

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 to contribute 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 complex problems:
- 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 ENGINEERING & TECHNOLOGY
CBCS Curriculum for First Year B. Tech. (All Branches)
W.E.F. 2020-21

Semester I : Theory Courses

<i>Course Code</i>	<i>Name of the Course</i>	<i>Engagement Hours</i>			<i>Credits</i>	<i>FA</i>	<i>SA</i>		<i>Total</i>
		<i>L</i>	<i>T</i>	<i>P</i>		<i>ESE</i>	<i>ISE</i>	<i>ICA</i>	
C011/ C012	Engineering Physics / Engineering Chemistry	3			3	70	30		100
C112	Engineering Mathematics-I	3			3	70	30		100
C113	Basics of Civil and Mechanical Engineering	4			4	70	30		100
C114	Engineering Mechanics	3			3	70	30		100
C115	Universal Human Values	2			2	50			50
C116	Communication Skills	1			1		25		25
Total		16			16	330	145		475

Semester I: Laboratory / Tutorial 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 \$			2	1			25	25
C112	Engineering Mathematics-I		1		1			25	25
C113	Basics of Civil and MechanicalEngineering @			2	1			25	25
C114	Engineering Mechanics			2	1			25	25
C116	Communication Skills			2	1			25	25
C117	Creativity & Design Thinking			2	1			50	50
C118	Workshop Practice			2	1			50	50
Total				12	7			225	225
Grand Total		16	1	12	23	330	145	225	700
C119	Induction Program	** Please see note below							

Semester II: Theory Courses

<i>Course Code</i>	<i>Name of the Course</i>	<i>EngagementHours</i>			<i>Credits</i>	<i>FA</i>	<i>SA</i>		<i>Total</i>
		<i>L</i>	<i>T</i>	<i>P</i>		<i>ESE</i>	<i>ISE</i>	<i>ICA</i>	
C011/ C012	Engineering Physics / Engineering Chemistry \$	3			3	70	30		100
C122	Engineering Mathematics - II	3			3	70	30		100
C123	Basic Electrical & ElectronicsEngineering	3			3	70	30		100
C124	Programming for problem solving	2			2		25		25
C125	Engineering Graphics and CAD	2			2	70	30		100
C126	Professional Communication	1			1		25		25
Total		14			14	280	170		450

Semester II: Laboratory / Tutorial Courses

<i>Course Code</i>	<i>Name of the Course</i>	<i>Engagement Hours</i>			<i>Credits</i>	<i>FA</i>	<i>SA</i>		<i>Total</i>
		<i>L</i>	<i>T</i>	<i>P</i>		<i>ESE (POE)</i>	<i>ISE</i>	<i>ICA</i>	
C011/ C012	Engineering Physics / Engineering Chemistry\$			2	1			25	25
C122	Engineering Mathematics- II		1		1			25	25
C123	Basic Electrical & ElectronicsEngineering			2	1			25	25
C124	Programming for problemsolving			4	2	50#		50	100
C125	Engineering Graphics and CAD			4	2			50	50
C126	Professional Communication			2	1			25	25
Total				14	8	50		200	250
Grand Total		14	1	14	22	330	170	200	700
C127	Democracy, Elections and GoodGovernance *					50			50

Legends used–

L Lecture
T Tutorial
P Lab Session

FA Formative Assessment
SA Summative Assessment
ESE End Semester Examination
ISE In Semester Evaluation
ICA Internal Continuous Assessment

Notes-

1. \$ - Indicates approximately half of the total students at F. Y. 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. @ - For the Course (C113) Basics of Civil and Mechanical Engineering, Practicals of Basics of Civil Engineering and Basics of Mechanical Engineering will be conducted in alternate weeks.
4. 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.

5. *- 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 End Semester Examination (ESE) of 50 marks (as prescribed by university) 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.
6. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C119)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economic, 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 of the 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
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	-	75
CE37L	Fluid Mechanics and Fluid Machines	-	-	2	-	1	-	25	-	50
CE38L	Concrete Technology, Material Testing & Evaluation	-	-	2	-	1	-	-	-	25
CE39L	Building Construction & Drawing	-	-	-	2	1	-	-	-	25
CE 410 L	Lab Practice	-	-	2	-	1	-	-	-	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
CE47L	Building Planning & Design	-	-	-	2	1	-	50	-	25
CE48L	Computer Programming & Numerical Methods	2	-	2	-	3	-	50	-	25
CE49L	Engineering Geology	-	-	2	-	1	-	25	-	25
	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

Lectures – 3 Hrs/Week, 3 Credits

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

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. As a 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 in Elevation 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

Lectures – 3 Hrs/Week, 3 Credits

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

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 BOUNDARY 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: DIMENSIONAL 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 site 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
CE33: CONCRETE TECHNOLOGY, MATERIAL TESTING & EVALUATION

Teaching Scheme
Lectures – 2 Hrs/Week, 2 Credits
Practical – 2 Hr/Week, 1 Credit
Examination Scheme
ISE – 30 Marks
ESE – 70 Marks
ICA – 25 Marks
Course Outcomes:

On completion of the course, students will be able to:

- 1) Perform laboratory testing of various ingredients of concrete for determining their physical properties
- 2) Explain properties of fresh and hardened concrete and apply this knowledge on field.
- 3) Select appropriate type of concrete, admixture and chemicals for specific requirements.
- 4) Design a concrete mix of required strength and durability, for given field conditions, using suitable ingredients
- 5) Evaluate properties of construction materials viz. steel, bricks, timber, tiles etc. in laboratory for the quality assurance

SECTION-I

Unit 1: Ingredients of Concrete:- Cement
(2 Hrs)

Hot and dry manufacturing process, significance of physical properties of cement such as fineness, consistency test, initial & final setting time, soundness, compressive strength, specific gravity. Hydration of cement, chemical compounds in cement & their properties. Types of cement- ordinary Portland, Portland pozzolana, rapid hardening Portland cement, quick setting cement, sulphur resisting cement.

Unit 2: Ingredients of concrete-Coarse Aggregates, Fine Aggregates & Water
(4 Hrs)

Physical properties such as particle size distribution & fineness modulus, specific gravity & water absorption, silt content, bulking of sand, bulk density, moisture content, flakiness index, elongation index.

Water: Specifications of water to be used for concrete making.

Unit 3: Properties of fresh concrete (4 Hrs)

Types of batching, mixing, transportation, placing including pumping and compaction techniques for good quality concrete, workability of concrete and its measurements, segregation and bleeding, curing of concrete, different methods of measuring workability, temperature effects on fresh concrete.

Use of Admixtures in concrete & construction chemicals, Types of admixtures.

Unit 4: Desired properties of concrete (5 Hrs)

Strength, impermeability, Characteristic strength, compressive strength, tensile and flexure strength of concrete, tests on concrete, modulus of elasticity, effect of water cement ratio and admixture on strength properties of concrete . Concrete mixes for different strength as per IS-456-2000.

SECTION-II

Unit 5: Creep and Shrinkage (2 Hrs)

Creep and shrinkage of concrete, significance, types of shrinkage and their control, factors affecting creep.

Unit 6: Durability of Concrete (2 Hrs)

Minimum & Maximum cement content, strength & durability relationship, impact of w/c ratio on durability, permeability, Exposure to different conditions, sulphate attack, Alkali aggregate reaction, chloride attack, corrosion of steel (chloride induced).

Unit 7: Concrete Mix Design (7 Hrs)

Design Mix Concrete, nominal Mix Concrete, objectives of mix design, factors governing mix design, methods of expressing proportions ACI method, IS 10262:2009 code method, road Note No.4 method, trial mixes, and Acceptance criteria. Quality control of concrete – Factors causing variations, field control.

Unit 8: Testing of Materials (4 Hrs)

Tension test on Mild and Tor Steel, Compression test on Mild Steel & Cast Iron, Compression test on Timber (Parallel and across the grains), Shear test on Mild Steel, Brinell or Rockwell Hardness test on different metals. Flexural test & Abrasion test on flooring tiles, Water absorption, Efflorescence and Compression test on burnt Bricks

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A. Testing of cement

- (1) Consistency, (2) Fineness, (3) Setting time, (4) Specific Gravity (5) Soundness (6) Compressive Strength

B. Testing of aggregates

1. Specific Gravity & Water absorption of Coarse Aggregate & Fine Aggregate
2. Sieve analysis of Coarse Aggregate & Fine Aggregate
3. Bulk density of Coarse Aggregate & Fine Aggregate
4. Flakiness index of Coarse Aggregate
5. Elongation index of Coarse Aggregate
6. Bulking of Fine aggregate
7. Silt Content of Fine Aggregate

C. Tests on Concrete: Workability tests:

- (1) Slump test (2) Compaction Factor test (3) Vee-bee test (4) Flow table test

Strength tests:

- (1) Compressive strength test (2) Flexural strength test

D. Concrete Mix design

Proportioning of Mix (calculations): IS method and ACI method,

Proportioning as well as Experimental (Casting of mix) - Above methods can be used. At least IS method shall be demonstrated.

Experiments

1. Tension test on Mild and Tor Steel
2. Compression test on Mild Steel & Cast Iron
3. Compression test on Timber (Parallel and across the grains)
4. Shear test on Mild Steel
5. Brinell or Rockwell Hardness test on different metals
6. Flexural test & Abrasion test on flooring tiles
7. Water absorption, Efflorescence and Compression test on burnt Bricks

TEXT BOOKS

1. Concrete Technology by Gambhir, Pub.- Tata McGraw- Hill
2. Concrete Technology by M. S. Shetty, Pub.-S. Chand & Co. Ltd.
3. Concrete Technology by K. T. Krishnaswamy, Pub.- Dhanpat Rai
4. Concrete Technology by A.M. Neville, Pub.- Pearson Education Ltd.
5. Concrete: Microstructure, Properties & Materials, PK Mehta, Tata McGraw

REFERENCE BOOKS

1. Highway Materials and Pavement, Khanna & Justo, Nemchand & Bros.
2. I.S.456-2002 Code of Practice for Plain & Reinforced Concrete.
3. I.S. 10262-2019 Guidelines for Concrete Mix Design.
4. I.S. 383-1970 Specification for Coarse & Fine Aggregates from Material Sources for Concrete.
5. I.S. 1199-1939 Methods of Sampling & Analysis of Concrete.
6. I.S.2386-1963 Methods of Tests for Aggregates for Concrete
7. I.S.516-1959 Methods of Tests for Strength of Concrete
8. I.S. codes for Testing of different Materials.



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

Teaching Scheme

Lectures – 2 Hrs/Week, 2 Credits

Drawing – 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

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 and its 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 public buildings.
4. Draw neat perspective view drawings of an object and given small residential building.
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 be drafted 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) – I, Semester- III
CE35C: STRUCTURAL MECHANICS-I

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Examination Scheme

ISE – 30 Marks

ESE –70 Marks

Course Outcomes:

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

1. Employ the knowledge of structural mechanics to depict the behavior of structures.
2. Identify principal planes and find principal stresses in beams and effect of combined bending and torsion
3. Identify all potential failure modes of an item
4. Draw Shear force diagrams and bending moment diagrams of statically determinate beams.
5. Evaluate bending and shear stresses in beams.
6. Analyse the behavior of structure under moving load using Influence line diagrams

Section-I

Unit 1: Simple stress & strains

(7 Hrs)

Scope of the subject, Behavior of Engineering materials under axial loading, Simple stresses and strains, Hooke's law, Stress strain relations for ductile and brittle material, elastic constants, working stress, Factor of safety, Stresses & strains in three dimensions (linear, lateral, shear and volumetric), normal and shear stresses, Complementary shear stress, relation between elastic constants, assumption in elastic analysis, St. Venant's principle. Composite sections under axial loading: compound bars,

Unit 2: Principal stresses and strains

(6 Hrs)

Principal stresses and strains for 2-D Problems-Normal and shear stresses on inclined plane. Principal plane and Principal stresses, Principal strains, Principal stresses in beams, Stress trajectories.

Unit 3: Combined Bending and Torsion (5 Hrs)

Combined bending, torsion and thrust-shaft subjected to simultaneous bending, torsion and thrust. Principal stresses, equivalent torque and equivalent moment for solid circular shaft.

Unit 4: Theories of Elastic Failures (5 Hrs)

Maximum principal stress, Maximum Principal strain, Maximum shear stress, Total strain energy and distortion energy.

Section -II

Unit 5: Shear Force and Bending Force (7 Hrs)

Analysis of statically determinate beams: S.F. and B.M. diagrams for beams subjected to point load (inclined load also), uniformly distributed load, uniformly varying load and couples. Relation between intensity of load, shear force and bending moment.

Unit 6: Bending Stresses in Beams (6 Hrs)

Simple bending theory, pure bending of beams, flexure formula, moment of resistance of different cross sections, built-up sections, Rectangular, Circular and flanged sections.

Unit 7: Shear Stresses in Beams (5 Hrs)

Distribution of shear stresses in beams of various commonly used sections such as rectangular, triangular, circular, T and I sections.

Unit 8: Influence Line Diagrams (5 Hrs)

Influence line diagrams, Muller-Breslau principle, Application to statically determinate simple and compound beams to determine support reaction, S.F. & B.M. at any section.

Note: - Term work shall consist of at least one assignment on each unit of syllabus

TEXT BOOKS

- 1) Strength of Materials by R. K. Bansal, Laxmi Publications
- 2) Strength of Materials by Bhavikatti, Vikas Publications, New Delhi.
- 3) Strength of Materials by Ramamurtham, Dhanpat Rai & Sons, New Delhi
- 4) Strength of Materials by R. S. Khurmi, S. Chand Publication, New Delhi
- 5) Mechanics of Structures (Vol. I & II) by S. B. Junnarkar, Charator Book House, Anand.
- 6) Strength of Materials by R. K. Rajput, S. Chand Publication, New Delhi
- 7) Strength of Materials, D.S. Bedi, Khanna Publishing House
- 8) Strength of Materials, R. Subramanian, Oxford University Press
- 9) Strength of Materials, R.K. Bansal, Laxmi Publications

REFERENCE BOOKS

1. Analysis of Structures (Vol- I& II) by Vazirani and Ratwani, Khanna Pub., Delhi.
2. Structural Analysis by C. S. Reddy, Tata Mc. Graw Hill, New Delhi.
3. Introduction to Mechanics of Solids by E. P. Popov. Prentice- Hall of India.
4. Elementary Structural analysis by Norris and Wilbur Mc-Graw Hill, New York.
5. Elements of Strength of Materials, (Recent Edition) by S. Timoshenko and J. Young
Affiliated East-West
6. Strength of Materials by F.L. Singer, Harper and Row Pub., New York.
7. Mechanics of Materials by Gere and Timoshenko, C.B.S. Delhi.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CE410 L: LAB PRACTICE

Teaching Scheme

Practicals – 2 Hrs/Week, 1 Credit

Examination Scheme

ICA – 25 Marks

‘Lab Practice’ consists of learning suitable Computer Aided Drawing and Design (CADD) software tool and obtaining hands on experience of working with the software by the student. The performance of the student will be assessed on the basis of proficiency of the student in using CADD Software for Simple Civil Engineering Drawings from Subject ‘**Building Construction and Drawing**’ at S.Y. B. Tech. Civil Engineering, Semester- III, of B. Tech.

Objectives:

- 1) To teach students to read, construct and understand basic Civil engineering drawings.
- 2) To educate students to present fundamentals of graphics and computer aided drafting required for developing functional skills in Computer Aided Design and Drafting (CADD).
- 3) To provide students with adequate knowledge and experience in preparing Civil Engineering drawings using CADD software tool.
- 4) To help students acquire the skills pertinent to the production of properly detailed, formatted and dimensioned Civil Engineering drawings.

Course Outcomes:

On completion of this course, students will be able to develop and draw using CADD Software tool:

- 1) Architectural floor plan of a small residential building
- 2) The geometric constructions, multi-view, sectional view, dimensioning and detail drawings of typical 2-D engineered objects.
- 3) Views like elevation, section, furniture plan for a small residential building
- 4) Detailed formatted and dimensioned Civil Engineering drawings.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE41: ENVIRONMENTAL ENGINEERING-I

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

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 CONTINUOUS 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

Lectures – 2 Hrs/Week, 2 Credits

Drawing – 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 15 Marks

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 of India.

Dimensions & Space requirement in relation to body measurements. Space design for 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 of various 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
CE43: STRUCTURAL MECHANICS-II

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Tutorial – 1 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

ESE –70 Marks

ICA – 25 Marks

Course Outcomes:

On completion of this course the students will be able to

1. Employ the knowledge of structural mechanics to describe the behavior of structures under combined direct and bending and also behavior of long columns.
2. Evaluate slope and deflection in beams and analysis of 3 hinged arch
3. Analyze determinate and indeterminate structural members subjected to different types of loadings.
4. Discretize simple structures; identify static and kinematic degrees of freedom
5. Analyze beams, trusses and frames for joint displacements, and forces in members, by force method and displacement method.
6. Select and use appropriate application software for structural analysis.

SECTION -I

Unit 1: Combined Direct and Bending Stresses

(6 Hrs)

Eccentric load on short columns, Kern of a section, Eccentricity of load about both axes of section. Chimney subjected to wind pressure, Simple problems on dams and retaining walls.

Unit 2: Behaviour of Axially Loaded Long Columns

(5 Hrs)

Effective length, Slenderness ratio, Crippling load by Euler's and Rankine's formula, assumptions, limitations.

Unit 3: Slope and Deflection of Determinate Beams

(8 Hrs)

Moment area method, Conjugate beam method. Deflection of beams by strain energy method

Unit 4: Three Hinged Arches

(4 Hrs)

Concepts, types of arches, analysis of parabolic with supports at same and different levels, semi-circular arches. Determination of horizontal thrust, radial shear and normal thrust.

SECTION-II

Unit 5: Introduction of Indeterminate Structures (3 Hrs)

Concept of Indeterminate structures, Degree of Static and Kinematic indeterminacy, Degrees of freedom for various types of structures, Methods of analysis and comparison of force and displacement methods.

Unit 6: Moment Distribution Method (6 Hrs)

Concept of stiffness of a member, Relative stiffness, Distribution factors, concept of moment distribution, Application to beams, non-sway portal frames.

Unit 7: Flexibility method for beams and frames (6 Hrs)

Derivation of flexibility equation, flexibility coefficients, Development of flexibility matrix, Analysis of beams and portal frames ($DSI \leq 3$).

Unit 8: Stiffness Method for Beams and Frames (7 Hrs)

Concept of stiffness, linearly elastic structures, derivation of Stiffness equation, Stiffness Coefficients, Development of stiffness matrix, Analysis of beams ($D.K.I. \leq 3$), Sinking of supports. Analysis of Portal frames ($D.K.I. \leq 3$).

INTERNAL CONTINUOUS ASSESSMENT (ICA)

1. It shall consist of at least one assignment on each topic.
2. Results of few assignment problems to be verified by using application software.

TEXT BOOKS

- 1) Mechanics of Structures (Vol. II) -S.B. Junnarkar, Charator Book Publishing House.
- 2) Structural Analysis- Negi and Jangid, Tata McGraw-Hill Publishing Company Ltd., New Delhi
- 3) Analysis of Structures (Vol. II) - Vazirani and Ratwani, Khanna Pub., Delhi
- 4) Structural Analysis- Matrix Approach- Pandit & Gupta, Tata McGraw-Hill Publishing Company Ltd., New Delhi
- 5) Structural Analysis – II by Bhavikatti, Vikas Publications, New Delhi
- 6) Structural Analysis, R. Agor, Khanna Publishing House

- 7) Mechanics of Materials, B.C. Punmia & A.K. Jain, Laxmi Publications
- 8) Advanced Structural Analysis, A.K. Jain, Nem Chand Bros.
- 9) Theory of Structures, Punmia, Laxmi Publications

REFERENCE BOOKS

- 1. Structural Analysis by C. S. Reddy, Tata Mc. Graw Hill, New Delhi.
- 2. Matrix Analysis of Structures- Gere and Weaver, CBS Publishers, New Delhi
- 3. Indeterminate Structural Analysis-C. K. Wang, Tata McGraw-Hill Publishing Company Ltd., New Delhi
- 4. Theory of Structures- Timoshenko & Young, Tata McGraw-Hill Publishing
- 5. Structural Analysis-Sixth Ed.,- R. C. Hibbeler - Dorling Kindersley (India) Pvt. Ltd., Pearson Education, New Delhi.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE44: ENGINEERING MATHEMATICS - III

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Tutorial – 1 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

ESE – 70 Marks

ICA – 25 Marks

Course Outcomes:

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

- 1) Solve higher order linear differential equation with constant coefficient
- 2) Solve partial differential equation of first order
- 3) Express a function in terms of sine and cosine components so as to model simple periodic functions.
- 4) Apply Laplace and inverse Laplace transforms for solving linear differential equations.
- 5) Find the relation between two variables for the given data using regression
- 6) Sketch and explain various probability distribution functions

SECTION – I

Unit 1: Higher order linear differential equations and applications (9 Hrs)

Basic definition, differential operator, complimentary functions, particular integral, Shortcut methods for standard functions like e^{ax} , $\sin(ax + b)$, $\cos(ax + b)$, x^m , $e^{ax}V$ and xV , particular integral by general method (without method of variation of parameters) for other functions. Homogeneous Linear Differential equations, Legendre's Linear equations, Civil Engineering Applications

Unit 2: First Order Partial Differential equations (7 Hrs)

Non – Linear partial differential Equations of Type I $f(p, q) = 0$, Type II $f(p, q, z) = 0$, Type III $f_2(p, x) = f_2(q, y)$, Linear partial differential equation Lagranges method. Solution of partial differential equation by method of separation of variables.

Unit 3: Fourier series (6 Hrs)

Introduction, Definition, Euler's formula, Fourier series of periodic functions with period 2π and $2L$. Dirichlet's theorem (Only statement), even and odd functions, half range sine and cosine series.

Section II

Unit 4: Laplace transform

(9 Hrs)

Definition, Laplace transform of standard functions, properties- first shifting, change of scale, multiplication of power t and division by t , Laplace transform of derivative and integral, Inverse Laplace transform - properties of inverse Laplace transforms- linear property, first shifting theorem, partial fraction, inverse transform of logarithmic & inverse trigonometric functions and convolution theorem, solution of differential equations by Laplace transform.

Unit 5: Statistics

(7 Hrs)

Fitting of curve- Least squares principle , fitting of straight line , fitting of second degree parabola, fitting of curves of the form $y = ab^x$, $y = ae^{bx}$, $y = ax^b$, Coefficient of correlation by Karl Pearson's method and lines of regression of bivariate data.

Unit 6: Probabilit

(7 Hrs)

Random variable, discrete and continuous random variable, Probability density function, Binomial, Poisson and Normal distributions.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall consist of minimum six to eight assignments based on entire curriculum

TEXT BOOKS

1. A textbook of Applied Mathematics Vol. II and Vol. III, J.N. and P.N. Wartikar, Vidyarthi Grah Prakashan, Pune.
2. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publications, Delhi.
3. A Textbook of Applied Mathematics, N.P. Bali, Ashok Saxena and N.Ch. S.N. Iyengar, Laxmi Publications, Delhi.
4. Advanced Engineering Mathematics, Kreyzig-John Wiley & SMS, New York.
5. Advanced Engineering Mathematics, Chandrika Prasasd & Reena Garg, Khanna Publishing
6. Higher Engineering Mathematics, Ramana B.V., Tata McGraw Hill
7. Advanced Engineering Mathematics (ISBN:9788120336094), Sashty, PHI
8. Discrete Mathematics and Its Applications, S. Chakraborty & B.K. Sarkar, Oxford

REFERENCE BOOKS

1. Advanced Engineering Mathematics, Peter O'Neil , Cengage Learning.
2. Engineering Mathematics, Srimanta Pal, Subodh Chandra Bhunia, Oxford University Press.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE45: ENGINEERING GEOLOGY

Teaching Scheme

Lectures – 2 Hrs/Week, 2 Credits

Practicals– 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

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 structure of 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. Gupta -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
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CE48: COMPUTER PROGRAMMING & NUMERICAL METHODS

Teaching Scheme

Lectures – 2 Hrs/Week, 2 Credits

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

POE –50 Marks

ICA – 25 Marks

Course Outcomes:

On completion of the course, the students will be able to develop computer programs for

1. Various Civil Engineering Problems
2. Matrix operations, which are necessary for structural analysis.
3. Calculating Roots of equation, Numerical Integration, ordinary differential equations and their various applications in Civil Engineering.
4. Carrying out statistical analysis of data for various statistical methods, with applications from Civil Engineering domain.

Unit 1: Revision of C Programming concepts

(6 Hrs)

Techniques for problem solving using Algorithm, Flow charts and Building blocks of C Program.

Character set in C, Data types in C, Operators in C, Decision control structure, Loop control structure, Case control structure.

Civil Engineering based problems and programs which is using Decision control structure, Loop control structure and case control structure

Functions in C – Functions using passing by parameters and passing by value. Civil Engineering based problems and programs using Functions' in C

Unit 2:

(5 Hrs)

Arrays in C - Declaration and initialization of one dimensional array, accessing elements, array handling. Declaration and initialization of two dimensional array, accessing elements, array handling.

Matrix operations on computer: Multiplication and inversion using Cramer's rule, Solution of simultaneous equations using Gauss elimination method.

Civil Engineering based problems and programs using matrix operations.

Unit 3: Roots of equation

(5 Hrs)

Trial and error method –

Bisection method; Derivative based methods - Newton Raphson method.

Unit 4: Numerical integration method

(4 Hrs)

Simpsons rule and Trapezoidal rule.

Civil Engineering based problems and programs using above Numerical methods.

Unit 5: Solution of ordinary differential equation

(5 Hrs)

Euler's Method, Modified Euler's method. Runge Kutta method.

Civil Engineering based problems and programs using above Numerical methods.

Unit 6: Statistical analysis

(5 Hrs)

Mean, standard deviation and Median, Least square method, Regression analysis –Linear, parabolic curve fitting.

Civil Engineering based problems using statistical analysis.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) shall consist of at least 12 programs with flow charts, source listing, input and outputs based on above topics. Programming has to be done in 'C' language.

(NOTE: All the units described above are to be taught with computer applications based on civil engineering problems.)

TEXT BOOKS

- 1) Numerical Methods: E. Balaguruswamy, Tata Mc-Graw Hill Publications.
- 2) Computer Programming and Numerical methods- Revised edition with C- N. Datta
- 3) Numerical Methods- S. Arumugam, A. Thangapandi Isaac, A. Somasundaram, Scitech Publishers
- 4) Numerical Methods- Grewal, Khanna Publishers.
- 5) Let us C-Yashawant Kanetkar, BPB Publications New Delhi
- 6) Programming with C-Schaum Outline Series, Tata-McGraw Hill Publications
- 7) Introductory Methods of Numerical Analysis, Sashtry, PHI

REFERENCE BOOKS

1. Numerical methods for engineers, Volume 1, Steven C. Chapra, Raymond P. Canale, McGraw-Hill Publications.
2. Numerical Methods for Scientific and Engineering Computation-M. K. Jain,
3. S. R. K. Iyengar, R. K. Jain- New Age International