

b) **EDM instruments:** Electromagnetic waves and their properties, phase, phase comparison, modulation.

c) **Total station:** Types, Construction, temporary adjustments and working. Various software functions such as B.S.F.S. survey, Resection, Traversing, Missing line measurement, Remote Elevation measurement, COGO, etc. Use of 'Total Station' for Contouring, Stake out, Land Use survey and calculation of earthwork.

Section II

Unit 4: Global Positioning System (GPS) (8 Hrs)

a) Global Positioning System (G.P.S.)- Principle of Operation- Trilateration
Segments: Spaces Segment, Control Segment, User Segment, Features of G.P.S. Satellites, G.P.S. Receivers: Navigational Receivers, Surveying Receivers, Geodetic Receivers Surveying with G.P.S.: GPS observables,
Methods of observations: Absolute Positioning, Relative Positioning, differential G.P.S., Kinematic G.P.S.

b) **Computation of Coordinates:-** Transformation from Global to Local Datum , Geodetic Coordinates to map coordinates , G.P.S. Heights and mean sea level Heights. Applications of G.P.S.

Unit 5: Remote Sensing Techniques (RST) (7 Hrs)

a) **Terrestrial and Aerial Photogrammetry**: Principles, Phototheodolite, Aerial Camera. Vertical aerial Photogrammetry: Scale, Relief Displacement, flight planning, Ground control Stereoscopy and photo interpretation: stereoscopes, Parallax Bar, Plotting instruments

b) **Light Detection and Ranging (LiDAR) LIDAR:** Basic Principles and advantages, Laser and Scanning System, Laser Location, Lidar Antenna Attitude, Types of Lidar returns,

Lidar post processing of multiple returns, Accuracy of Lidar measurements, The Laser Vegetation Imaging Sensor, Lidar types based on Platforms

c) **Unmanned Aerial Vehicle (Drone)** -Introduction

d) **Electromagnetic remote sensing**: Physics of radiant energy: Nature of Electromagnetic radiation, Electromagnetic spectrum. Energy sources and its characteristics. Atmospheric influences: Absorption, Scattering. Energy interaction with Earth Surfaces: Spectral reflectance Curve. Image Acquisition: Photographic sensors, Digital Data, Earth Resource satellites, Image resolution. Image Interpretation. Applications of Remote Sensing.

Unit 6: Geographical Information System (GIS) and Project Survey (7 Hrs)

a) **Geographical Information System (GIS):** Information systems, spatial and non- spatial Information, geographical concept and terminology, advantages of GIS, Basic component of GIS.GIS hardware and software. Field data, statistical data, maps, aerial Photographs, satellite data, points , lines, and areas features, vector and raster data, data entry through keyboard, digitizer and scanners, preprocessing of data rectification and registration, interpolation techniques.

b) Project Surveys

a) Building Lineout and layout
b) Route Survey
c) Culvert and Bridges
d) Tunnel, Mine: Centre line transfer, Level transfer, Weisbach triangle

In Semester Evaluation (ISE)

ISE shall be based upon student's performance in minimum three tests conducted and evaluated at institute level.

In Semester Continuous Assessment (ICA):

ICA shall be based on following experiments. Any other appropriate experiments based on above curriculum may also be added to the list. Student shall record them in a field book. Asa part of the completion of ICA, student shall submit completed field book and drawing sheets at the end of the course.

1) Study and use of Auto Level
2) Study and use of Total station

3) One Project on Preparation of contour map using Block contouring method Minimum area of one Hectare. (Data to be collected using either auto level or using the Total station).
4) One Project on Route surveying for Minimum length of 1 km. (Data to be collected using either auto level or using the Total station).

   Note: Data for both the projects to be submitted using soft copies in CSV or MS Excel format which shall be printed and submitted. Drawing to be prepared by using open source drafting software or by using academic version of drafting software. Drawing Submission shall be in the form of blue print to be submitted with every individual student.
5) Remote Sensing Techniques
   a) Study and use of Mirror stereoscope and finding out Air base distance.
   b) Study and use of parallax bar for measuring parallax and finding out the difference inElevation between two points
   c) Study of satellite images and its interpretation
6) Collection of field data by using surveying and mapping GPS receiver.
7) Geographic Information System
   a) Geo-registration of map and its digitization by using suitable GIS software.
   b) Map editing, vector and raster analysis of digitized map by using suitable GIS software.
   c) A project using GIS software (open source or academic version shall be acceptable) to be submitted in hard copy prints with successive processing images and reports.

TEXT BOOKS

1. Surveying – Vol. II and III, B. C. Punmia Laxmi Publication, New Delhi
2. Surveying and Leveling Vol. 2, T. P. Kanetkar and S. V. Kulkarni -Pune Vidyarthi Griha Publication
3. Advanced Surveying - Gopi, Sathikumar, Madhu, Pearson Education
4. Advanced Surveying, Agor. Khanna Publishers, Delhi
5. Surveying Vol. II., S. K. Duggal, Tata McGraw Hill Publishing Co. New Delhi.
6. Geomatics Engineering, Arora & Badjatia, Nem Chand & Co.
7. Surveying Vol.-I, II, III, BC Punamia, Laxmi Publications
8. Surveying, Vol.-I, II, III, K.R. Arora, Standard Book House
9. Basics of Remote Sensing & GIS, S. Kumar, University Sc. Press

REFERENCE BOOKS

1. Jawahar Lal Sharma- Advanced Surveying -CBS Publishers New Delhi
2. T. M. Lillisand and R.W. Kaifer, Remote Sensing & Image Interpretation, John Wiley &Sons
3. Lo C. P. Yeung A K W, Concepts and Techniques of GIS - Prentice Hall, India
4. Kang-tsung Chang, Introduction to GIS, Tata McGraw Hill
5. K. Anjali Rao, Remote sensing and GIS, BS Publications

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CE32: FLUID MECHANICS AND FLUID MACHINES

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credits	**ISE –** 30 Marks
Practical – 2 Hr/Week, 1 Credit	**ESE –**70 Marks
	POE-25 Marks
	ICA – 25 Marks

Course Outcomes

After successful completion of this course, student will be able to:

1) Identify and obtain values of fluid properties and relationship between them.
2) Carry out calibration of discharge measuring equipments.
3) Carry out hydraulic design of notched, weirs and spillways
4) Analyze fluid flows and will be able to design pipe networks.
5) Explain the working of Pelton, Francis and Kaplan turbines and pumps along their performance parameters.
6) Apply dimensional analysis to predict physical parameters that influence the flow in fluid mechanics.

SECTION – I

Unit 1: FLUID PROPERTIES (5 Hrs)

Scope and Importance of Fluid Mechanics, Definition of Fluid, , Physical properties of fluids: density, specific weight, specific volume, relative density and viscosity, Newtonian and Non-Newtonian fluids, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure,cavitation. Classification of fluids, Problems involving use of above Fluid Properties. Basic concept applicable to fluid mechanics.

Unit 2: FLUID STATICS (6 Hrs)

PASCAL's law, Units and scale of pressure measurement, types of pressure, Piezometer, U-tube manometer, Single column manometer, U-tube differential manometer, Inverted U-tube differential manometer, micro manometers, Mechanical pressure gauges.

Total pressure on plane surfaces and inclined surfaces, depth of center of pressure, Practical applications of Total pressure and Center of pressure.

Buoyant force, Buoyancy and Center of Buoyancy, Archimedes Principle, Metacentre and Metacentric height, Equilibrium of floating and submerged bodies, Metacentric height evaluation, .

Unit 3: FLUID KINEMATICS and DYNAMICS (7 Hrs)

Fluid flow methods of analysis of fluid motion, Concept of Control Volume, Streamlines, Path lines, Streak lines and Stream tubes. Types of fluid flows,Velocity potential and stream function, flow net, Equipotential Line.

Forces acting on fluid mass in motion, Euler's equation of motion along a streamline, Bernoulli's Theorem, Limitation and Applications, Measurement of discharge- through Venturi meter, Orifice meter, Measurement of velocity through Pitot tube. Experimental determination of hydraulic coefficients, Mouthpiece- classification, Concept of HGL and TEL.

Unit 4: NOTCHES, WEIRS & SPILLWAYS (6 Hrs)

A) Types of notches, Derivation of discharge equation, velocity due to approaches, Francis formula, calibration of notch and errors in measurements.

B) Weir and Spillways sharp & broad crested weirs, calibration of weirs, time required to empty the tank with notches and weirs, profile of ogee spillways types of nappe, ventilation of weirs**.**

SECTION-II

Unit 5: FLOW THROUGH PIPES and BOUNDRY LAYER ANALYSIS (6 Hrs)

Laminar Flow – Reynold's Experiment, Hazen Poiseuille, Equations for Viscous Flow between Parallel Plates and Circular Pipes.

Turbulent Flow– Prandtl's mixing length theory, Concept of turbulent flow in smooth and rough pipes.

Energy Losses in pipe flow (Major and Minor Losses), Darcy Weisbach Equation, Concept of Equivalent length and Equivalent diameter of pipe, Pipes in Series and Parallel, Concept of Syphon, concept of water hammer and surge tank, its function and location and use, **Hardy Cross Method** for solving pipe network.

Boundary Layer Theory- Development of Boundary layer on flat plate, displacement, momentum and energy thickness, laminar turbulent and transitional boundary layer, laminar sub layer, Hydro dynamically smooth and rough boundaries, Drag and Lift coefficients

Unit 6: DIMENTIONAL ANALYSIS (4 Hrs)

Dimensions and Dimensional homogeneity, Importance and Use of Dimensional analysis, Buckingham π theorem, statement & applications, Non dimensional numbers and their significance, Difference between model and Prototype ,

Unit 7: IMPACT OF JET AND TURBINES (6 Hrs)

A) Force and work done due to impact of jet on stationary and moving, flat and curved surfaces using linear momentum principle.

B) Elements of hydropower plant, hydraulic turbines- Classification, , Design and governing of Pelton Wheel, Francis turbine. Cavitations in hydraulic turbines, Prediction of performance in terms of unit quantities and specific quantities, Specific speed, selection of turbines on the basis of head and specific speed**.**

Unit 8: CENTRIFUGAL PUMPS (5 Hrs)

General classification of pumps and Classification of Centrifugal pumps, Selection of pumps, concept of Centrifugal head, Work done by impeller, Types of Heads, and efficiencies, minimum starting speed, Cavitations in centrifugal pumps, multistage pumping. Introduction to submersible pumps and reciprocating pumps, Concept of priming of pump, troubles and remedies in pump operations.

CONTINUOUS ASSESSMENT (ICA)

At least **NINE** experiments from the following.

1) Measurement of pressure (Piezometer, Manometers, Pressure gauges)
2) Determination of Metacentric heights.
3) Verification of Bernoulli's Theorem
4) Calibration of an orifice/mouthpiece.
5) Calibration of Venturi meter.
6) Calibration of V notch and rectangular notch.
7) Calibration of broad and sharp crested suppressed weir

8) Calibration of Ogee Weir.

9) Determination of loss of head in pipe flow.

10) Study of Moody's charts, nomograms for pipe design

11) Simple computer programs. (At least 3 based on the syllabus)

Turbines and Pumps

At least TWO experiments from the following.

1). Impact of jet.

1) Study of turbines (demonstration/test).

3) Study of centrifugal pump. (demonstration/test)

A s**ite visit is recommended to learn this topic.**

TEXT BOOKS

1) Fluid Mechanics – A. K. Jain-Khanna Pub., Delhi.
2) Fluid Mechanics and Fluid Machines – Modi and Seth – Standard Book House, Delhi.
3) Fluid Mechanics – S. Nagrathanam – Khanna Pub., Delhi.
4) Fluid Mechanics – Garde, Mirajgaonkar – Nemchand and Bross., Roorkee.
5) Fluid Mechanics – Arora.
6) Fluid Mechanics – R. W. Fox, P.J. Prichard, A. T. McDonold- Wiley India.
7) Fluid Mechanics – K.L. Kumar – Eurasia Publishing House, Delhi.
8) Fluid Mechanics & Hydraulic Machines, SS Rattan, Khanna Publishing Houe

REFERENCE BOOKS

1) Fluid Mechanics – Streeter McGraw Hill-International Book Co., Aucklard.
2) Fluid Mechanics –Munson, Young- Willy India.
3) Mechanics of Fluids – M.C. Potler, Wiggert, Ramdan- Cengage Learning
4) Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd., Tokyo.
5) Fluid Mechanics – Shames – McGraw – Hill International Book Co.
6) Fluid Mechanics and Machinery, C.S.P Ojha, P.N.Chandramouli, Oxford University
7) Fluid Machinery, Sadhu Singh, Khanna Publishing House, Delhi

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CE34: BUILDING CONSTRUCTION AND DRAWING

Teaching Scheme	**Examination Scheme**
Lectures – 2 Hrs/Week, 2 Credits	**ISE –** 30 Marks
Drawing – 2 Hr/Week, 1 Credit	**ESE –**70 Marks
	ICA – 25 Marks

Course Outcomes:

After successful completion of this course the students will be able to:

1. Elucidate functional requirements of buildings and types of foundation andits suitability.
2. Draw neat drawings of different building components such as doors,windows, stairs etc with the suitable scale using CADD software.
3. Design different types of staircases commonly used in residential and publicbuildings.
4. Draw neat perspective view drawings of an object and given small residentialbuilding.
5. Select appropriate ventilation systems and building finishes.

SECTION – I

Unit 1: Building functional Requirements, Building Type & Foundation (4 Hrs)

- Building functional Requirements - Strength, Stability, Comfort, Convenience, Safety, Damp Prevention, Water Proofing, Heat Insulation, Day Lighting, Ventilation, Termite Resistance.
- Building Types – Framed and Load Bearing and Composite structures, Comparison between all the three types. Building components (elements), Methods of transfer of building loads to foundation strata.
- Foundation: - Importance of foundation as load transferring building element. Shallow Foundations – Wall footing, Isolated footing, Combined Footing, Strap Footing, Continuous or Strip Footing, Cantilever Footing, Raft Foundation. (Reinforcement placement not expected)

Unit 2: Types of Masonry and Walls **(4 Hrs)**

- Introduction to Scale and various types of Scale.
- Introduction to Stone masonry walls, bonding and breaking of Joints.
- Brick masonry walls – Standard Brick size and Properties of good brick-work. Bonds-Stretcher, Header, Flemish & English bond (up to 1 ½ Brick thick)
- Concrete Block masonry – Hollow and Solid blocks, Construction method and bonds.
- Concept of Main Wall and Other wall, External wall and internal wall, Loadbearing wall and Partition wall. Glass Block wall and Curtain wall.
- Introduction to Autoclaved Aerated Concrete , Size, weight, etc.

Unit 3: Doors, Windows, Stairs and Arches **(4 Hrs)**

- Doors Types: - Paneled, Flush, Glazed. Door elements, Fixtures and Fastenings.
- Window: - Types: Steel Glazed, Wooden Paneled, Aluminum Glazed Sliding Ventilators and Fixed Glass windows.
- Staircase: - Functional requirements of stair, design of stair, types of stairs, technical terms.
- Arches: - Types of Arches based on shape, mechanism of load transfer.

Unit 4: Floors and Roofs **(3 Hrs)**

- Flooring and types of flooring, floor tiles, selection factors and fixing procedures offloorings.
- Roofing and types of roofs, Selection factors for Roofing materials

SECTION –II

Unit 5: Perspective Drawing **(5 Hrs)**

- Elements of Perspective drawings, parallel perspective (One Point) and angular perspective (Two Point) drawing.
- Perspective drawing of objects and perspective drawing of one G+1 Residential building(Readymade plan to be given to the students).

Unit 6: Lighting, Ventilation, Thermal Insulation, & Air Conditioning (5 Hrs)

- Lighting: - Definition and objective of lighting, Principles of Good lighting, Daylighting.
- Ventilation: - Definition and objective of ventilation, types of ventilation and its functional requirements, various systems and selection criteria.
- Thermal insulation: - General concept and Principles, Various methods and use of materials for thermal insulation, Computation of Heat loss and Heat gain in buildings.
- Air conditioning: - Purpose, classification, principles, systems and Components of the Air conditioning.

Unit 7: Building Finishes (5 Hrs)

- Plastering, Pointing and various techniques.
- Paints: - Different types and application methods.
- Varnishes and application methods.
- Tiles cladding, skirting, dado work with various materials.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

➢ For drawing session

(A) Sketching in sketchbook consisting of the following 9 drawing exercises:

1. Lettering, Symbols and line work.
2. Building structures (Load bearing & Framed structures)
3. Foundations- Isolated footing, combined footing, Strap footing and Pile footing.
4. Brick bonds
5. Arches and Roofs.
6. Doors
7. Windows
8. Staircases
9. Perspective drawing of object and one G+1 Residential building (Ready plan).

(B) Drawing using CADD software to be done:

1. Double leaf paneled doors
2. Double leaf paneled window
3. Open well staircase

Prints of these CADD drawings will form a part of 'Term work'.

- Site Visit for learning construction details of a residential building. A visit report to bedrafted and submitted as a part of term work.

TEXT BOOKS

1. A text book of Building Construction- Arora & Bindra- Dhanpat Rai Publication, New Delhi.
2. Building Construction- Sushil Kumar- Standard Publishers, Delhi.
3. Building Construction – Arora & Gupta –Satya Prakashan, New Delhi.
4. Principles of Building Drawing- M.G. Shah and C.M. Kale.
5. A course in Civil Engineering Drawing- V.B. Sikka – S.K.Katariya & Sons, Delhi.
6. Civil Engineering Construction Materials, S.K. Sharma, KBP House
7. Engineering Drawing + AutoCAD , by K.Venugopal , New Age International Publishers
8. Mastering AutoCAD 2019 and AutoCAD LT 2019, George Omura and Brian C. Benton, SYBEX Publishers.

REFERENCE BOOKS

1. Building Technology- Ivor H. Seely.
2. Building Construction-Makay vol. I & II
3. National Building Code of India-SP7- Indian Standards Delhi.
4. Various IS Specifications for Drawings, Symbols, Conventional Signs as per IS 962-1967-Indian Standards Delhi.
5. Building Construction A to Z – Mantri.
6. Building Materials- TTTI, Chandigadh.
7. Building Construction- S.S. Bhavikatti- Vikas Publishing House Pvt. Ltd., Noida.
8. Building Materials- S.S. Bhavikatti- Vikas Publishing House Pvt. Ltd., Noida.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE41: ENVIRONMENTAL ENGINEERING-I

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credits	**ISE –** 30 Marks
Practical – 2 Hr/Week, 1 Credit	**ESE –**70 Marks
	ICA – 25 Marks

Course Outcomes:-

After studying this course, students will be able to:

1. Plan and design water conveyance systems for a rural/urban area based on population forecasts.
2. Design various water treatment units and plan their operations on the basis of raw water quality and water demand.
3. Apply knowledge of advanced water treatment processes for individual water purification units.
4. Plan and design water distribution systems and identify operation and maintenance problems in water supply systems and suggest suitable solutions.

SECTION –I

Unit 1: Water Demand and Quality **(8 Hrs)**

Water supply system: Introduction, Components

Water demand: Usage and rates, Governing factors, Variation, Estimation (Present, intermediate and ultimate)

Water Quality: Physical, Chemical and biological parameters, IS 10500-2012

Sources: Quantitative and Qualitative study

Unit 2: Conveyance of water **(6 Hrs)**

Source works: Intake (Types and location), Design of river intake, Jack well, Pumping system, Power and capacity of pump

Conveyance system: Types (Gravity, gravity fed and pressure), Forces acting, Materials (Ductile Iron, Mild steel and Plastic), Jointing, Laying, Hydraulic testing, Break pressure tank, Design of gravity fed and pressure pipe,

Economic design Appurtenances: Valves, Thrust block

Unit 3: Water treatment (Aeration, Mixing and Settling) (8 Hrs)

Treatment: Philosophy, Unit processes and operations

Aeration: Process, Types of aerator, Design of cascade aerator

Coagulation: Physics and chemistry, Practice, Design of rapid mixer Flocculation: Theory, Design of slow mixer (hydraulic and mechanical)

Settling: Theory, Types, Design of rectangular and circular clarifiers for type 1 settling

SECTION –II

Unit 4: Water treatment (Filtration and Disinfection) (7 Hrs)

Granular Filtration: Classification, Theory of deep mono and dual bed filter, Components of deep bed filter, clean filter bed head loss, Filter operation, Design of mono and dual bed filter

Disinfection: Types, Ideal and non-ideal disinfectant, Chlorination, Chemistry of chlorination, Chlorine demand, Chlorination practice, UV and Ozone disinfection

Unit 5: Advanced water treatment (6 Hrs)

Membrane filtration: Types, Basic concepts, Applications

Adsorption: Introduction, Basics of Carbon adsorption

Ion Exchange: Theory, Design of softener Point of use purifiers, Package drinking water plant, Water plant residual management

Unit 6: Water distribution system and Operation-Maintenance (10 Hrs)

Water distribution: Methods, System configurations, Hydraulic and functional requirements, Hydraulic analysis, Design, Computer applications (EPANET/WATERGEMS)

Service reservoirs: Necessity, Components, Location, Head, and Capacity

Leakage: Causes, Detection and Control

Water quality in distribution: Causes of deterioration, Source trace, Water age, Nodal constituent concentration

Operation and maintenance: Water supply system

INTERNAL CONTINIUOS ASSESSMENT (ICA)

The ICA includes practical work to find the characteristics of water and assignments on each unit operations

(A) Experiments for the determination of the following (Min. 10)

1. pH value
2. Alkalinity
3. Acidity
4. Chloride content
5. Hardness
6. Turbidity
7. Residual Chlorine
8. Total Dissolved Solids through measurement of conductivity
9. Solids – Total, Suspended, dissolved, volatile and fixed
10. Dissolved Oxygen
11. Most Probable Number
12. Optimum dose of alum by jar test
13. Fluorides
14. Nitrogen
15. Irons and Manganese

(B) Design /Analysis Problems on each water treatment unit / distribution system

(C) Visit to water treatment plant

Internal Continuous Assessment (ICA) submission shall consist of journals containing

1. Above mentioned Experiments
2. Visit report describing the water treatment units of the plants visited.
3. Design of distribution system by using software or programming.

TEXT BOOKS:

1. Raju, B.S.N., “Water Supply and Wastewater Engineering” Tata McGraw Hill Private limited, New Delhi, 2nd Edition, 2000.
2. Garg, S. K. “Water Supply Engineering”, Khanna Publishers, 33rd Edition, 2010.
3. Modi, P. N., “Water Supply Engineering (Environmental Engineering I)”, Standard Book House, 6th Edition, 2018.

REFERENCE BOOKS

1. "Manual on Water Supply and Treatment", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
2. Hammer M, J and Hammer M, J, "Water and Wastewater Technology", PHI learning private limited, 7th Edition, 2018.
3. Davis, M, L, and Cornwell, D.A., "Introduction to Environmental Engineering", Tata McGraw Hill Publishing Company, Special Indian Edition, 2010.
4. Nathanson, J. A., "Basic Environmental Technology", PHI Learning private limited, 5th Edition, 2009.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE42: BUILDING PLANNING & DESIGN

Teaching Scheme	**Examination Scheme**
Lectures – 2 Hrs/Week, 2 Credits	**ISE –** 15 Marks
Drawing – 2 Hr/Week, 1 Credit	**ESE –**35 Marks
	POE – 50 Marks
	ICA – 25 Marks

Course Outcomes:

After successful completion of the course the students will be able to:

1) Plan residential and public buildings, according to the prevalent building byelaws
2) Prepare 'Municipal building permission drawings' of residential buildings using CADD software tools.
3) Plan appropriate building services for a building
4) Design a rain water harvesting system for a building.
5) Plan appropriate acoustics, sound insulation and fire fighting arrangements for a building

SECTION I

Unit 1: Site Selection of Building, Principles of Building Planning, Orientation and By- Laws and Dimension Relationships **(4 Hrs)**

Site selection criteria for building.

Principles of Building Planning and significance of Sun Diagram (Sun Path Diagram) and Wind flow Direction.

Orientation: - Basic Zones of India on bases of climate condition, Orientations of building for various part of India on bases of climate conditions.

Building Planning Byelaws and Regulations as per SP-7, National Building Code ofIndia.

Dimensions & Space requirement in relation to body measurements. Space designfor passage between walls, service access, stairs, ramps, elevators.

Unit 2: Planning and Design of Residential Buildings (4 Hrs)

Planning and functional requirements of Residential Building: - Bungalows (Detached), Twin bungalows (Semi Detached), Row houses, Ownership flats, and Apartments.
Parking Area Criteria

Unit 3: Planning and Design of Public Buildings (5 Hrs)

Educational Building: Pre-primary and primary school, Secondary and HigherSecondary school, Degree School (College).
Institutional Building:- Health centre and Hospitals.
Business and Mercantile building – Shops, banks, markets, & departmental stores.
Office and Other building: Post office, Administrative building etc.
Parking Area Criteria (for all above Public Building)

Unit 4: Building Permissions and its Procedure (2 Hrs)

Procedure and list of document for Building Permission and significance of various certificates (Commencement Certificate, Plinth Completion Certificate and Occupancy certificate).

SECTION II

Unit 5: Building Services (4 Hrs)

Plumbing Systems:- Significance of Plumbing and Drainage plan and layout, Water Supply Requirements for Buildings, various types of traps, Fittings, Chambers and various type of materials like PVC, GI, AC, CI, HDPE, Stoneware, CPVC with various gauges and thickness, Water Closet Pan: Types and sizes.
Introduction to Concept and Design of Rain Water Harvesting.
Electrification: - Concealed and open wiring system, requirements and locations ofvarious Electrical points, Concept of earthing.

Unit 6: Green Buildings and Low Cost Housing (4 Hrs)

Computer aided design and drawing, Development of plan, Elevation and Section.
Concepts of Green Building and energy efficient buildings.
Low cost Housing, Materials & methods (Conceptual introduction only).

Unit 7: Acoustics and Sound Insulation (5 Hrs)

Acoustics:- Sound Frequency, Intensity, sound decibel rating, absorption of sound-Various materials. Sabine's formula, optimum reverberation time, conditions for good acoustics, effect of reflectors, flat ceiling, design of an auditorium, defects in auditorium and remedies, acoustics of various buildings such as Auditorium hall, Classrooms, broadcasting room etc.

Sound insulation:- Acceptable noise level – Noise prevention at its source, transmission of noise, Noise control- general Consideration.

Unit 8: Fire Resistant Structures (2 Hrs)

Fire resistant Structures - Fire protection precautions, confining of fire, Fire hazards, characteristics of fire resistant material, various building material and resistance for fire, Fire resisting construction, fire load- Normal and abnormal, distribution of fire load, grading of structural elements and buildings, fire escapes.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

(A) ICA shall consist of all the following drawings strictly using CADD software tool.

(No drawing sheets shall be used for any drawing of ICA)

Line Plans of residential buildings (4 Numbers): Detached house, Semi-detached house, Row house and Apartment Building

Line plans of any 2 Public buildings.

Planning and designing of residential building (G+1) and preparation of full set of CADD drawings for the residential building. Full set of the following CADD drawing prints shall be submitted as a part of term work.

a) 'Municipal Building Permission drawing'
b) Water supply, drainage layout plan and Electrification layout plan.
c) Furniture layout plan
d) Perspective view of selected Residential building for project

Note: Every student shall develop different and separate plan of residential building for the term work purpose. Group projects are not allowed in any case.

(B) Report of Planning & Design of a building, selected for a project work –

The report shall include the Line plan, Principles of planning adopted, Byelaws, Rules and regulations followed while planning, Design calculations for Staircase, Sanitary requirements, etc.

END SEMESTER EXAMINATION

(1) Theory examination (35 marks, 2 Hours)

It will consist of theory and sketching questions based on full syllabus of the subject. However, it will ***not*** include development of residential/public building drawing on drawing sheets.

(2) Practical & Oral (50 marks)

a) Practical examination shall consist of planning of residential building and development of drawings using CADD drafting tool during practical examination. The assessment will be based on knowledge of student about building planning and CADD drafting skills depicted by the candidate during practical examination. Maximum two hours shall be allotted to the students to complete given task on CADD software tool during Practical examination.

b) In addition Oral examination shall be based on CADD drawing developed during practical examination and term work.

TEXT BOOKS

1) Building Design and Drawing: Y.S. Sane-Allies Book Stall, Pune
2) Building Design and Drawing : Shaha, Kale & Patki – T.M.H., New Delhi
3) Building Construction : Sushilkumar –Standard Publishers, Delhi
4) Building Construction : N.K.R. Murthy -Allies Book Stall, Pune
5) Building Construction: Arora and Gupta – Satya Prakash, New Delhi.
6) A Text book of building Construction: Bindra, Arora – Dhanpat Rai Publications.
7) Civil Engineering Drawing, Sharma & Gurucharan Singh, Standard Publishers
8) A Course in Civil Engineering Drawing, Sikka, S.K. Kataria & Sons
9) Engineering Drawing, Dhanarajay A Jolhe, Tata McGraw Hill
10) Engineering Drawing + AutoCAD , by K.Venugopal , New Age InternationalPublishers
11) Mastering AutoCAD 2019 and AutoCAD LT 2019, George Omura and Brian C. Benton, SYBEX Publishers.

REFERENCE BOOKS

1) Building Technology by I. Seeley.
2) SP 7 – 1983: National Building code, Indian Standards, Delhi.
3) Planning an Annual Notebook, The Architect's Handbook, E & OE.
4) SP 1650- 1973: Standard code for Building & Decorative finishes- Indian Standards, Delhi.
5) Building Planning And Drawing, Dr. N. Kumarswamy and A. Kameswara Rao, 6/e PB 6th Edition
6) Building Construction illustrated: Francis D.K. Ching- Willey (India Edition).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE45: ENGINEERING GEOLOGY

Teaching Scheme	**Examination Scheme**
Lectures – 2 Hrs/Week, 2 Credits	**ISE –** 30 Marks
Practicals– 2 Hr/Week, 1 Credit	**ESE –**70 Marks
	POE-25 Marks
	ICA – 25 Marks

Course Outcomes:

At the end of course students will be able to:

1) To describe issues concerning the geological formations and geological structureof a region
2) To distinguish the characteristics of the most important geological formations and problems that may arise in the various civil engineering projects in such formations.
3) To interpret and explain the geological structures in the geological maps and cross sections.
4) To assess and appropriately adjust the results of geological study in order to ascertain secure construction and operation of a civil engineering projects like dams, reservoirs hilly roads and railway tracks.
5) To receive, analyze and evaluate data and appropriately and solve technical as well as ground water related problems.

SECTION - I

Unit 1: **(2 Hrs)**

Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Mineralogy- Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, SEM, XRD, Rock forming minerals, megascopic identification of common primary & secondary minerals.

Unit 2: **(7 Hrs)**

Petrology-Rock forming processes. Specific gravity of rocks, Ternary diagram.

Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption, Hot spring and Geysers, Characteristics of different types of magma, Division of rock on the basis of depth of formation, and their characteristics, Chemical and Mineralogical Composition, Texture and its types, Various forms of rocks, Field Classification chart, Structures, Classification of Igneous rocks on the basis of Chemical composition, Detailed study of Acidic Igneous rocks like Granite, Rhyolite or Tuff, Felsite, Pegmatite, Hornfels, Metamorphic Aureole, Kaolinization, Landform as Tors, Engineering aspect to granite, Basic Igneous rocks Like Gabbro, Dolerite, Basalt, Engineering aspect to Basalt.

Sedimentary petrology- mode of formation, Mineralogical Composition, Texture and its types, Structures, Gradation of Clastic rocks, Classification of sedimentary rocks and their characteristics, Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone

Metamorphic petrology- Agents and types of metamorphism, metamorphic grades, Mineralogical composition, structures & textures in metamorphic rocks, Important Distinguishing features of rocks as Rock cleavage, Schistosity, Foliation, Classification, Detailed study of Gneiss, Schist, Slate with engineering consideration.

Unit 3: **(3 Hrs)**

Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration.

Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, Solifluction deposits, mudflows, Coastal deposits.

Unit 4: **(3 Hrs)**

Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

SECTION - II

Unit 5: **(4 Hrs)**

Geological Hazards- Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Types of landslide, Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment. Case study on black clay.

Ground water: Factors controlling water bearing capacity of rock. Pervious & impervious rocks and ground water, Lowering of water table and Subsidence.

Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case Study on Elevation and Subsidence in Himalayan region in India. Seismic Zone in India.

Unit 6: **(3 Hrs)**

Rock masses as construction material: Definition of Rock masses. Main features constituting rock mass. Main features that affects the quality of rock engineering and design. Basic element and structures of rock those are relevant in civil engineering areas. Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals. Effect of alteration and weathering. Measurement of velocity of sound in rock. Classification of Rock material strength. Core logging .Rock Quality Designation. Rock mass description.

Unit 7: **(4 Hrs)**

Geology of dam and reservoir site- Required geological consideration for selecting dam and reservoir site. Failure of Reservoir. Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of discontinuities on the dam site and treatment giving to such structures.

Unit 8: **(4 Hrs)**

Rock Mechanics- Sub surface Investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and sheer strength of rocks, Bearing capacity of rocks.

PRACTICALS:

1) Study of physical properties of minerals.
2) Study of different group of minerals.
3) Study of Crystal and Crystal system.
4) Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5) Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6) Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties , Laterite, Limestone and its varieties, Shales and its varieties.
7) Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8) Study of topographical features from Geological maps. Identification of symbols in maps.
9) Study of structural Geological models. (at least 5)
10) Identification of Subsurface rock with the help of Resistivity Instrument.

A Study tour to the place worth visiting from Engineering Geological point of view.

A journal containing complete record of above practical work shall be examined as 'Internal Continuous Assessment'. Practical Examination shall be based on practical course. Case study of any engineering structure with respect to geological investigation

TEXT BOOKS

1) Engineering and General Geology, Parbin Singh, 8th Edition (2010), S. K. Kataria & Sons. Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
2) Geology for Geotechnical Engineers, J. C. Harvey, Cambridge University Press (1982).
3) A Text Book of Engineering Geology by R.B. Gupte -P.V.G. Publications, Pune
4) A Text Book of Engineering Geology by N. Chenna Kesavulu.
5) Text Book of Engineering Geology, N. Chenna Kesavulu, Macmillan Publishers
6) Engineering Geology for Civil Engineers, Varghese P.C, PHI

7) Engineering Geology, Subinoy Gangopadhyay, Oxford University

REFERENCE BOOKS

1) Geology and Engineering by R. Legget- McGraw Hill Book Co., London.
2) Physical Geology by Arthur Holmes-ELBS Publication.
3) Principles of Petrology by G.W. Tyrrel.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Civil Engineering

Name of the Course: Final Year B. Tech

(Syllabus to be implemented w.e.f. June 2021)

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. Tech. Civil Engineering

Program Educational Objectives (PEOs)
B. Tech. Civil Engineering

1. Graduate will demonstrate peer-recognized technical competency in the analysis, design and construction of Civil Engineering Structures.

2. Graduate will demonstrate leadership and initiative to advance professional and organizational goals with commitment to ethical standards of profession, teamwork and respect for diverse cultural background.

3. Graduate will be engaged in ongoing learning and professional development through pursuance of higher education and self-study.

4. Graduates will be committed to create practice of engineering and other professionals in a responsible manner contributing to the socio-economic development of the society.

Program Outcomes (POs)
B. Tech. Civil Engineering

The program outcomes of B. Tech. Civil Engineering Program are as following:

i) **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

ii) **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

iii) **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

iv) **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems:

v) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

vi) **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

vii) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

ix) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

x) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

xi) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

xii) **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)
B. Tech. Civil Engineering

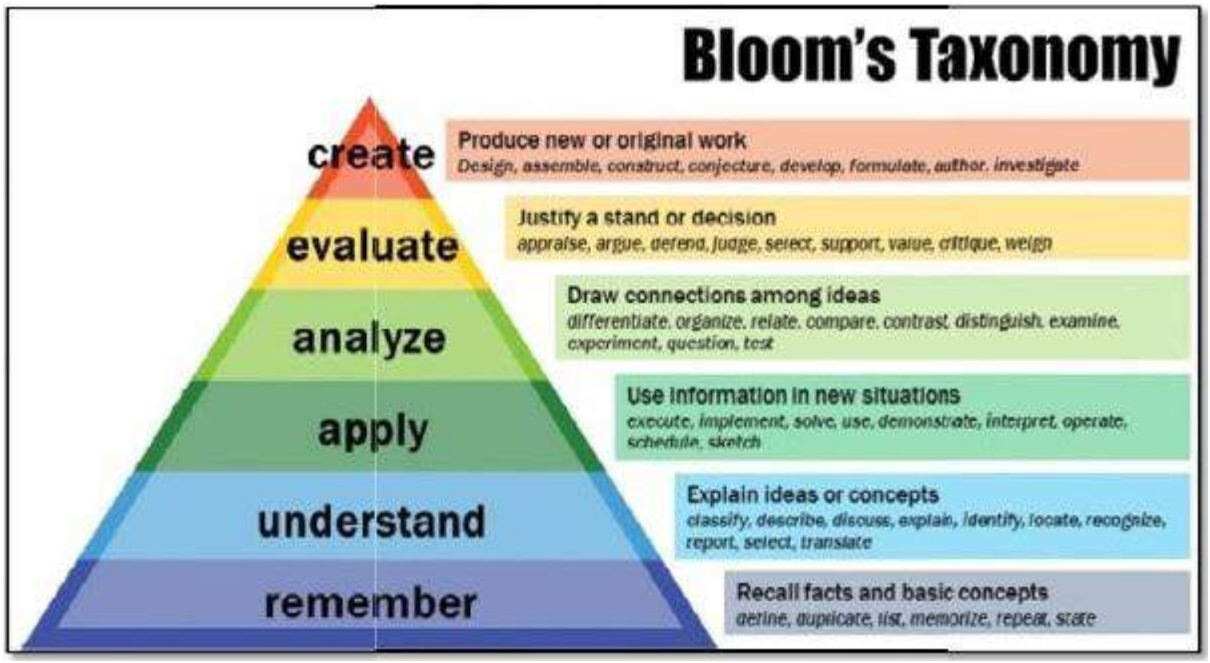
The program specific outcomes of B. Tech. Civil Engineering Program are as following:

1) Students will be able to survey, conduct geo-technical investigations, plan, analyze, design, estimate and construct residences, public buildings, industrial buildings, townships and infrastructural projects by adopting appropriate construction methods.

2) Students will be able to analyze and design the water resources systems, municipal and industrial waste treatment plants with due consideration to pollution free environment.

3) Students will be able to use appropriate application software, develop skills necessary for professional practice as a Civil Engineer and prepare themselves for education & for Public service commissions

Blooms Taxonomy



PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of SCIENCE & TECHNOLOGY

Credit System structure of Final Year B. Tech. Civil Engg. I; Semester – VII, W. E.F. 2021-2022

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CV411	Engineering Economics, Estimation & Costing	3	-	-	-	3	30	70		-	**100**
CV412	Construction Engineering, Management & Construction Practices	3	-	-	-	3	30	70		-	**100**
CV413	Design of Concrete Structures-II	3	-	-	-	3	30	70		25	**125**
CV414	Earthquake Engineering	3	1	-	-	4	30	70		25	**125**
CV415	Professional Elective Course- II	3	-	-	-	3	30	70		25	**125**
	Total	**15**	**1**	**-**	**-**	**16**	**150**	**350**		**75**	**575**
	Laboratory/Drawings:							**POE**	**OE**		
CV411	Engineering Economics, Estimation & Costing	-	-	4	-	2	-	25	-	50	**75**
CV412	Construction Engineering , Management & Construction Practices	-	-	2	-	1	-	-	25	-	**25**
CV416	Project on R. C. C. Structures	-	-	-	4	2	-	-	25	50	**75**
CV417	Seminar	-	-	2	-	1	-	-	-	50	**50**
CV418	Project work	-	-	2	-	1	-	-	-	25	**25**
CV419	Assessment of report on field training-II	-	-	-	-	1	-	-	-	25	**25**
	Total	**-**	**-**	**10**	**4**	**8**	**-**	**75**		**200**	**275**
	Grand Total	**15**	**1**	**10**	**4**	**24**	**150**	**425**		**275**	**850**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE - Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of SCIENCE & TECHNOLOGY

Credit System structure of Final Year B. Tech. Civil Engg. II, Semester – VIII, W. E.F. 2021-2022

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CV421	Professional Elective Course- III	4	-	-	-	4	30	70		-	**100**
CV422	Professional Elective Course - IV	4	-	-	-	4	30	70		-	**100**
CV423	Railway & Harbour Engineering	3	1	-	-	4	30	70		-	**100**
CV424	Open Elective-III :Economic policies in India	3	-	-	-	3	30	70		-	**100**
CV425	Professional Practice, Law & Ethics	3	-	-	-	3	30	70		-	**100**
	Total	**17**	**1**	**-**	**-**	**18**	**150**	**350**		**-**	**500**
	Laboratory/Drawings							**POE**	**OE**		
CV421	Professional Elective Course- III	-	-	2	-	1	-	-	25	25	**50**
CV422	Professional Elective Course - IV	-	-	2	-	1	-	-	25	25	**50**
	Project work	-	-	8	-	4	-	-	100	100	**200**
	Total	-	-	**12**	-	**6**	-	**150**		**150**	**300**
	Grand Total	**17**	**1**	**12**	-	**24**	**150**	**500**		**150**	**800**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE - Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

.**Note:**

(1) Project group be of @ 7 students.

(2) Elective subject can be offered from the following list, if minimum 15 students opt for that subject.

(3) Term work assessment: Term Work assessment shall be a continuous process based on the performance of the student in assignments, classtests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable.

Professional Elective Courses: Student shall choose any one course from a group

Elective No	Semester	(I) Structural Engineering	(II) Geotechnical Engineering & Transportation Engg	(III) Construction Engineering & Management	(IV) Environmental Engineering & Hydraulics, Hydrology & Water Resources Engineering
Prof. Elective-I	**Semester-VI**	Masonry Structures	Structural Geology	Construction Engineering Materials	Ecological Engineering
		Structural Analysis by MatrixMethods	Urban TransportationPlanning.	Systems Engineering & Economics	Solid and Hazardous Waste Management
		Structural Dynamics	Pavement Design	Infrastructure Planning and Management	Physico-Chemical Processes for Water and Wastewater Treatment
					Hydraulic modeling
					Urban Hydrology and Hydraulics
					Instrumentation & Sensor Technologies for Civil Engg. Applications
					Open Channel flow & River Hydraulics
Prof. Elective-II	**Semester-VII**	Metal Structure Behaviour- I	Traffic Engineering and Management	Construction Productivity	Environmental Systems
		Advanced Structural Analysis	Geosynthetics and soil structures		Water Power Engineering
		Finite Element Method	Advanced Railway Track		

Prof. Elective-III	**Semester -VIII**	Industrial Structures	Public Transportation Systems	Construction Cost Analysis	Rural Water Supply and Onsite Sanitation Systems
		Repairs & Rehabilitation of Structures	Airport Planning and Design	Construction Equipment & Automation	Air & Noise Pollution and Control
			High Speed Rail Engineering		Surface Hydrology
Prof. Elective-IV	**Semester -VIII**	Metal Structure Behaviour - II	Infrastructure Planning and Design	Advanced Concrete Technology	Water and Air Quality Modelling
		Design of Bridges	Transportation Economics	Entrepreneurship	Water Resources Field Methods
			Railway Project Design & Planning for Civil Engineering		
			Ground Improvement Techniques		

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech Civil – Part I

CV- 412 CONSTRUCTION ENGINEERING, MANAGEMENT & CONSTRUCTION PRACTICES

Teaching Scheme	**Examination Scheme**
Lectures:- 3 Hrs/Week, 3 Credits	**ISE:** 30 Marks
Practical:- 2 Hrs/Week, 1 Credit	**ESE:** 70 Marks
	OE:- 25 Marks

Course Outcomes:

At the end of course, students will be able to

1. Plan the project and prepare Bar chart and Network to optimize the project duration and cost
2. Update the network and re evaluate the resources.
3. Use appropriate project management application software for planning, tracking and reporting progress of civil engineering projects.
4. Calculate output of earthmoving, hoisting, dredging equipments.
5. Adopt appropriate safety measures for various Civil Engineering Projects.
6. Explain prefabricated constructions, Diaphragm wall constructions, advanced formwork and Hot Mix Plant.

SECTION I

Unit 1: **(8 Hrs)**

Project Management: Introduction, Steps in Project Management, Work Breakdown Structure (WBS). Gantt (Bar) Chart, Mile Stone chart.

Development of network: Representation by Activity on Arrow (AOA) and Activity on Node (AON), Fulkerson's Rule.

Critical Path Method (CPM): Introduction, Time estimates, floats, critical path.

Unit 2: **(6 Hrs)**

Network compression: - Least Cost and Optimum Duration.

Resource allocation: Smoothening and leveling.

Updating: Need, steps, project duration, and calculation for updated network.

Unit 3: **(6 Hrs)**

Performance Evaluation and Review Techniques (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.

Precedence Network (only concept)

Unit 4: **(3 Hrs)**

Project Management Software (PMS): Introduction to applications of PMS (such as MS Excel, MS Project, Primavera, and PRINCE) and Open Source software. Reports generated by the software and its interpretation. Introduction to BIM (Building Information Modeling).

SECTION II

Construction Practices

Unit 5 Construction safety **(4 Hrs)**

Safety against accidents on various construction sites such as building, dam, road, tunnel, bridge, fabrication and erection works, etc. Safety at various stages of construction. Safety measures in construction.

Unit 6 Mechanical v/s Manual construction **(8 Hrs)**

Introduction -Conceptual planning of new project, site access and services,

Excavation in Earth: Earth moving equipments - Tractors, Bulldozers, Scrappers, Power shovel, Hoes, simple numerical problems based on cycle time and production rates, Drag line, Compactors- types and performance, operating efficiencies.

Asphalt mixing and batching plant (hot mix plant), sensor paver

Unit 7 Prefabricated Units and Advanced formworks **(6 Hrs)**

Prefabricated construction –relative economy, elements and simple connections, cranes. Advanced formworks- Aluform, Tunnel Form, Mivan Formwork.

Unit 8 Special constructions **(4 Hrs)**

Floating and dredging equipments.

Diaphragm Walls – Purpose and Construction Methods, Clamshell, Trenchers,

ESE (OE)

It shall be based on the assignments, Civil Engineering project management reports generated using relevant software and Visit report covering construction safety, construction Practices and construction equipments.

CONSTRUCTION ENGINEERING, MANAGEMENT

TEXT BOOKS

1. A Management Guide to PERT/CPM: Weist J. D. ,Levy, Prentice Hall of India, New Delhi, 2nd Ed. 1982
2. PERT and CPM Principles and Applications: Srinath L. S., East West Publication, New Delhi, 3rd Ed. 1995.
3. PERT and CPM- B. C. Punmia, K. K. Khandelwal, Laxmi Publications, New Delhi, 4th Ed. 2012.
4. Computerized Project Management Technique for Manufacturing and construction: Samaras T.T., Kim Yensueng, Prentice Hall of India, New Delhi, 1979.
5. Principles of Construction Management: Roy Pilcher , Tata McGraw Hill Publications.

REFERENCE BOOKS

1. CPM in Construction Practice, Antill J. M., John Wiley and Sons.
2. Construction Project Management – Planning, Scheduling and Control- Chitkara K.K., Tata McGraw Hill Publications New Delhi, 4th Ed. 2002.
3. Construction Planning and Management through System Techniques: Verma M., Metropolitan Publication, 3rd Ed. 1985.
4. Construction Project Management- Bennett J. M. Clough R. H., Butterworth's Wiley John, New Delhi, 1972.
5. Construction Scheduling with Primavera Enterprise- Marchman D.A., Thomson/Brooks-Cole.

CONSTRUCTION PRACTICES

TEXT BOOKS

1. Construction, Planning, Equipment and methods - R. L . Peurifoy McGraw hill book co New Delhi
2. Construction Equipment Guide, David A. Day, Neal B. H. Benjamin, John Wiley & Sons.
3. Construction Equipment – Mahesh Varma ,Metropolitan book co ,New York
4. Heavy Construction – Planning, Equipment and methods – Jagman Singh, Oxford and IBH publishers, New Delhi.
5. Construction of Diaphragm Walls, I Hajnal, I Marton, F. Regele Wiley Interscience Publication, John Wiley & Sons.
6. Structural & cut off Diaphragm walls, R.G.H. Boyes, Applied Science Publishers Ltd., London.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech Civil – Part I

CV- 415 PROFESSIONAL ELECTIVE COURSE-II
415 (D) TRAFFIC ENGINEERING AND MANAGEMENT

Teaching Scheme
Lectures:- 3 Hrs/Week, 3 Credits

Examination Scheme
ISE: 30 Marks
ESE: 70 Marks
ICA:- 25 Marks

Course Outcomes:

At the end of course, students will be able to

1. Undertake various traffic studies and analysis of traffic data including parking studies and calculation of parking demand.
2. Explain relation between flow, density, speed, concept of level of service for urban and rural area.
3. Explain the regulations on vehicle, driver and speed and Vehicle as per Motor Vehicle Rules.
4. Design intersections and signals and propose various traffic signs, road marking and lighting at various locations.
5. Explain applications and principles of various modern instruments used in traffic studies.

SECTION I

Unit-1: Introduction and Traffic Characteristics (8 Hrs)

a) Introduction: Components of road traffic, the vehicle, driver and road, Objectives-Scope of Traffic Engineering.

b) Traffic characteristics: Road user characteristics, vehicular characteristics-static and dynamic characteristics, power performance of vehicles, Road Characteristics, Resistance to the motion of vehicles – Reaction time of driver.

Unit-2: Traffic Engineering Studies and Analysis (8 Hrs)

Sampling in traffic studies; adequacy of sample size; Application of sampling methods for traffic studies. Traffic parameter studies and Analysis: Objectives and Method of study –

Definition of study area- Sample size – Data Collection and Analysis- Interpretation of following Traffic Studies- Volume, Spot Speed, Speed and Delay , Origin and Destination, - parking on street and off street Parking- space consideration, parking demand, parking load and duration, space demand relation. Accidents- Causes, Analysis, Measures to reduce Accident. Statistical applications in traffic studies and traffic forecasting.

Unit-3:Traffic Flow and Capacity **(6 Hrs)**

Nature of Traffic flow, Approaches to understand Traffic Flow, Parameters connected with Traffic Flow, Categories of traffic flow, uninterrupted traffic flow model, Analysis of speed, flow and density relationship, Empirical studies of traffic stream Characteristics. Highway Capacity and level of service, capacity of urban and rural roads, PCU concept.

SECTION-II

Unit-4: Traffic Regulations and Control **(8 Hrs)**

Traffic Regulation: General regulations, regulations on vehicles- Vehicle registration requirements and accessories, vehicle inspection, inspection coverage, general control for motorist pedestrian, regulations on drivers- driver licensing, speed control- methods of control devices speed zoning, one way street – necessity, requirements, advantages and disadvantages.Central Motor Vehicle Rules

Unit-5: Traffic Control Devices **(7 Hrs)**

Traffic Control Devices: Traffic signs, traffic Markings, islands, types of intersection and channelization, Rotary intersection design and traffic signal design by IRC and Webster's method- vehicle actuated and synchronized signals, signal coordination, Road Lighting and Intelligent Transport System- Definition, Necessities, Application in the present traffic scenario.

Unit-6: ITS **(8 Hrs)**

Introduction to Intelligent Transport System- Application of ITS to Traffic Management System- Public Transportation Management System – ITS Case studies.

TERM WORK

1. Field studies on traffic volume at midblock, intersection; O-D studies; speed studies, spot speed, speed and delay; parking demand studies and accident studies. Preparation and submission of report on all field surveys.
2. Assignment on each chapter and field visit report shall be submitted by the students.
3. Brief report on applications of software's used in traffic studies and analysis, such as VISSIM, SIDRA, PASSER III, TSIS, AIMSUN, Dynameq, Dynasmart, and SimTraffic and Transyt-7F.

TEXT BOOKS:

1. Traffic Engineering by Matson, Smith and Hurd McGraw Hill & Co publication.
2. Traffic Engineering and Transport Planning by Dr. L.R.Kadiyali., Khanna Publishers.
3. Highway Engineering by Khanna and Justo, Nem Chand & Bros publication.
4. Traffic Engineering – An Introduction by Wells, G.R., Griffin, London publication.

REFERENCE BOOKS:

1. Traffic Engineering by Pignataro, Prentice Hall publications
2. Highway Traffic Analysis and Design by Salter, R.J and Hounsell, N.B., Mac Millan publishers, 1996.
3. Highway capacity Manual-2000.
4. An Introduction to Transportation Engineering by JotinKhistey and Kent Lall, Prentice Hall publication, 2002.
5. Traffic Engineering by Roger P. Roess, Elena S. Prassas& William R. McShane, Fourth Edition, Pearson Education, South Asia

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech Civil – Part I
CV- 416 PROJECT ON R. C. C. STRUCTURES

Teaching Scheme	**Examination Scheme**
Drawing:-4 Hrs/Week, 2 Credits	**OE:** 25 Marks
	ICA:- 50 Marks

Course Outcomes:

At the end of course, students will be able to

1. Apply codal provisions in the analysis and design of structures in accordance with relevant IS codes.
2. Prepare detailed drawing of R.C.C section of designed building.
3. Perform the analysis using relevant application software.

INTERNAL CONTINIUOS ASSESSMENT (ICA)

The ICA shall consist of detailed design & drawing of the following R.C. structures by Limit State method unless specified.

1) 3D Analysis and Design of RC Building up to G+10

3D modeling and analysis of RC Framed Building Structure under design load combinations including earthquake loads. Use of commercial software. Analysis of results for design of structural Elements.

2) Any one from the following.

a) Combined trapezoidal footing/ raft foundation.
b) Pile foundation for structure with pile cap.
c) Water tank (GSR/USR/ESR) by working stress method using IS 3370.

Note:

i. 3D Computer analysis of for project No.1 shall be performed for Dead Load,
ii. Live Load & Earthquake Loads using relevant application software and IS codes

iii. Structural drawing showing reinforcement details shall be prepared with provision of IS: 13920

TEXT BOOK

1. S.U. Pillai and D. Menon, Reinforced Concrete Design, Tata McGraw Hill, 3rd Edition.
2. P. Agarwal and M. Shrikhande, Earthquake Resistant Design of Structures, Prentice-Hall of India Private Limited, 2006.

REFERENCE BOOKS

1. T. Paulay and M.J.N. Priestley, Seismic Design of Reinforced Concrete and Masonry Buildings, John Wiley and Sons Inc., 1992.
2. S.K. Duggal, Earthquake Resistant Design of Structures, Oxford University Press, 2007.
3. IS 456 (2000), Plain and Reinforced Concrete - Code of Practice, Bureau of Indian Standards, New Delhi.
4. IS 1893 (Part 1): 2016 and IS 1893(Part 3): 2014, Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.
5. IS 13920 (2016), Code of Practice for Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces, Bureau of Indian Standards, New Delhi.
6. IS 3370 (Part I): 2009, Code of Practice for Concrete Structures for Storage of Liquids Part I General Requirements. Bureau of Indian Standards, New Delhi
7. IS 3370 (Part II): 2009, Code of Practice for Concrete Structures for the Storage of Liquids Part II Reinforced Concrete Structures. Bureau of Indian Standards, New Delhi.
8. IS 3370 (Part IV): 1997, Code of Practice for Concrete Structures for the Storage of Liquids, Design Tables. Bureau of Indian Standards, New Delhi.
9. IS 11682 (1985): Criteria for Design of RCC Staging for Overhead Water Tanks

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech Civil – Part I

CV- 418 PROJECT WORK

Teaching Scheme	**Examination Scheme**
Practical:- 2 Hrs/Week, 1 Credit	**ICA**:- 25 Marks

Objectives:

1) To carry out a thematic design project in one of the specializations of civilengineering
2) To carry out a project that will make the students aware of the different facets of civilengineering.

The topic for the Project Work may be from any Civil Engineering and inter-disciplinary arearelated to Civil Engineering. Final Year B.Tech. (Civil) part-I will comprise of literature survey / problem formulation / preparation of experimental setup as the case may be of the identified problem.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech Civil – Part I

CV- 419 ASSESSMENT OF REPORT ON FIELD TRAINING-II

Teaching Scheme	**Examination Scheme**
Credit:- 1 Credit	**ICA**:- 25 Marks

The basic objective of this Field Training Programme is to expose the students to,

1. Gain direct field/ practical experience with the actual civil engineering work processes such as Surveying, marking out, Mixing, Quality control, Reinforcement (i.e., cutting, bending and placement), Measurements, advance construction equipment, Curing, Centering etc.
2. It is intended that the students understand how theoretical aspects are put into actual action in the form of field activities.

In this light following exercise assignments are required to be covered by engaging students at actual work sites.

1. Marking out building plan on field.
2. Centering details in multi-storey buildings
3. Reinforcement details of all RCC structural members
4. Excavation and bed concreting for different structures (e.g., Bridges, Dams, Buildings etc.)
5. Road pavement work. (Pavement Layer construction and Quality control tests)
6. Plumbing accessories and techniques.
7. Measurements, units and rates for important raw materials.
8. Set of documents for new construction works(Scheduling, Detailed Project Reports)
9. Bank loans, processing, repayment details and running bill preparations
10. Scheduling

Report should include daily progress of the construction works along with detail photographs

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Final Year B. Tech Civil – Part II

CV- 423 RAILWAY, AIRPORT & HARBOUR ENGINEERING

Teaching Scheme
Lectures:-4 Hrs/Week, 4 Credits

Examination Scheme
ISE: 30 Marks
ESE: 70 Marks
ICA: 25 Marks

Course outcomes:

At the end of course, students will be able to

1. Acquires capability of choosing alignment and also design geometric aspects of railway system, runway and taxiway
2. Understand the Construction techniques and Maintenance of Track laying and Railway stations and calculate the material quantities required for construction.
3. Illustrate different types of signals explain the working principles of railway interlocking system.
4. Gain an insight on the planning and site selection of Airport Planning and design.
5. Analyze and design the elements for orientation of runways and passenger facility systems.
6. Understand the various features in Harbours and Ports, their construction, coastal protection works and coastal Regulations to be adopted.

SECTION-I

RAILWAY ENGINEERING

Unit 1: Railway Planning and Design **(15 Hrs)**

Significance of Road, Rail, Air and Water transports – Coordination of all modes to achieve sustainability – Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, – Track Stress, Various resistance and their evaluation, Hauling capacity, Tractive effort, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- – Soil suitability analysis – Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

Unit 2: Railway Construction and Maintenance **(10 Hrs)**

Earthwork – Stabilization of track on poor soil, Calculation of Materials required for track laying – Construction and maintenance of tracks – Modern methods of construction & maintenance – Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways. RDSO specifications

Unit 3: Signaling and Interlocking **(5 Hrs)**

Signaling and Interlocking: Objects of signaling, types of signals, Interlocking and devices used in interlocking.

SECTION- II

AIRPORT & HARBOUR ENGINEERING

Unit 4: Airport Planning **(10 Hrs)**

Air transport characteristics-airport classification-airport planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, Case studies, Parking and circulation area.

Unit 5: Airport Design **(10 Hrs)**

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings and lighting.

Unit 6: Dock and Harbours Engineering **(10 Hrs)**

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Dredging – Maintenance of Ports and Harbours – Navigational aids.

TERM WORK

Assignment on each chapter and field visit report shall be submitted by the students.

TEXT BOOKS

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora – Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.
4. RDSO Codes

REFERENCES BOOKS

1. 'Railway Engineering' by Saxena & Arora – Dhanpat Rai, New Delhi.
2. 'Transportation Engineering Planning Design' by Wright P.H. & Ashfort N.J. – John Wiley & Sons.
3. 'Airport Engineering' by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. 'Transportation Engineering' by Srinivasa Kumar R, University Press, Hyderabad
5. Railway and track Engineering- by Mundrey J.S.- Tata McGraw-Hill Education
6. Docks and Harbour Engineering Oza, Charotar Publication House

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015'B' Grade
(CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus Structure: B. Tech. (Civil Engineering)

T.Y. B. Tech (Civil Engineering)
w. e. f. Academic Year 2022-23

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology

Credit System structure of T. Y. B. Tech. Civil Engg.- I, Semester- V,
(Revised from 2022-2023)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CE51C	Design of Steel Structures	3	-	-	-	3	30	70		-	100
CE52C	Geotechnical Engineering	3	-	-	-	3	30	70		-	100
CE53C	Highway and Tunnel Engineering	3	-	-	-	3	30	70		-	100
CE54C	Hydrology and Water Resources Engineering	3	-	-	-	3	30	70		-	100
CE55C	Design of Concrete Structures I	3	-	-	-	3	30	70		-	100
CE56C	Environmental Engineering-II	3	-	-	-	3	30	70		-	100
SL-5	HSS Course – Elective (Self Learning mode)	-	-	-	-	1	-	50		-	50
	Total	**18**	**-**	**-**	**-**	**19**	**180**	**470**		**-**	**650**
	Laboratory/Drawings							**POE**	**OE**		
CE57L	Geotechnical Engineering	-	-	2	-	1	-	25	-	25	50
CE58L	Highway & Tunnel Engineering	-	-	2	-	1	-	-	-	25	25
CE59L	Planning & Design of Public Building	1	-	-	2	2	-	50	-	25	75
CE510L	Environmental Engineering-II	-	-	2	-	1	-	-	25	25	50
	Total	**1**	**-**	**6**	**2**	**5**	**-**	**100**		**100**	**200**
	Grand Total	**19**	**-**	**6**	**2**	**24**	**180**	**570**		**100**	**850**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing. *- Alternate week, ISE -Internal Tests, ESE – University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

Note:- Students shall undergo a field training of 15 days in the winter vacation after T.Y. B. Tech Part I and submit the field training report, which shall be assessed by faculty associated with 'Principles of Management and Quantitative Techniques', in T.Y. B. Tech. Part II.

1) Self-Learning Module- I at T.Y. B. Tech. Civil Engineering, Semester – I:

(A) Student can select & enroll a 'Self Learning Module- I' (HSS) Course from following list

SL5- A:- Self Learning Module – I (HSS)

No	Course title
1	Economics
2	Intellectual Property Rights for Technology Development and Management
3	Introduction to Sociology
4	Stress and Coping
5	Professional Ethics & Human Value

OR

(B) Student can select and enroll for minimum eight weeks NPTEL HSS course SL31-(B), complete its assignments, and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-(B) will be updated from time to time by Institute. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.

More details about NPTEL are available at http://nptel.ac.in

SL31-(B): Self Learning Module-I (HSS)

University approved NPTEL- HSS course List (SL31-B)

No	Course title	No	Course title
1	Soft skills	15	Management of Inventory Systems
2	Introduction to Modern India Political Thought	16	Economic Growth and Development
3	Intellectual Property	17	Ethic in Engineering Practice
4	Technical English for Engineers	18	Corporate Social Responsibility
5	Developing Soft Skills and Personality	19	Marketing Management –I
6	Educational Leadership	20	Marketing Research and Analysis
7	Microeconomics: Theory & Applications	21	Selected Topics in Decision Modeling
8	Engineering Economics	22	Innovation, Business Models and Entrepreneurship
9	Human Resource Development	23	Simulation of Business Systems: An Applied Approach
10	Project Management for managers	24	Sustainability through Green Manufacturing Systems: An Applied Approach
11	Data Analysis and Decision Making - I	25	Total Quality Management - I
12	E-Business	26	Introduction to Operations Research
13	Working Capital Management	27	Knowledge Management
14	Industrial Safety Engineering		

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology
Credit System structure of T. Y. B. Tech. Civil Engg. –II, Semester –VI, W. E.F. 2022-2023

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CE61C	Foundation Engineering	3	-	-	-	3	30	70		-	100
CE62C	Hydraulic Structures and Water Power Engg.	3	-	-	-	3	30	70		-	100
CE63E	Professional Elective Course-I *(Refer list at the end)*	3	-	-	-	3	30	70		-	100
CE64C	Design of Concrete Structures II	3	-	-	-	3	30	70		-	100
CE65C	Principles of Management and Quantitative Techniques	3	-	-	-	3	30	70		-	100
CE66C	Railway, Airport & Harbour Engineering	3	-	-	-	3	30	70		-	100
	Total	**18**	**-**	**-**	**-**	**18**	**180**	**420**		**-**	**600**
	Laboratory/Drawings:							**POE**	**OE**		
CE67L	Project on Steel Structures	-	-	-	2	1	-	-	25	25	50
CE68L	Principles of Management and Quantitative Techniques	-	-	2	-	1	-	-	25	25	50
CE69L	*Mini Project using Application Software	-	-	2	-	1	-	-	-	25	25
	Total	**-**	**-**	**4**	**2**	**3**	-	**50**		**75**	**125**
	Grand Total	**18**	**-**	**4**	**2**	**21**	**180**	**470**		**75**	**725**

Abbreviations: L- Lectures, P –Practical, T- Tutorial, D- Drawing, ISE -Internal Tests, ESE - University Examination (Theory &/ POE &/Oral examination), ICA- Internal Continuous Assessment.

* The students shall carry out 'Mini Project' in any one of the using suitable application software. The Mini project shall be assessed by the concerned subject teachers for ICA.

Note:

1) Students shall undergo a field training of 15 days in the summer vacation after T.Y. B. Tech. Part II. The training report shall be assessed in Final Year B.Tech. Part -I by the concerned 'Seminar' guides.
2) Internal Continuous Assessment (ICA): ICA shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable
3) The batch size for the practical/tutorial is of 15 students. On forming the batches, if the number of remaining students exceeds 7 students, then a new batch be formed.

Professional Elective Courses: Student shall choose any one course of the following

Elective No	Semester	(I) Structural Engineering	(II) Geotechnical Engineering & Transportation Engg.	(III) Construction Engineering & Management	(IV) Environmental Engineering &Hydraulics, Hydrology & Water Resources Engineering
Prof Elective-I	**Semester-VI**	Structural Analysis by Matrix Methods	Airport Planning and Design	Construction Engineering Materials	Open Channel flow & River Hydraulics
		Structural Dynamics	Pavement Design	Systems Engineering & Economics	Solid and Hazardous Waste Management
		Design of Bridges		Advanced Concrete Technology	Urban Hydrology and Hydraulics
		Design of Pre stressed concrete structures			

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T.Y. B. Tech Civil – Part I

CE53C- HIGHWAY AND TUNNEL ENGINEERING

.

Teaching Scheme	**Examination Scheme**
Lectures:-3Hrs/Week, 3 Credits	**ISE:** 30 Marks
Practical:-2 Hr/Week, 1 Credit	**ESE:** 70 Marks
	ICA:- 25 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Choose the ideal alignment for highways after thorough understanding of planning and different surveys.
2. Design various geometric elements of highway as per IRC standards.
2. Evaluate the pavement materials through various tests in the laboratory and design the crust thickness of flexible and rigid pavements as per IRC standards.
4. Recognize different layers of pavement and illustrate the construction process and also suggest maintenance activities for flexible and rigid pavement.
5. Select appropriate method of tunnel construction in different types of soils.

SECTION- I

Unit 1: **(6)**

Introduction to Transportation engineering: Modes of transportations, their importance and limitations, the importance of highway transportation.

Highway Development and Planning: Principles of Highway planning, Road development in India, Classification of roads, road network patterns, Planning Surveys. Salient features of road development plan 2021 and present scenario of road development in India

Highway Alignment and Surveys: Requirements, Engineering Surveys.

Unit 2: **(8)**

Highway Geometric Design: Cross Section elements, carriageways, camber, stopping and overtaking sight distances, Sight distance at uncontrolled intersection Horizontal alignment- Curves, design of super elevation, extra widening, transition curves, Set back distance and design of vertical curves.

Unit 3: **(7)**

Highway Materials: Properties of sub grade and pavement component materials, Tests on subgrade soils (CBR and Plate load tests), properties and requirements of road aggregates and bituminous materials, bituminous mix design by Marshall Method. Applications of Geosynthetics and Modified Binders in road construction.

SECTION- II

Unit 4: **(9)**

Pavement Design: Types of pavements, Design parameters, Axle and Wheel load, tyre pressure, ESWL concept, EWL factors, IRC method of flexible pavement design based on CSA method using IRC-37-2018. Analysis of wheel load and temperature stresses of rigid pavement, joints, Design of Rigid Pavement as per IRC-58-2015 and Design of Dowel and Tie bars.

Unit 5: **(10)**

Highway Construction and Maintenance:

Flexible Pavement: Specifications, construction steps and quality control tests for Granular sub base course, Water Bound Macadam, Cement Treated Base and Subbase, Wet Mix macadam, Bituminous Concrete pavement, Stone Mastic Asphalt, Micro surfacing, Stress Absorbing Membrane Interlayer (SAMI), Recycling of Bituminous Pavement, Slurry Seal, Fog spray, surface dressing, Premix carpet.

Rigid Pavement: Dry Lean Concrete, Cement Concrete pavement and construction of joints

Highway Maintenance: Pavement failures (flexible and rigid), causes and remedies, Pavement evaluation, Functional and Structural evaluation. Demonstration (Animation and videos) of various equipment's such as Bump Integrator, Benkelman Beam Deflection, Falling Weight Deflectometer and Network Survey Vehicle. **Highway drainage**: Surface and sub-surface drainage.

Unit 6: **(5)**

Tunnel Engineering: Introduction to tunneling, size and shape of tunnel and suitability, tunneling through soils, soft and hard rocks, tunnel lining, drainage and ventilation. Demonstration of Tunnel Construction using Tunnel Boring Machine (TBM)

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Test on Aggregates

1. Impact test on aggregate
2. Abrasion Test on aggregate
3. Crushing strength test on aggregate
4. Soundness test on aggregate
5. Shape test on aggregate

Test on Soil

1. CBR test on soil
2. Compaction test on soil

Test on Bitumen

1. Penetration test on bitumen
2. Ductility test on bitumen
3. Softening Point test on bitumen
4. Specific gravity test on bitumen 8.
5. Flash and Fire point test on bitumen
6. Viscosity Test on Bitumen.

From the above tests, Minimum 10 Tests have to be performed and assignments on each unit based on syllabus.

Suggested Student Activities:

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports for each activities.

1. Undertake micro-projects related to road construction.
2. Observe the components of roadway and record the details of the same with necessary sketches.
3. Collect the information of NH and SH constructed and under construction across the country.
4. Visit the various plants such as RMC, Hot Mix Plan, stone crushing unit and Pug Mill Plant.
5. Collect the typical samples of drawings and legal documents required for road project form PWD office and prepare the detailed report

6. Search the software/freeware on the courses content related to Geometric Design of Road and Pavement Design and prepare the detailed report stating their applications.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

1. Collect all the details of all types of existing NH, SH across the country.
2. Evaluate the camber and gradient of any one road of each type of pavement in the vicinity of area of college.
3. Conduct topographical survey using total station or any other advanced equipment and prepare Plan and Profile of road using advanced geometrical design software's.
4. Advance Techniques of repairs like, White topping, Preventive maintenance, overlays, MSA (Million Standard Axle Load) calculation, utility system, encroachment, forest land under roads and road deflection studies.
5. Calculation of quantity estimation of flexible and rigid pavement.
6. Any other micro-projects suggested by subject faculty on similar line.

TEXT BOOKS

1. Highway Engineering By C.E.G.Justo, A. Veeraragavan& S.K.Khanna., *Nemchand Bros.*
2. Harbour, Dock and Tunnel engineering By R. Shrinivasan, *Charotar Publishing House.*
3. Transportation Engineering By Subramanian. K.P Scitech Publications, Chennai.
4. Principles of Transportation and Highway Engineering By Rao, G.V., McGraw – Hill Publishing Company Limited, New Delhi.
5. Highway Engineering, Kadiyali L.R, Khanna Publishers, New Delhi

REFERENCE BOOKS

1. Principles of Transportation Engineering, Partha Chakroborty and Animesh Das, PHI Publication.
2. Transportation Engineering – An Introduction, Khistry, C.J., PHI Publication.
3. Specifications of Road and Bridge Works (MoRTH) Publication – 5^{th} Revision. New Delhi.
4. IRC: 37-2018, IRC: 58-2015, Road Development Plan Vision: 2021 and other relevant IRC codes

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

CE56C- ENVIRONMENTAL ENGINEERING-II

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Teaching Scheme	**Examination Scheme**
Lectures:-3Hrs/Week, 3 Credits	**ISE:** 30 Marks
Practical:-2 Hr/Week, 1 Credit	**ESE:** 70 Marks
	ICA:- 25 Marks
	OE: 25 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Plan the layout of sewage collection system, matching with topography of the region and characterization of sewage.
2. Select aerobic or anaerobic wastewater treatment processes and decide their sequence.
3. Design of aerobic and anaerobic wastewater treatment units and disposal of treated wastewater into the streams.
4. Elaborate the novel decentralized wastewater treatment systems.
5. Select appropriate methods of Solid waste Disposal and Management of hazardous waste based on their characteristics.
6. Analyze air pollution and adopt various measures to control air pollution.

SECTION-I

Unit 1: Collection and conveyance of Sewage (8)

Components of wastewater flows, waste water sources and flow rate. Variation in flow rates, Waste water constituents: Characteristics of various types of waste waters, Sewerage system, layout, types of sewers, collection system. Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems, Sewage and sludge pumping, location, capacity and pumping station design.

Unit 2: Unit Operations (10)

Primary treatment- Screening, comminuting, grit removal, oil and grease trap, chemical precipitation.

Secondary treatment- Activated sludge process, Process design and operating parameters,

modification of ASP, operational problems, MBBR, SBR and MBR, Trickling filter, classification, process design considerations, Secondary Clarifications.

Unit 3: Anaerobic treatment and Low cost treatment (6)

Fundamentals of anaerobic treatment, sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors.

Low cost waste water treatment methods- Principle of waste stabilization pond, Design and operation of oxidation pond, aerobic and anaerobic lagoons, Oxidation ditch, septic tank, Selection of alternative treatment process flow sheets.

SECTION-II

Unit 4: Disposal of waste water (8)

Disposal of waste water stream pollution, Self-purification, DO sag curve, Streeter Phelp's Equation, Emerging Technology for wastewater Treatment: objectives of small & decentralized wastewater Treatment systems:

i.Root zone Technology,

ii.Constructed Wetlands,

iii.Duckweed Ponds,

iv.Fluidized aerobic bed Technology,

v.UASB

vi.Anaerobic baffled reactor

Unit 5: Solid Waste Disposal (6)

Solid waste management - Solid waste definition, Types, sources, characteristics. Functional outlines- storage, collection, processing techniques, Treatments of solid waste-Composting, Incineration, Pyrolysis and sanitary land filling.

Unit 6: Air Pollution (7)

Air Pollution- Definition, Sources and classification of pollutants, Effects. Introduction to meteorological aspects of control of industrial air pollution- Settling Chamber, Bag filter, Cyclone separator, Scrubbers, Electrostatic precipitators. Control of vehicular air pollution. Air quality standards.

LABORATORY WORK

INTERNAL CONTINUOUS ASSESSMENT (ICA)

The Internal Continuous Assessment (ICA) work includes practical work to find the characteristics of wastewater and demonstration of Air monitoring equipments and design of sewage treatment plant

Internal Continuous Assessment (ICA) work shall consist of the following:-

(A) List of Experiments (Any Eight)

Analysis of Waste Water,

1.pH Value

2.Total Solids

3.Dissolved Oxygen

4.Biochemical Oxygen Demand

5.Chemical Oxygen Demand

6.Chlorides

7.Oil & Grease

8.Sulphate Content

9.Total Nitrogen

10.Demonstration of High Volume Sampler

11.Demonstration of Auto Exhaust Analyzer.

(B) Design of sewerage system & Treatment system for a small urban area.

(C) Visit to sewage treatment plant

Internal Continuous Assessment (ICA) submission shall consist of the following –

Journal containing experiments carried out in part A of the Internal Continuous Assessment (ICA) and visit Report on (C).

Detail design and appropriate drawings required for part B of the Internal Continuous Assessment (ICA) work.

END SEMESTER EXAMINATION (Oral)

Oral examination will be based on the above syllabus.

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T.Y. B. Tech Civil – Part I

CE59L- PLANNING & DESIGN OF PUBLIC BUILDING

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Teaching Scheme	**Examination Scheme**
Lectures:-1 Hr/Week, 1 Credit	**POE:** 50 Marks
Drawing:-2 Hr/Week, 1 Credit	**ICA**:- 25 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Plan and design a "Public Building" according to requirements adhering to National Building Code norms and standards.
2. Prepare "Permission Drawing" for public buildings for obtaining building permission from competent authority by using suitable 'Computer Aided Drawing and Design' application software.
3. Plan and design appropriate building services layout for "Furniture requirement, Electrification points, Water supply and Drainage System" for a building as per standards norms by using suitable 'Computer Aided Drawing and Design' application software.
4. Prepare "Perspective drawing of the Building" and "Line plan of any two Public Buildings" by using suitable 'Computer Aided Drawing and Design' application software.
5. Prepare a report on selected Public Building.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A. Preparation of drawings for any one public building by using AutoCAD

1) Permission Drawing
2) Furniture layout
3) Water supply and Drainage layout along with electrification layout
4) Perspective drawing of the building.

B. Line plan of any two public buildings by using AUTOCAD

C. Report on building project under (A) above.

D. Site visit for the type of public building selected for planning and designing for Internal Continuous Assessment (ICA) submission.

END SEMESTER EXAMINATION (Practical - Oral)

1. Practical examination shall be based on assessment of knowledge of students about planning skill and AutoCAD drafting skills related to public building. (Maximum two hours shall be allotted to students to complete given task on AutoCAD during Practical and viva Exam.)
2. In addition Oral examination shall be based on Practical and ICA.

TEXT BOOKS

1. Building Construction: Arora and Bindra, Dhanpat Rai Publications
2. Building Design and Drawing – Y. S. Sane, Allies Book Stall
3. Principles of Perspective drawing- Shah, Kale, Patki, Tata McGraw Hill Publication Ltd, Delhi
4. Building Construction by Sushil Kumar, Standard Publishers Distributors, Delhi
5. Interior Design- Principles and Practice- M. Pratap Rao, Standard Publishers and Dist.,Delhi
6. Building Planning and Design by Kumar Swami and Kameshwar Rao, Charotar Publishing House.
7. Civil Engg. Drawing- by M. Chakraborty, Published by M. Chakraborty – Kolkata
8. Civil Engineering Drawing – by R.S.Malik, G.S.Meo, Computech Publication Ltd New Asian.
9. AutoCad software

REFERENCE BOOKS

1. National Building Code, BIS, New Delhi.
2. Model Building Bye Laws, Town and Country Planning Departments, Ministry of Urban Development, Government of India.
3. Building Construction by Mckay, W. B. & Mckay, J. M. ,Vol.III and IV, Donhead Publishing Limited
4. Modern Building Construction by Warland D. E., Vol. I and II, Pitman Publishing
5. Building Drawing – Shah, Kale, Patki, Tata McGraw-Hill Education
6. Built Environment by Shah, Kale, Patki, Tata McGraw-Hill Education
7. Construction science – by Edwin Walker, Selwyn Morgan, Hutchinson Educational
8. Time savers standards for buildings – Calendar Pub. McGraw Hill
9. Alternative Building Materials & Technology-by Jagdish ,Reddy, Rao Published by New Age International, New Delhi
10. Development Control Rules- Building Byelaws of Local Authority.

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T.Y. B. Tech Civil – Part II

CE61C- FOUNDATION ENGINEERING

.

Teaching Scheme	**Examination Scheme**
Lectures:-3Hrs/Week, 3 Credits	**ISE:** 30 Marks
	ESE: 70 Marks

Course Outcomes

After successful completion of the course, students will be able to

1. Evaluate bearing capacity of soil by various analytical and experimental approaches by obtaining the data from soil exploration.
2. Perform geotechnical design of shallow foundation such as isolated footing, combined footing, raft foundation.
3. Apply suitable ground improvement techniques for construction of footing in difficult soil.
4. Perform geotechnical design of deep foundation such as Pile foundation and Caisson foundation
5. Investigate slope stability of embankments

SECTION –I

Unit 1: **(8)**

Introduction: - General requirements for satisfactory performance of foundations.

Soil Exploration:- Necessity, Planning, Exploration methods, Different types of boring- Hand and continuous flight augers, Wash boring, Rotary drilling. Soil sampling- Disturbed and Undisturbed. Rock drilling and sampling. Core barrels, Core boxes, Core recovery, RQD

Unit 2: **(12)**

Bearing Capacity Analysis: Bearing capacity – Ultimate, safe and allowable. Modes of failure, Terzaghi's bearing capacity equation with derivation, I S code method of bearing capacity (IS 6403 -1981), Effect of water table, Eccentricity of load.

Field Test for Bearing Capacity Evaluation: - Plate load test, Standard Penetration test and Pressure meter test. Test procedures and limitations.

Foundation Settlement: - Immediate settlement – computations as per IS 8009 – 1976 (part–I) approach and from plate load test observations. Consolidation settlement, Total settlement, Differential settlement, Tolerable settlement, Angular distortion

Unit 3: Foundation Construction in Difficult Soil (9)

Guide lines and care to be exercised in weak and compressible soil, Expansive soil, Collapsible soil, Corrosive soils

Ground Improvement Techniques: - Pre compression, Sand drains, Vibro-floatation, Grouting, Soil reinforcement Foundations on filled up soils. Contamination of soils and foundation problems.

Geosynthetic and its applications: - Geotextiles- Definition and Types, Functions of Geotextiles, Different applications in Civil Engineering (Roads, Railways, Embankments, Earth Retainment, Erosion control etc)

SECTION –II

Unit 4: Shallow foundations (6)

Shallow foundations: - Design of Isolated, Combined, Strap footing (Rigid analysis), Raft foundations (Conventional method), Floating foundations (RCC design is not expected)

Unit 5: Deep foundations (10)

Pile foundation: Classification, Single pile capacity for RCC cast in situ pile in Cohesive, Non cohesive and mixed soils by Static method, Dynamic formulae, Negative skin friction. Under reamed piles- equipment, construction and precautions. Load carrying capacity of pile group, Group action of piles- Spacing of piles in a group, group efficiency- empirical formulae.

Caisson Foundations: Box, Pneumatic, open (well) caissons, Shapes of well, components. Forces on caisson, grip length, well sinking, practical difficulties and remedial measures

Unit 6: (08)

Cofferdams: Various Types, Cell fill material, Stability of cellular cofferdam.

Sheet Piles: Classifications, Design of cantilever sheet pile in cohesion less (approximate method) and cohesive soils. Design of anchored sheet pile by free earth support method

Unit 7: Slope Stability (6)

Stability of finite slopes- slip circle method, Semi graphical and graphical methods- Swedish slip circle method, Method of slices, Friction circle method. Fellenius construction to locate critical slip center, Stability Number and it’s use.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

The ICA shall consist of Laboratory work, Field work and Assignments on above topics

A) Field tests:-

1. Standard penetration test
2. Plate Load test

B) Visit to foundation construction sites and preparation of report.

C) Laboratory work:-

1. Swelling pressure test
2. Vane shear test

D) Assignments consisting design problems on:-

1. Bearing capacity calculation by various methods
2. Settlement calculations
3. Design of shallow foundation - Isolated, Combined, Raft using conventional method.
4. 4. Pile and Pile group - Load carrying capacity of piles, Design of pile group
5. Sheet piles - Cantilever, Anchored using 'Free earth support method'
6. Stability analysis – Slip circle, slice method, Fellenius construction, Taylor's Stability number.

TEXT BOOKS

1. Soil Mechanics and foundation Engineering -B.C. Punmia (Laxmi publications Pvt. Ltd, New Delhi)
2. Geotechnical Engineering- Purushottam Raj (Tata Mcgraw hill company Ltd, New Delhi)
3. Principals of Foundation Engineering – Braja M. Das (Cengage Learning India Pvt. Ltd, New Delhi)
4. Geotechnical Engineering - C. Venkatachalam (New Age International (I) Ltd, New Delhi)
5. Soil mechanics and foundation engineering- V.N.S. Murthy (UBS publisher's and distributers, New Delhi)
6. Foundation Design Manual- Dr. N.V. Nayak (Dhanpat Rai and Sons)
7. Foundation Engineering- Kasamalkar B.J. (Pune Vidyarthi Griha, Pune)
8. SP36-1 Compendium of Indian Standards on Soil Engineering Part 1
9. SP36-2 Compendium of Indian Standards on Soil Engineering Part 2
10. Design of sub structure- Swami Saran (Oxford and IBH Publications)

REFERENCE BOOKS

1. Foundation analysis and design- Bowles J. E. (Tata McGraw hill company Ltd New Delhi)
2. Foundation design and construction- Tomlinson (M.J. English Language Book Society, Essex)
3. Foundation Design- Teng W.C, (Prentice Hall publications)
4. Soil mechanics in theory and practice- Alam Singh, (Asian Publishing House, Bombay)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE62C - HYDRAULIC STRUCTURES AND WATER POWER ENGINEERING

.

Teaching Scheme	**Examination Scheme**
Lectures:-3Hrs/Week, 3 Credits	**ISE:** 30 Marks
	ESE: 70 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Plan and design the reservoirs depending upon the water resources potential.
2. Analyze and design Gravity dams and Earth dams (Simple Designs).
3. Elaborate the design principles of Arch dams.
4. Carry out Hydraulic Design of spillways
5. Select appropriate method of river training depending upon river characteristics
6. Estimate water power potential at a site.

SECTION – I

Unit 1: Dams and Reservoir Planning **(5)**

Dams – Necessity, types of dams, selection of site for dams, selection of type of dam, Introduction to dam instrumentation

Planning of Reservoirs: Storage calculations, Control levels, silting of reservoirs, reservoir sedimentation surveys, reservoir losses. Use of remote sensing for reservoir sedimentation surveys.

Unit 2: Gravity and Arch Dams **(8)**

Gravity Dams - Forces acting on dam, design criteria, theoretical and practical profile, high and low dam, stability calculations, materials and methods of Construction, Galleries, joints, Dam Instrumentation, Computer Application for Design of Dam. Decommissioning of dams

Arch Dams – Types, Layout of Constant angle and Constant radius arch dam, Forces acting on arch dams.

Unit 3: Earth Dams **(5)**

Earth Dams: Components and their functions, Design Criterions; Seepage through and below earth dam, Application of Slip circle method, Inverted Filters, Downstream Drainage, relief

wells, Construction of earth dam.

Unit 4: Spillways and Outlets through Dams (5)

Spillways: Necessity and different types , factors affecting choice and type of spillway, elementary hydraulic design, jump height and tail water rating curve, energy dissipation below spillway, gates for spillway. Spillway operations for different discharge values.

Outlets through Dams: types and energy dissipation in outlets transition

SECTION – II

Unit 5: Weirs on Permeable Foundations (6)

Weirs on Permeable Foundations: Theories of seepage, Bligh's creep theory, Khosla's theory exit gradient, Piping and undercutting, Concept of flow net etc. Kolhapur type weirs- working principles, suitability and construction.

Unit 6: Canals and Canal Structures (6)

Canals: Types, Alignment, Design – Kennedy's and Lacey's Silt theories, Canal losses, Typical canal sections, canal lining – Necessity and types, Economics of canal lining.

Canal Structures (Introduction): Cross drainage works and canal regulatory works - Aqueduct, Culvert, Super passage, Level Crossing, Cross and Head regulator, Canal Siphon, Canal Escape, canal fall, canal outlets.

Unit 7: River Training Works ad Water logging (5)

River and River Training Works: Types of rivers, Meandering phenomenon, Types of river training works, river navigation.

Water Logging and Drainage: Causes, effects, preventive and curative measures, alkaline soils, soil efflorescence, drainage arrangements.

Unit 8: Hydropower Engineering (5)

Elements of Hydropower Engineering: Power crisis and competing uses of water, need of harnessing solar energy. Types of water power plants, small hydropower plants, layout and components of each type, Intakes, Conveyance system, Surge tanks, Power house types, components and layout, tail race. Managing power demand using various sources of power.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A) Minimum seven assignments from the following:

1. Determination of height of dam: Reservoir capacity calculations based on demand and Supply, fixing control levels of dam for completed project or ongoing project.
2. Design of gravity dam: Elementary and practical profile with stability calculations
3. Earth dam
    a. Design- Determination of section – slip circle calculations.
    b. Filters and Drainage arrangements.
4. Spillway: Geometrical section, Design of spillway; Energy dissipation arrangements and gates.
5. Arch dam layout of constant angle and constant radius
6. Drawing sheet: Outlets through earth dam. Masonry dam, layout.
7. Drawing sheet: Typical plan and section of Kolhapur type barrage.
8. A typical layout of Hydropower plant and its functioning. Calculating reservoir capacity for hydropower plant
9. Design of any one Canal Structure / Cross Drainage Works

B) Report based on Field visits to Irrigation and Water Power Engineering Projects

END SEMESTER EXAMINATION - ORAL EXAMINATION

Oral Examination will be based on the ICA

TEXT BOOKS

1. Irrigation Engineering – S. K. Garg , Khanna Pub. Delhi
2. Irrigation and Water Power Engineering - Priyani , Charoter pub. House, Anand
3. Irrigation and Water Power Engineering – Punmia, B. C.
4. Irrigation – Bharat Singh, NEW CHAND & bros. Roorkee
5. Irrigation Engineering Vol. I – Varshhey and Gupta
6. Engineering Hydrology - K. Subramanya
7. Design of Canals – Circular of Government of Maharashtra, 18 February 1995
8. Irrigation Water Power & Water Resource Engineering, Arora, Standard Publishers

REFERENCE BOOKS:

1. Design of Small Dam – U. S. B. R., OXFORD & IBH pub.co.
2. Engineering for Dam Vol. I, II, III – Justinn, Creager and Hinds
3. Design of Hydraulic Structures Vol. I & II – Leliavsky
4. River Behaviour, Management and Training - CBIP Publication

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE63E- PROFESSIONAL ELECTIVE COURSE-I

SOLID AND HAZARDOUS WASTE MANAGEMENT

.

Teaching Scheme	**Examination Scheme**
Lectures:-3Hrs/Week, 3 Credits	**ISE:** 30 Marks
	ESE: 70 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Develop solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies.
2. Select and adopt the appropriate methods for solid waste collection, transportation, redistribution and disposal.
3. Identify the types of hazards and describe methods of disposal of hazardous solid waste.
4. Implement legal, political and administrative considerations in design and operation of solid and hazardous waste management.

SECTION-I
SOLID WASTE MANAGEMENT

Unit 1: **(6)**

Solid Waste management: Functional outlines of refuse, storage, transportation of refuse, analysis, composition and quantity of refuse, various aspects of refuse collection and transport, Solid waste in industries, common types of solid waste, classification, collection and transportation. Concept of biomedical & Hazardous waste management, Introduction to integrated solid waste management.

Unit2: **(5)**

Solid waste handling and Processing methods, Segregation and salvage recovery of bye-products, Use of solid waste as raw material in industries, Recycling of solid waste.

Unit 3: **(4)**

Composting: Theory of composting, types of composting, factors governing composting, processing before composting, mechanical composting plant, and recovery of biogas energy from organic solid

waste.

Unit 4: **(6)**

Incineration: Theory and types of incinerators, location, planning aspects, effects of feed, composition, rate and temperature, air supply, design of incineration plant, proximate analysis and ultimate analysis of refuse. Solid waste management rules, status of solid waste management in India.

SECTION-II
HAZARDOUS WASTE MANAGEMENT

Unit 5: **(6)**

Definition of Hazardous waste, Characteristics and nature of hazards, natural and man- made hazards, classification of hazards.

Unit 6: **(4)**

Qualitative estimation of damages, risk assessment and management.

Unit 7: **(6)**

Types of hazardous waste, characteristics, Site assessment waste minimization resource recovery. Strategy for minimization of damage due to natural and manmade hazards.

Unit 8: **(6)**

Storage and handling of hazardous waste, Site Selection, Transportation of hazardous wastes. Case Studies of hazards, episodes. Sanitary landfill site selection, types of land filling, maintenance and precaution, leachate and its control, control of contamination of ground water.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

The ICA shall consist of:

1. Analysis of solid waste
2. Project on Design of Refuse collection & Disposal System for medium size town or a part of city.
3. Case study of Hazards and Episodes (Any Two).
4. Assignments (One Assignment on each unit)

TEXT BOOKS

1. Solid Waste Management – Dr. A.D. Bhide
2. Hazardous Waste Management – C. A., Wentz McGraw Hill International Edition
3. Management of Municipal Solid Waste- T. V. Ramchandra, Capital Publishing company, New Delhi
4. Solid and Hazardous Waste Management- M. N. Rao and Razia Sultana, B. S. Publication
5. Elements of Land/Soil Pollution, O.P. Gupta, Khanna Publishing House
6. Air Pollution Control Engineering, Keshav Kant, Khanna Publishing House

REFERENCE BOOKS

1. Solid Waste Management – George Tchobanoglous, McGraw Publication
2. Manual on Municipal Solid Waste management by ministry of Urban Development of Govt. of India.
3. Solid Waste Management- I. H. Khan, and Naved Ahsan, CBS Publishers and Distributors, New Delhi.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE66C-RAILWAY, AIRPORT & HARBOUR ENGINEERING

.

Teaching Scheme	**Examination Scheme**
Lectures:-3Hrs/Week, 3 Credits	**ISE:** 30 Marks
	ESE: 70 Marks

Course outcomes:

After successful completion of the course, students will be able to

1. Identify various components of Permnentway and know the constructions process of railway track.
2. Acquires capability of choosing alignment and also design geometric aspects of railway system.
3. Illustrate different types of signals, explain the working principles of railway interlocking system.
4. Analyze and design the elements for orientation of runways, taxiways and passenger facility systems.
5. Understand the various features in Harbours and Ports, their construction and coastal protection works.

SECTION-I
RAILWAY ENGINEERING

Unit 1: Introduction **(14)**

General Introduction: Role of transportation in Society, objectives of transportation system, different types of modes, planning coordination of different modes for Indian conditions

1. Railways for urban transportation-Engineering surveys for track alignment-Obligatory Points-Conventional and modern methods (eg. Remote sensing, GIS)
2. Permanent way-track components their functions, sleeper – functions types, sleeper density, ballast functions different ballast materials.
3. Rails: coning of wheels, tilting of rails, rail cross sections, wear, creep of rails, rail fastenings.
4. Yards: details of different types of railway yards their functions.
5. Construction and maintenance of railway track, methods of construction, material requirements,

maintenance of tracks, traffic operations.

6. Modernization of track and railway station for high-speed trains, Mono rails and Metro rails.

Unit 2: Geometric Design of Railway Track and Traffic Control (10)

1. Geometrics: Superelevation, Cant deficiency, Cant excess, negative cant, safe permissible speed, gradients, transition curves, widening of gauge on curves,
2. Points crossing: design of turnouts, description of track junctions, different types of track junctions.
3. Signaling interlocking: classifica0tion of signals, interlocking of signals points, Route Relay Interlocking system, control of train movement.

SECTION- II
AIRPORT ENGINEERING

Unit 3: Airport Planning (5)

Air transport characteristics-airport classification-airport planning: objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, Parking and circulation area.

Unit 4: Airport Design (8)

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings, lighting and Air Traffic Control (ATC).

SECTION- II
HARBOUR ENGINEERING

Unit 5: Dock and Harbour Engineering (8)

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Dredging – Maintenance of Ports and Harbours – Navigational aids.

TERM WORK

1. The visit of Railway and Airport site should be carried out to understand the various structures, its construction and operations.
2. Assignment on each chapter and field visit report shall be submitted by the students.

TEXT BOOKS

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora – Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.
4. RDSO Codes

REFERENCES

1. 'Railway Engineering'by Saxena & Arora – Dhanpat Rai, New Delhi.
2. 'Transportation Engineering Planning Design' by Wright P.H. & Ashfort N.J. – John Wiley & Sons.
3. 'Airport Engineering' by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. 'Transportation Engineering' by Srinivasa Kumar R, University Press, Hyderabad
5. Railway and track Engineering- by Mundrey J.S.- Tata McGraw-Hill Education
6. Docks and Harbour Engineering Oza, Charotar Publication House

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE67L PROJECT ON STEEL STRUCTURES

.

Teaching Scheme	**Examination Scheme**
Drawing:-2Hrs/Week, 1 Credit	**OE:** 25 Marks
	ICA:- 25 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Selection of roof truss / Portal frame. Decide various parameters to complete Geometry of truss / Portal frame
2. Analyze the steel structure using standard structural engineering application software
3. Design of various components of Industrial shed with roof truss or portal frame or gable Frame using relevant software and prepare their detailed computer aided drawing
4. Design the various components of Building frame/Foot bridge/Welded plate girder and prepare their detailed computer aided drawing
5. Create report for the structure as per Analysis and Design.

PROJECT ON STEEL STRUCTURES (Laboratory)

INTERNAL CONTINUOUS ASSESSMENT (ICA)

It shall consist of detailed structural design and drawing of the following steel structure along with necessary drawings.

1. INDUSTRIAL SHED

Design of industrial shed including roof truss / Portal frame, purlin, gantry girder, columns, bracing system, column bases along with their connections and concrete pedestal. Prepare the detailed drawing of the truss / Portal frame with their connections

2. ANY ONE from the following:

A. Welded Plate Girder:

Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and their connections.

B. Foot Bridge

Influence lines, cross beam, main truss, Raker, joint Details, support details

C. Building Frames

Building with Secondary and main beams, column and column bases, beam-to beam connection, column-beam-connection, design of typical members.

D. Offshore Structures

Offshore structures containing elements like jackets, topside platforms, equipment foundations etc. Further, these components can be designed using circular and hollow square sections etc.

E. Pre-Engineered Buildings

Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads.

NOTE

1. Sample verification of analysis results shall be made by using software for any one problem.
2. Maximum number of students in a group not more than three to five for design.

SITE VISITS

Report should contain structural details with sketches.

TEXT BOOKS

1. Design of Steel Structures, N. Subramanian, Oxford, 2008
2. Limit State Design of Steel Structures, S.K. Duggal.
3. Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti S. S,I K International Publishing House, New Delhi
4. Limit state design in Structural Steel by Dr. M. R. Shiyekar

REFERENCE BOOKS

1. Limit state design of Steel Structure by V. L. Shah & Gore, Structures Publication, Pune
2. Limit State Design of Steel Structures by D. Ramchandra & Virendra Gehlot, Scientific Publishers

3. Design of Steel Structures by K. S. Sai Ram, published by Dorling Kindersley (India) Pvt. Ltd.
4. Structural Design and Drawing Reinforced Concrete and Steel by N. Krishnaraju,
5. Universities Press (India) Pvt. Ltd. Hyderabad.
6. Teaching Resource Material by INSDAG
7. Indian Standard Codes: IS 800-2007, IS 875-1987 Bureau of Indian Standards.
8. Steel Tables SP: 6(1) and SP: 6(6)
9. Dynamic Analysis and Design of Offshore Structures, Srinivasan Chandrasekaran
10. Offshore Structures: Design, Construction and Maintenance by Mohamed A. EI-Reedy
11. K. S. Vivek & P. Vaishavi – Pre-Engineered Steel Buildings, Lambert Academic Publishing.
12. Alexander Newman, Metal Building Systems Design and Specifications, 2nd Edition

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part II

CE69L MINI PROJECT USING APPLICATION SOFTWARE

.

Teaching Scheme	**Examination Scheme**
Practical:-2Hrs/Week, 1 Credit	**ICA**:- 25 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Identification and Selection of problems.
2. Define aims and objectives of selected problem
3. Decide various relevant parameters
4. Find appropriate solution
5. Generate technical report

Student/s shall carry out 'Mini Project' in any one of the following subjects: Structural Engineering, Geotechnical Engineering, Environmental Engineering, or Engineering Management, by preferably employing relevant application software.

The project shall consist of Civil Engineering / interdisciplinary.
Prototype design, working models, Laboratory experiments, Process modification/development, Simulation, Software development, Data analysis, Survey etc.

The student is required to submit a 'Project Report' based on the work. The Mini project shall be assessed by the domain subject teachers for ICA.

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पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Commerce & Management

CHOICE BASED CREDIT SYSTEM

Syllabus: Master of Business Administion

Name of the Course: M.B.A. Part- II (Sem. III & IV)
(Syllabus to be implemented from w.e.f. June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

MBA Part II Syllabus (CBCS) w.e.f. 2021-22

Semester III						Semester IV					
Paper No.	**Subject**	**Weekly Theory**	**Internal Marks**	**Univ. Exam Marks**	**Total Marks**	**Paper No.**	**Subject**	**Weekly Theory**	**Internal Marks**	**Univ. Exam Marks**	**Total Marks**
17	Strategic Management	04	20	80	100	25	Business Ethics & Corporate Governance	04	20	80	100
18	Management Accounting	04	20	80	100	26	Quality Management	04	20	80	100
19	Entrepreneurship Development	04	20	80	100	*27	*Elective I - Paper III*	04	20	80	100
20	Project Report & Viva	--	50	50	100	*28	*Elective II - Paper-III*	04	20	80	100
*21	*Elective I - Paper I*	04	20	80	100	*29	*Elective I - Paper IV*	04	20	80	100
*22	*Elective II - Paper-I*	04	20	80	100	*30	*Elective II - Paper-IV*	04	20	80	100
*23	*Elective I - Paper II*	04	20	80	100	*31	*Elective I - Paper V*	04	20	80	100
*24	*Elective II - Paper-II*	04	20	80	100	*32	*Elective II - Paper-V*	04	20	80	100

Dual Specialization Groups.

Group	Elective Specialization
A	• Marketing Management
B	• Financial Management • Tourism and Hospitality Management • Production and Materials Management
C	• Human Resource Management • International Business Management • Banking Management • Systems Management • Agriculture & Co-operative Management

Semester : III	Hard Core	Semester Exam			L/W	Credits
Code: 303	Project Report & Viva	Theory	I A	Total		
Subject Title		50	50	100	-	4

Course Objectives:	1. To expose students to the working of any organization and managers. 2. To relate the concepts learnt by the students to the working of the organization. 3. To work on a problem identified by the organization / student and thus understand the practical aspects of the working of an organization
Course Outcome	• Ability to undertake problems for study and analyse for appropriate inferences and conclusions or suggest solutions for the same.
Guidelines:	1. The project work shall be for a minimum period of 30 days immediately after IInd semester examinations. 2. Students should join the organization within 15 days from the last day of examination. 3. No two Students shall work on the same topic in the same organization. 4. The student should collect a Certificate of Minimum 30 Days Project Work Completion mentioning the period (*From* ____ *to* ____) on the Company's letter Head. 5. The student shall submit the Final Project Report as per following.

Project Report 'Table of Contents'

Chapter 1	**Introduction of the Study**

1.1 Introduction – Overview of the sector, organization and the Study

1.2 Objectives of the study. This should give a clear picture of the project. Objective should be clearly specified. There should be minimum 4 to 5 objectives of the project report. What the project intends to find out should be clearly specified.

1.3 Scope and limitations of the study

1.4 Research Methodology The methodology comprises of Research Design, Hypothesis, Types of data, Data collection techniques, sampling techniques, Sample size, etc.

1.5 Significance of the study. : What the project intends to find out and how it would be helpful to the organization.

Chapter 2	**Company Profile**

2.1 Introductions to Organization.

2.1.1 Background and Inception of the Organization

2.1.2 Ownership Pattern

2.1.3 Nature of the Business

2.1.4 Vision, Mission and Quality Policy

2.1.5 Types of Products and Services

2.2 Market Scenario

2.2.1 Area of Operation – Global / National / Regional 2.2.2 Competitors' Information 2.2.3 Achievement/Award if any 2.3 Various departments in the organization. 2.4 Organization chart.	
Chapter 3	**Theoretical Background**
3.1 Brief Review of Literature 3.2 Conceptual framework	
Chapter 4	**Data Analysis and Interpretation**
Should include Tables, Graphs / Diagrams, Mean, Median, Mode, Std. Deviation as Applicable.	
Chapter 5	**Findings**
Chapter 6	**Suggestions OR Conclusion.**
Annexure	Should contain a copy of Questionnaire if used for Data Collection
Bibliography	Students should refer and mention at least 5 reference books, 3 National and 3 International journals and websites referred.
Format for Writing and presenting the summer project:	1. Font type – Times New Roman, Font size – Headings – 14 pts., Normal Text – 12 pts. 2. Spacing – Line - 1.5 lines, Paragraph – 12 pts. 3. Page margins – Left - 1.5 inch Right - 1.0 inch Top - 1.0 inch Bottom - 1.0 inch 4. Header – (College Name/Abbrn.) - MBA Dept (Left Side), PAH Solapur University, Solapur. (Right Align) 5. Footer – Page No. (Center). "MBA Program (yyyy - yy)" (Right side) 6. Use of colour fonts, Company Logos, Photographs is not allowed. 7. Information Brochures/leaflets, etc. can be inserted as part of Annexure. 8. Only graphs can be inserted in colour. 9. The report should contain Certificate, Guide Certificate and Student Declaration (formats should be provided by the college). 10. Project should be of minimum 40 pages.

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सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

Revised Structure and Syllabus

CHOICE BASED CREDIT SYSTEM

Syllabus: Mechanical-Design Engineering

Name of the Course: M.Tech.- Semester I, II, III & IV

(Syllabus to be implemented from w.e.f. June 2018-19 & 2019-20)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

FACULTY OF ENGINEERING & TECHNOLOGY
Curriculum for M. Tech. (Mechanical-Design Engineering)
Four Semester Course
Choice Based Credit System (CBCS) - (WEF 2019-20)

Semester III: Theory /Tutorial/ Lab Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
Dissertation	Lab Practices	-	-	2	2	-	-	50	50
	Open Elective	3	-	-	3	70	30	-	100
	Dissertation Phase I : Synopsis Submission Seminar*	-	-	2	2	-	50	-	50
	Dissertation Phase II : Progress Seminar	-	-		8	100	200	-	300
Total		**3**	**-**	**4**	**15**	**170**	**280**	**50**	**500**
Note:- * indicates student engagement against which faculty contact hour is 2 hours per candidate									

L Lecture
T Tutorial
P Lab Session

FA Formative Assessment
SA Summative Assessment
ESE End Semester Examination
ISE In Semester Evaluation
ICA Internal Continuous Evaluation

List of open Elective

1. Business Analytics
2. Operation Research
3. Cost Management of Engineering Projects
4. Non conventional Energy

- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the advisor.
- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit Synopsis of the Dissertation Work only after delivering this seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation.
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Lab Practice shall include any of the below activities as recommended by Advisor and student shall submit a report after completion of the activity to Advisor along with other details if any. Software / hardware assignments, learning new software, literature survey, filed work, industrial training etc. related to dissertation work.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

FACULTY OF ENGINEERING & TECHNOLOGY

Curriculum for M. Tech. (Mechanical-Design Engineering)
Four Semester Course
Choice Based Credit System (CBCS) - (WEF 2019-20)

Semester IV: Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
Dissertation	**Dissertation Phase –III** Progress Report presentation and submission		-	4	3	-	-	100	100
	Dissertation Phase –IV Final presentation and submission of report	-	-	2	6	-	-	100	100
	Dissertation Viva voice	-	-	-	6	200	-	-	200
Total		**-**	**-**	**6**	**15**	**200**		**200**	**400**
Note:- * indicates student engagement against which faculty contact hour is 3 hours per candidate									

L	Lecture	**FA**	Formative Assessment
T	Tutorial	**SA**	Summative Assessment
P	Lab Session	**ESE**	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Evaluation

- For all activities related to dissertation Phase III, student must interact regularly every week with the advisor.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation.
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the faculty advisor along with other details if any.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur.

SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

ELECTRONICS and TELECOMMUNICATION ENGINEERING

CBCS Syllabus for

First Year M. Tech.

w.e.f. Academic Year 2018-19

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE of M.Tech. (ELECTRONICS and TELECOMMUNICATION ENGINEERING)

Four Semester Course

Choice Based Credit System (CBCS) Syllabus w.e.f. A.Y. 2018 -19

Semester-I

Sr. No.	*Subject*	*Teaching Scheme*				*Credits*				*Evaluation Scheme*				
		L	*T*	*P*	*Total*	*Credits (L)*	*Credits (T)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA- P Marks*	*ICA-T Marks*	*Total Marks*
1	Research Methodology & IPR	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
2	Antenna Design and Application	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
3	Soft Computing Methods	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
4	Advanced Network System	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
5	Elective I	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
6	Seminar- I	-	-	2	2	-	-	2.0	2.0	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**2**	**8**	**25**	**15.0**	**2.0**	**5.0**	**22.0**		**500**	**125**	**50**	**675**

Note: *L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment*

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE of M.Tech. (ELECTRONICS and TELECOMMUNICATION ENGINEERING)
Four Semester Course
Choice Based Credit System (CBCS) Syllabus w.e.f. A.Y. 2018-19
Semester-II

Sr. No.	Subject	Teaching Scheme				Credits				Evaluation Scheme				
		L	T	P	Total	Credits (L)	Credits (T)	Credits (P)	Total Credits	Scheme	Theory Marks	ICA- P Marks	ICA-T Marks	Total Marks
1	Advanced Internet of Things	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
2	RF Circuit Design	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
3	Artificial Intelligence & Machine Learning	3	-	2	5	3.0	-	1.0	4.0	ISE	30	25	--	125
										ESE	70	--	--	
4	Cryptography and Network Security	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
5	Elective – II	3	1	-	4	3.0	1.0	-	4.0	ISE	30	--	25	125
										ESE	70	--	--	
6	Seminar- II	-	-	2	2	-	-	2.0	2.0	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**2**	**8**	**25**	**15.0**	**2.0**	**5.0**	**22.0**		**500**	**125**	**50**	**675**

Note : *L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment*

- Seminar I shall be delivered on a topic related to student's broad area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- Seminar II shall be delivered on a topic related to student's particular area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- **List of elective courses for semester I and II -**

Sr.	***Elective - I***	***Elective – II***
1.	Biomedical Signal Processing	Communication System Design
2.	Advanced Embedded System	Multimedia Processing
3.	Automotive Electronics	Automation and Industrial Robotics

- Courses may be added in the list of Elective I and II as and when required

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY
STRUCTURE of M.Tech. (ELECTRONICS and TELECOMMUNICATION ENGINEERING)
Four Semester Course
Choice Based Credit System (CBCS) Syllabus w.e.f. A.Y. 2018-19
Semester-III

Sr. No.	*Subject*	*Teaching Scheme*		*Credits*			*Evaluation Scheme*			
		L	*P*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA Marks*	*Total Marks*
1	Self Learning Course	$	-	3.0	-	3.0	ISE	30	--	100
							ESE	70		
2	Open Elective Course#	3		3.0		3.0	ISE	30		100
							ESE	70		
3	Dissertation Phase I : Synopsis Submission Seminar*		@4		3.0	3.0	ISE	--	100	100
							ESE	--	--	
4	Dissertation Phase II : ICA*		-		3.0	3.0	ISE	--	100	100
							ESE	--	--	
5	Dissertation Phase II Progress Seminar*		-		3.0	3.0	ISE	--		100
							ESE	--	100	
Total		**3**	**4**	**6.0**	**9.0**	**15.0**		**200**	**300**	**500**

L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment

Note -

- $- Being a Self Learning Course, student shall prepare for examination as per specified syllabus
- *- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the advisor.
- # - This course is common for all branches of Technology (ie for all M.Tech. Programs)

- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit synopsis of the dissertation work only after delivering this seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any
- @ Indicates contact hours of students for interaction with advisor.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur

List Self Learning Courses -

Sr.	***Self LearningSubject***
1	Semiconductor Device Modelling
2	Programmable System on Chip (PSoC)
3	Remote Sensing
4	Multimedia Network

List of Open Elective Courses-

Sr.	***Self LearningSubject***
1	Business Analytics
2	Operation Research
3	Cost Management of Engineering Projects
4	Non conventionalEnergy

- New Self Learning Courses and New Open Elective Courses may be added as and when required

SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF ENGINEERING & TECHNOLOGY
STRUCTURE of M.Tech.(ELECTRONICS and TELECOMMUNICATION ENGINEERING)
Four Semester Course
Choice Based Credit System (CBCS) Syllabus w.e.f. A.Y. 2018-19
Semester-IV

Sr. No.	*Subject*	*Teaching Scheme*			*Credits*			*Evaluation Scheme*		
		L	*P*	*Total*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*ICA Marks*	*Total Marks*
1	Dissertation Phase III : Progress Seminar #	-	4@	4	-	3.0	3.0	ISE	100	100
2	Dissertation Phase IV: #	-	2@	2	-	6.0	6.0	--	200	200
3	Final Submission of the Dissertation and Viva –Voce	-	-	-	-	6.0	6.0	ESE	200	200
	Total	**-**	**-**	**6**	**--**	**15.0**	**15.0**	**-**	**500**	**500**

Note –

- #- For all activities related to dissertation Phase III & IV student must interact regularly every week with the advisor.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Student must submit a hard copy of Project Report to the department
- @ indicates contact hours of the student for interaction with the advisor
- Details of modes of assessment of seminar and dissertation shall be as specified in 7 (III) of PG Engineering Ordinance of Solapur University, Solapur.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

M.Tech. (COMPUTER SCIENCE & ENGINEERING)

Four Semester Course

Choice Based Credit System

Semester-III

Sr. No.	Subject	Teaching Scheme		Credits			Evaluation Scheme			
		L	P	Credits (L)	Credits (P)	Total Credits	Scheme	Theory Marks	ICA-P Marks	Total Marks
1	Self Learning Course	$	--	3.0	--	3.0	ISE	30	--	100
							ESE	70	--	
2	Open Elective Course#	3	--	3.0	--	3.0	ISE	30	--	100
							ESE	70	--	
3	Dissertation Phase-I : Synopsis Submission Seminar*		@4	--	3.0	3.0	ISE	--	100	100
							ESE	--		
4	Dissertation Phase-II : ICA*	--	--	--	3.0	3.0	ISE	--	100	100
							ESE	--		
5	Dissertation Phase-II : Progress Seminar*	--	--	--	3.0	3.0	ISE	--		100
							ESE	--	100	
	Total	**3**	**4**	**6.0**	**9.0**	**15.0**		**200**	**300**	**500**

L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE – End Semester Evaluation, ICA- Internal Continuous Assessment

Note -

- $- Being a Self Learning Course, student shall prepare for examination as per specified syllabus
- *- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the adviser.
- # - This course is common for all branches of Technology (i.e. for all M.Tech. Programs)
- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit synopsis of the dissertation work only after delivering this seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the adviser along with other details if any
- @ Indicates contact hours of students for interaction with adviser.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of P.A.H. Solapur University, Solapur

Self Learning Course	
Sr. No.	Subject
1	Big Data
2	Computer Network Administration
3	Open Source Technologies
4	Usability Engineering

Open Elective Course	
Sr. No.	Subjects
1	Business Analytics
2	Operation Research
3	Cost Management of Engineering Projects
4	Non Conventional Energy

- New Self Learning Courses and New Open Elective Courses may be added as and when required

3. Dissertation Phase – I : Synopsis Submission Seminar

Teaching Scheme
Practical: 4 Hrs/Week

Examination Scheme
Credits:3
ISE: 100 marks

Phase I Synopsis Submission Seminar (ISE): A student shall be expected to carry out intensive literature survey for a period of about two months in the field of interest and to select a topic for his/her dissertation in consultation with the faculty adviser assigned. The student shall then submit a report and deliver a seminar on the problem chosen by him/her to the panel of three departmental PG recognized faculty members. It shall be expected that a student justifies the gravity and also the relevance of the problem through his/her seminar. This shall be for the approval of synopsis.

4. Dissertation Phase – II : ICA

Examination Scheme
Credits:3
ICA : 100 marks

Phase II Term Work (ICA)

Phase II evaluation consists of term-work evaluation (ICA) based on the efforts put in by the student to carry out his/her work & the results obtained thereof.

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5. Dissertation Phase – II : Progress Seminar

Examination Scheme
Credits:3
ESE : 100 marks

Phase II Progress Seminar Presentation (ESE):

The End Semester Evaluation (ESE) consisting of submission of progress report and presentation of progress seminar followed by demonstration before a panel three departmental PG recognized faculty members.

Guidelines for Assessment of Dissertation Phase I & II

1. Quality of Literature survey and Novelty in the problem
2. Clarity of Problem definition and Feasibility of problem solution
3. Clarity of objective and scope

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
M.Tech. (COMPUTER SCIENCE & ENGINEERING)
Four Semester Course
Choice Based Credit System
Semester-IV

Sr. No.	Subject	Teaching Scheme		Credits			Evaluation Scheme		
		L	P	Credits (L)	Credits (P)	Total Credits	Scheme	ICA-P Marks	Total Marks
1	Dissertation Phase-III : Progress Seminar #	--	@4	--	3.0	3.0	ISE	100	100
2	Dissertation Phase-IV : #	--	@2	--	6.0	6.0	--	200	200
3	Final Submission of the Dissertation and Viva-voce	--	--	--	6.0	6.0	ESE	200	200
	Total	--	6	--	15.0	15.0		500	500

Note –

- #- For all activities related to dissertation Phase-III and Phase IV student must interact regularly every week with the adviser.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation.
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the adviser along with other details if any.
- Student must submit a hard copy of Project Report to the department
- @ indicates contact hours of the student for interaction with the adviser.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7 (III) of PG Engineering Ordinance of P.A.H. Solapur University, Solapur.

1. Dissertation Phase – III : Progress Seminar

Teaching Scheme
Practical: 4 Hrs/Week

Examination Scheme
Credits: 3
ISE: 100 marks

Phase III Term Work and Progress Seminar Presentation and report (ISE):
The student who has cleared his/her Phase II evaluation shall submit a report and present the status of work carried out on the dissertation, after 8-10 weeks of Phase II ESE, to three departmental PG recognized faculty members.

Guidelines for Assessment of Dissertation Phase III

1. Quality of work attempted
2. Presentation skills
3. Relevance to the specialization

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
M.Tech. (COMPUTER SCIENCE & ENGINEERING)
Four Semester Course
Choice Based Credit System
Semester – IV

2. Dissertation Phase – IV : Termwork

Teaching Scheme
Practical: 2 Hrs/Week

Examination Scheme
Credits: 6
ICA: 200 marks

After completing the dissertation work to the satisfaction, the student shall submit the dissertation report in the prescribed format to the university.

Guidelines for Assessment of Dissertation Phase IV Termwork

1. Fulfilment of objectives
2. Validation of results
3. Quality of Written Presentation

- **Students should publish at least one paper based on his/her work in reputed International Journal (desirably in Referred Journal)**

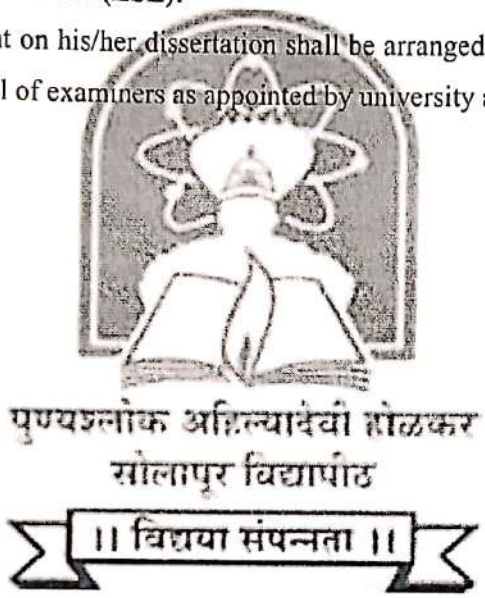
पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
॥ विद्यया संपन्नता ॥

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
M.Tech. (COMPUTER SCIENCE & ENGINEERING)
Four Semester Course
Choice Based Credit System
Semester - IV
3. Final Presentation and Viva-voce

Examination Scheme
Credits: 6
ESE: 200 marks

Final Presentation and Viva-voce (ESE):

Open defense of the student on his/her dissertation shall be arranged by the university. This defense shall be in front of the panel of examiners as appointed by university authority.



PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
STRUCTURE OF M.Tech. CIVIL (STRUCTURAL ENGINEERING)
Four Semester Course
Choice Based Credit System Syllabus wef 2018-19
Semester-II

Sr. No.	*Subject*	*Teaching Scheme*				*Credits*				*Evaluation Scheme*				
		L	*T*	*P*	*Total*	*Credits (L)*	*Credits (T)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA- P Marks*	*ICA-T Marks*	*Total Marks*
1	FEM in structural Engineering	3	1	-	4	3	1	-	4	ISE	30	--	25	125
										ESE	70	--	--	
2	Theory of plates and shells	3	1	-	4	3	1	-	4	ISE	30	--	25	125
										ESE	70	--	--	
3	Seismic design of multistoried buildings	3	1	-	4	3	1	-	4	ISE	30	--	25	125
										ESE	70	--	--	
4	Elective – II	3	1	-	4	3	1	-	4	ISE	30	--	25	125
										ESE	70	--	--	
5	Elective – III	3	1	-	4	3	1	-	4	ISE	30	--	25	125
										ESE	70	--	--	
6	Advanced concrete Lab	-	-	2	2	-	-	1	1	ISE		25	--	25
										ESE	--	--	--	
7	Mini project	-	-	2	2	-		2	2	ISE	--	50	--	50
										ESE	--	--	--	
Total		**15**	**5**	**4**	**24**	**15**	**5**	**3**	**23**		**500**	**75**	**125**	**700**

Note : *L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment*

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
STRUCTURE OF M.Tech. CIVIL (STRUCTURAL ENGINEERING)
Four Semester Course
Choice Based Credit System Syllabus w.e.f. 2019-20
Semester-III

Sr. No.	*Subject*	*Teaching Scheme*			*Credits*			*Evaluation Scheme*			
		L	*P*	*Total*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*Theory Marks*	*ICA- P Marks*	*Total Marks*
1	Lab. Practice	-	4	4	-	2	2	ISE	--	50	50
								ESE	--	--	
2	Open Elective Course#	3	-	3	3		3	ISE	30	--	100
								ESE	70	--	
3	Dissertation Phase I : Synopsis Submission Seminar*		@4	4	-	2	2	ISE	--	50	50
								ESE	--	--	
4	Dissertation Phase II : ICA*				-	4	4	ISE	--	100	100
								ESE	--	--	
5	Dissertation Phase II Progress Seminar*				-	4	4	ISE	--	--	100
								ESE	--	100	
Total		**3**	**8**	**11**	**3**	**12**	**15**		**100**	**300**	**400**

L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment

Note –

- Lab Practice shall include any of the below activities as recommended by Advisor and student shall submit a report after completion of the activity to Advisor along with other details if any. Software / hardware assignments, learning new software, literature survey, filed work, industrial training etc. related to dissertation work.
- *- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the advisor.
- # - This course is common for all branches of Technology (i.e. for all M.Tech. Programs)
- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit synopsis of the dissertation work only after delivering this seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any
- @ Indicates contact hours of students for interaction with advisor.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur

- **List of open Elective Courses-**

Sr.	***Subject***
1	Business Analytics
2	Operation Research
3	Cost Management of Engineering Projects
4	Non conventional Energy

- New Open Elective Courses may be added as and when required

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
STRUCTURE OF M.Tech. CIVIL (STRUCTURAL ENGINEERING)
Four Semester Course
Choice Based Credit System Syllabus w.e.f. 2019-20
Semester-IV

Sr. No.	*Subject*	*Teaching Scheme*			*Credits*			*Evaluation Scheme*		
		L	*P*	*Total*	*Credits (L)*	*Credits (P)*	*Total Credits*	*Scheme*	*ICA- P Marks*	*Total Marks*
1	Dissertation Phase III : Progress Seminar #	-	4@	4	-	3	3	ISE	100	100
2	Dissertation Phase IV: Final presentation and submission of report #	-	2@	2	-	6	6	--	200	200
3	Dissertation Viva – Voce	-	-	-	-	6	6	ESE	200	200
Total		**-**	**6**	**6**	**--**	**15**	**15**	**-**	**500**	**500**

Note –

- #- For all activities related to dissertation Phase III & IV student must interact regularly every week with the advisor.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Student must submit a hard copy of Project Report to the department
- @ indicates contact hours of the student for interaction with the advisor
- Details of modes of assessment of seminar and dissertation shall be as specified in 7 (III) of PG Engineering Ordinance of Solapur University, Solapur.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - II

Choice Based Credit System (CBCS)

MINI PROJECT

Lab Scheme:
2 hours per week, 2 Credits

Examination Assessment Scheme:
ICA: 50 marks

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Course Outcomes:

At the end of the course, the students will be able to:

1. Identify structural engineering problems reviewing available literature.
2. Study different techniques used to analyze complex structural systems.
3. Work on the solutions given and present solution by using his/her technique applying engineering principles.

Syllabus Contents:

Mini Project shall consist of detailed analysis, design along with working drawings of any one structure.

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

The student shall submit report on the subject chosen and make a presentation at the end of Semester-I. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the Advisor.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - III

Choice Based Credit System (CBCS)

DISSERTATION PHASE- I
SYNOPSIS SUBMISSION SEMINAR

Contact hour of student: 4 **Examination Assessment Scheme:**

Credits: 2 ICA: 50 marks

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The student is expected to carry out intensive literature survey for a period of about two months in the field of interest and to select a topic for his/her dissertation in consultation with the faculty advisor assigned. The student shall then submit a report and deliver a seminar on the problem chosen by him/her to the panel of three departmental PG recognized faculty members. It shall be expected that a student justifies the gravity and also the relevance of the problem through his/her seminar. This shall be for the approval of synopsis.

The assessment of Synopsis Submission Seminar shall be done by aforesaid panel of three departmental PG recognized faculty members.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - III

Choice Based Credit System (CBCS)

DISSERTATION PHASE- II: ICA

Contact hour of student: 4 **Examination Assessment Scheme:**

Credits: 4 ICA: 100 marks

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Student shall submit a report to the faculty advisor, on the basis of work carried out in accordance with instructions given by faculty advisor, throughout the semester. Dissertation Phase II evaluation consists of term-work evaluation (ISE) based on the efforts put in by the student to carry out his/her work & the results obtained thereof.

The faculty advisor shall complete the assessment of the report and accordingly allocate the marks to the student out of maximum 100 marks.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - III

Choice Based Credit System (CBCS)

DISSERTATION PHASE- II: PROGRESS SEMINAR

Contact hour of student: 4 **Examination Assessment Scheme:**

Credits: 4 ESE: 100 marks

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Progress seminar shall be delivered capturing details of the work done by the student for dissertation. Student shall deliver seminar using modern presentation tools. A hard copy of report shall be submitted to the faculty advisor before delivering the seminar. A PDF copy of the report must be submitted to the faculty advisor along with other details if any.

End Semester Evaluation (ESE) shall consist of presentation of progress seminar on the report submitted by the student, followed by demonstration before a panel of three departmental PG recognized faculty members.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - IV

Choice Based Credit System (CBCS)

DISSERTATION PHASE- III: PROGRESS SEMINAR

Contact hour of student: 4 **Examination Assessment Scheme:**

Credits: 3 ICA: 100 marks

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For all activities related to Phase III, student must interact regularly every week with the faculty advisor. The student who has cleared his/her Phase II evaluation, shall submit a report and present the status of work carried out on the dissertation after 8-10 weeks of Phase II ESE to three departmental PG recognized faculty members.

Progress seminar shall be delivered capturing details of the work done by student for dissertation. Student shall deliver seminar using modern presentation tools. A hard copy of report shall be submitted to the faculty advisor before delivering the seminar. A PDF copy of the report must be submitted to the faculty advisor along with other details if any.

The evaluation will be done by the aforesaid panel of three departmental PG recognized faculty members based on the requirements of completion of dissertation work for the dissertation Phase-III.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - IV

Choice Based Credit System (CBCS)

DISSERTATION PHASE- IV:
FINAL PRESENTATION AND SUBMISSION OF REPORT

Contact hour of student: 2 **Examination Assessment Scheme:**

Credits: 6 ICA: 200 marks

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After completing the dissertation work to the satisfaction of faculty advisor, the student shall submit the dissertation report to the University in the prescribed format. The final approved dissertation shall be submitted in black bound hard copy along with soft copy on CD/DVD.

The evaluation of dissertation is to be carried out by the faculty advisor as ICA for 100 marks. This evaluation shall be on the basis of the requirements of completion of dissertation work. The faculty advisor shall submit mark list of term work marks, along with the submission of dissertation to university as mentioned in assessment scheme.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M.Tech. Civil (Structural Engineering) - IV

Choice Based Credit System (CBCS)

DISSERTATION VIVA- VOCE

Examination Assessment Scheme:

Credits: 6 ICA: 200 marks

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Open defense of the student on his/her dissertation shall be arranged by the university. This defense shall be in front of the panel of examiners as appointed by university authority. The evaluation will be done by panel of examiners as appointed by university authority.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty : Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus

Name of the Course : **MCA – I (Sem. I and II)**
(Two Year)

(Syllabus to be implemented from June. 2020)

MASTER OF COMPUTER APPLICATIONS (SCIENCE & Technology FACULTY)
DETAIL SYLLABUS OF SEMESTERS I AND II

1. **Introduction:** The Master of Computer Applications (M. C. A.) Programme has been designed with a semester approach in mind. It is a two years course and in each year there are two semesters. Courses in semester-I to semester-IV are aimed at skills development in computers using various technologies.

2. **Program Outcomes :**
   - Students are able to take up positions as systems analysts, systems designers, programmers and managers in any field related to information technology.
   - Students are able to apply knowledge of Mathematical Foundations in computing problems.
   - Students pass on their knowledge for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application.
   - Produce entrepreneurs who can develop customized software solutions for small to large Enterprises.
   - Students are able to function as an effective communicator and team member through essential skills in multidisciplinary projects.

3. **Intake Capacity: 60**

4. **Ordinances and regulations**

5. **ELIGIBILIY:** The eligibility criteria for admission for the MCA course will be as decided by the All Indian Council of Technical Education (AICTE), New Delhi and Directorate of Technical Education (DTE), Government of Maharashtra. It will be published on their respective websites time to time.
   - Passed B.C.A. / Bachelor Degree in Computer Science (B.C.S) / B.Sc. (Entire Computer Science / Computer Science) / Bachelor Degree in Computer Science Engineering or equivalent Degree
     OR passed B.Sc. / B.Com. / B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).
   - Obtained at least 50% marks (45 % marks in case of candidates belonging to reserved category) in the qualifying Examination.

6. **FEES STRUCTURE:** The tuition fees or laboratory fees and other fees have to be paid at the beginning of every semester. At present a student has to pay tuition fees Rs.14000/- per semester and laboratory fee Rs.7000/- per semester together with other fees. These fees may be revised from time to time. The fees once paid will not be refunded.

7. COURSE STRUCTURE: The MCA course is a FOUR semester course. The teaching for the semesters I and III will be during the first half of the academic year and for the semesters II and IV will be during the second half the academic year.

a) A candidate will be awarded a class or distinction as per the rules of other science subjects.

b) The Regulations / Ordinance not covered in this shall be followed from the Regulations / Ordinance laid down for the science faculty.

A Four Semester M.C.A. Course

Semester	No. of Papers / Practical / Project	Marks	Credits
Semester - I			
• Theory Papers	06	600	24
• Practical Papers	02	100	04
• Mini Project	01	50	02
Semester - II			
• Theory Papers	06	600	24
• Practical Papers	02	100	04
• Mini Project	01	50	02
Semester - III			
• Theory Papers	06	600	24
• Practical Papers	02	100	04
• Mini Project	01	50	02
Semester - IV			
• Major Project	01	250	10
Total marks and credits		**2500**	**100**

Bridge Course for B.Sc. / B.Com. / B.A. students

Semester	No. of Papers / Practical / Project	Marks	Credits
Semester - I			
• Theory : Programming using C	01	50	02
• Practical : Programming using C	01	50	02

MCA – I Semester I and II : Structure of the Syllabus

M. C. A. Part – I Semester – I						
Paper Code	**Title of the Paper**	**Contact hrs./week**	**Distribution of Marks for Exam.**			**Credits**
			Internal	**University**	**Total**	
	Hard Core – Theory					
HCT 1.1	Object Oriented Programming using C++	04	20	80	100	04
HCT 1.2	Data Structures	04	20	80	100	04
HCT 1.3	Software Engineering	04	20	80	100	04
HCT 1.4	Operating Systems	04	20	80	100	04
HCT 1.5	Digital Circuits and Microprocessors	04	20	80	100	04
Soft Core - Theory (Any One Group)						
SCT 1.1	Discrete Mathematical Structures	04	20	80	100	04
SCT 1.2	Operation Research					
Hard Core – Practical						
HCP 1.1	Practical-I based on HCT 1.1	04	10	40	50	02
HCP 1.2	Practical-II based on HCT1.2	04	10	40	50	02
HCP 1.3	Mini Project –I	02	10	40	50	02
	Total	**-**	**150**	**600**	**750**	**30**

M. C. A. Part – I Semester – II						
Paper Code	Title of the Paper	**Contact hrs./week**	**Distribution of Marks for Exam.**			**Credits**
			Internal	**University**	**Total**	
Hard Core – Theory						
HCT 2.1	Java Programming	04	20	80	100	04
HCT 2.2	Advanced DBMS	04	20	80	100	04
HCT 2.3	Computer Communication Network	04	20	80	100	04
HCT 2.4	System Software	04	20	80	100	04
Soft Core - Theory (Any One)						
SCT 2.1	UML	04	20	80	100	04
SCT 2.2	Graph Theory					
Open Elective (Any One)						
OET 2.1	Office Automation	04	20	80	100	04
OET 2.2	SWAYAM course*	--	--	--	--	
Hard Core – Practical						
HCP 2.1	Practical-III based on HCT 2.1 and HCT 2.2	04	10	40	50	02
HCP 2.2	Mini Project - II	04	10	40	50	02
Open Elective - Practical (Any One)						
OEP 2.1	Practical Based on OET 2.1	02	10	40	50	02
OEP 2.2	Practical / Seminar / Viva based on SWAYAM course OET2.2					
	Total	**-**	**150**	**600**	**750**	**30**

* : The credits will be transferred as per university policy and UGC guidelines after submitting the completion certificate / mark list from the SWAYAM.

Bridge Course for B.Sc. / B.Com. / B.A. students M. C. A. Part – I Semester – I						
Paper Code	**Title of the Paper**	**Contact hrs./week**	**Distribution of Marks for Exam.**			**Credits**
			Internal	**University**	**Total**	
	Hard Core – Theory					
HCT-B1	Theory : Programming using C	02	50	--	50	02
HCP-B1	Practical : Programming using C	02	50	--	50	02

8. Passing Standard: Passing standard is same as that of other M.Sc. courses in the Punyashlok Ahilyadevi Holkar Solapur University. The candidate has to appear for internal evaluation of 20 marks and external evaluation (university exam) for 80 marks for each theory paper. The nature of internal evaluation of practical and project will be decided by the respective schools / departments. The internal evaluation is a process of continuous assessment.

A student who failed in Term End examination (theory) & passed in internal assessment of a paper (subject) shall be given FC (Failed in Term End Exam) Grade. Such student will have to appear for Term End examination only. A student who fails in Internal assessment and passed in Term End examination (Theory) shall be given FR (Failed in Internal Assessment) Grade. Such student will have to appear for Term End examination as well as internal assessment.