

**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR**



FACULTY OF SCIENCE & TECHNOLOGY



Syllabus for

S.Y. B. Tech. Civil Engineering - Part-I & II

w. e. f. Academic Year 2019-2020

Choice Based Credit System

**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR**

FACULTY OF SCIENCE & TECHNOLOGY

**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:

1. Graduates will be prepared with strong engineering fundamentals leading to excellent performance in professional career in planning, designing, construction, operation & maintenance of the built environment and global infrastructure that meet the societal needs.
2. Graduates will exhibit strong technical ability to create and synthesize data using relevant tools and concepts, for providing sustainable solutions to civil engineering problems and projects.
3. Graduates will exhibit excellent interpersonal communication and resource management skills as leaders in the civil engineering profession while working as a part of multidisciplinary team.
4. Graduates will be prepared with sound foundation in mathematics, science and in Civil Engineering to prepare them for higher studies and research.
5. Graduates will possess a breadth of knowledge and engage themselves in the life-long learning to meet challenges of globalization.
6. Graduates will have a sense of responsibility, respect towards society & its heritage and will follow the professional ethics.

Program Outcomes (POs)

B. Tech. (Civil Engineering)

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

- a) Students will demonstrate the basic knowledge of mathematics, science and engineering.
- b) Students will demonstrate ability to design and conduct experiments, interpret & analyze data and report results.
- c) Students will demonstrate an ability to design a system, component, or a process that meets desired specifications within realistic constraints.
- d) Students will demonstrate an ability to function in multidisciplinary team.
- e) Students will demonstrate the ability to identify, formulate and solve Civil engineering problems.
- f) Students will demonstrate the understanding of their professional Responsibilities ethically.
- g) Students will be able to communicate effectively to all concerned.
- h) Students will have the confidence to apply engineering solutions in global and social context.
- i) Students will recognize the need for and an ability to engage in life-long learning.
- j) Students will have broad education for understanding the impact of engineering solutions in a global, economic, environmental, and societal context.
- k) Students will possess an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PROGRAM SPECIFIC OUTCOMES (PSOs)

B. Tech. Civil Engineering

- a) Graduates will be able to survey, conduct geo-technical investigations, plan, analyse, design, estimate and construct residences, public buildings, industrial buildings, townships and infrastructural projects by adopting appropriate construction methods.
- b) Graduates will analyse and design the water resources systems, municipal and industrial waste treatment plants with due consideration to pollution free environment.
- c) Graduates will use appropriate application software, develop skills necessary for professional practice as a Civil Engineer and prepare themselves for competitive examinations for higher education & for public service commissions.





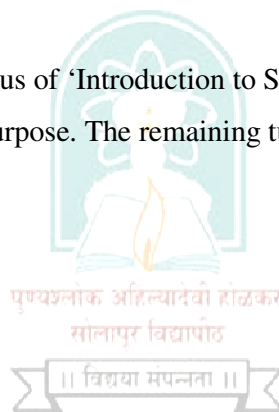
PUNYASHLOK AHILYADEVJI HOLKARSOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology
Credit System structure of S. Y. B. Tech. Civil Engg.- I, Semester- III, (W.E.F. 2019-2020)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
CV211	Concrete Technology, Material Testing & Evaluation	3	-	-	-	3	30	70	-	100
CV212	Surveying & Geomatics	3	-	-	-	3	30	70	-	100
CV213	Building Construction & Drawing	2	-	-	-	2	30	70	-	100
CV214	Introduction to Fluid mechanics	3	-	-	-	3	30	70	-	100
CV215	Engineering Geology	2	-	-	-	2	30	70	-	100
CV216	Introduction to Solid Mechanics	3	1*	-	-	4	30	70	-	100
CV217	Energy Science & Engineering	1	-	-	-	1	25	-	-	25
	Total	17	1	-	-	18	205	420	-	625
	Laboratory/Drawings							POE	OE	
CV211	Concrete Technology, Material Testing & Evaluation	-	-	2	-	1	-	-	-	25
CV212	Surveying & Geomatics	-	-	2	-	1	-	25	-	25
CV213	Building Construction & Drawing	-	-	-	2	1	-	-	-	25
CV214	Introduction to Fluid mechanics	-	-	2	-	1	-	25	-	25
CV215	Engineering Geology	-	-	2	-	1	-	25	-	25
CV218	Lab practice	-	-	2	-	1	-	-	-	25
	Total	-	-	10	-	6	-	75	150	225
	Grand Total	17	1	10	2	24	205	495	150	850
	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) Term work assessment: Term Work assessment 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 Engineering to become eligible for award of degree.
- (4) *Laboratory tests and experiments included in syllabus of 'Introduction to Solid Mechanics' shall be conducted in laboratory. Just essential number of tutorial hours, be used for this purpose. The remaining tutorial turns shall be used for problem solving in the subject.





PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science & Technology

Credit System structure of S. Y. B. Tech. Civil Engg., Semester – IV, W. E.F. 2019-2020

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
CV221	Water Supply Engineering	3	-	-	-	3	30	70	-	100
CV222	Building Planning & Design	3	-	-	-	3	15	35	-	50
CV223	Hydraulic Engineering	3	-	-	-	3	30	70	-	100
CV224	Open Elective-I: ICT for development	2	-	-	-	2	50	-	-	50
CV225	Structural Analysis	3	-	-	-	3	30	70	25	125
CV226	Engineering Mathematics-III	3	1	-	-	4	30	70	25	125
	Total	17	1	-	-	18	185	315	50	550
	Laboratory/Drawings:							POE	OE	
CV221	Water Supply Engineering	-	-	2	-	1	-	-	-	25
CV222	Building Planning & Design	-	-	-	2	1	-	75	-	50
CV223	Hydraulic Engineering	-	-	2	-	1	-	-	-	25
CV224	Open Elective- I : ICT for development	-	-	2	-	1	-	-	-	50
CV227	Computer Programming & Numerical Methods	2	-	2	-	3	-	50	-	75
	Total	2	0	8	2	7	-	125	175	300
	Grand Total	19	1	8	2	25	185	415	225	850
	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) Term work assessment: Term Work assessment 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 Engineering to become eligible for award of degree.





**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR**

S. Y. B. Tech. (Civil Engineering) – I, Semester- III

**CV211: CONCRETE TECHNOLOGY, MATERIAL TESTING
& EVALUATION**

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 Objectives:

- 1) To acquaint students with properties of various ingredients of concrete
- 2) To introduce students to properties of fresh and hardened concrete
- 3) To educate students about admixtures in concrete & construction chemicals
- 4) To impart knowledge of various methods of concrete mix design.
- 5) To educate students about testing of various construction materials.

Course Outcomes:

On completion of the course students will be able to:

- 1) Carry out testing of various ingredients of concrete for mix design of concrete
- 2) Select appropriate type of concrete, admixture and chemicals for specific requirements.
- 3) Design a concrete mix of required strength and durability, for given field conditions, using suitable ingredients
- 4) To evaluate properties of construction materials viz. steel, bricks, timber, tiles etc. in laboratory for the quality assurance

Unit 1: Ingredients of Concrete:- Cement

(5 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 and Water (6 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.

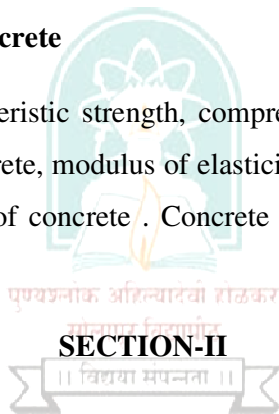
Unit 3: Properties of fresh concrete (6 Hrs)

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.



Unit 5: Creep and Shrinkage (4 Hrs)

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

Unit 6: Durability of Concrete (4 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

(10 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

(5 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) 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) Highway Materials and Pavement, Khanna & Justo, Nemchand & Bros.
- 5) Concrete: Microstructure, Properties & Materials, PK Mehta, Tata McGraw



REFERENCE BOOKS

- 1) Concrete Technology by A.M. Neville, Pub.- Pearson Education Ltd.
- 2) I.S.456-2002 Code of Practice for Plain & Reinforced Concrete.
- 3) I.S. 10262-2009 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. codes for Testing of different Materials.



**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CV212 – 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-25 Marks

ICA – 25 Marks

Course Objectives:

1. To make student understand level instrument setup, theory, field procedures and computations, for vertical control survey accuracy.
2. To introduce to student basics of Distances, angles, azimuths and bearing measurements
3. To make student derive traversing and traverse computations, for horizontal control survey accuracy.
4. To make student understand Total Station instrument setup, field procedures and computations, including instrument technical specifications and expected survey precision using the instrument.
5. To enable student understand working in a team and leading the team.

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) **Unmanned Aerial Vehicle (Drone)** -Introduction
- c) **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
CV213: BUILDING CONSTRUCTION AND DRAWING

Teaching Scheme

Lectures – 2 Hours/week, 2 Credits

Drawings – 2 Hour/week, 1Credit

Examination Scheme

ESE – 70 Marks

(Theory Paper of 4 Hours duration)

ISE – 30 Marks

ICA- 25 Marks

Course Objectives:

- 1) To introduce students to functional requirements of buildings.
- 2) To introduce students to Scale and various types of Scale.
- 3) The impart knowledge of various building components such as door, windows, arches, floors etc along with its functions and method of construction.
- 4) To explain methodology adopted for design of various types of staircases.
- 5) To enable students to draw perspective view of a building.
- 6) To make the student conversant with various building finishes, ventilation and air conditioning principles

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 and Foundation (5 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, Load bearing 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 of floorings.
- Roofing and types of roofs, Selection factors for Roofing materials

SECTION –II**Unit 5: Perspective Drawing****(3 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, and Air Conditioning. (5 Hrs)

- Lighting: - Definition and objective of lighting, Principles of Good lighting, Day lighting.
- 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**(4 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
CV214: INTRODUCTION TO FLUID MECHANICS

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

ESE – 70 Marks

ISE - 30 Marks

ICA- 25 Marks

ESE (POE) - 25 Marks

Course Objectives

- 1) To study basics of Fluid Mechanics, Fluid properties and concept of submerged & floating structure in a static fluid
- 2) To study fluid dynamics and fluid kinematics and types of flows.
- 3) To make use of principles of continuity, momentum, and energy as applied to fluid motions.
- 4) To apply fundamental principles of fluid mechanics for the solution of practical civil engineering problems.
- 5) To know characteristic of turbulent flow and flow through pipes.

Course Outcomes

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

- 1) Comprehend technical properties of fluids, their estimations and analysis for civil engineering applications
- 2) Apply kinematics and dynamics of flow for solving Civil engineering problems
- 3) Quantify water flow through orifice, mouth piece and estimate losses
- 4) Select and apply knowledge for conveyance of water through close conduits channels
- 5) Analyze fluid flows and design pipe networks.

SECTION - I

Unit 1: FLUID PROPERTIES

(7 Hrs)

Scope and Importance of Fluid Mechanics, Definition of Fluid, Difference between Solid, Liquids and Gas, 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, Cavitations. Classification of fluids, Problems involving use of above Fluid Properties. Basic concept applicable to fluid mechanics.

Unit 2: FLUID STATICS

(9 Hrs.)

Pressure variation in static fluid, PASCAL's law, Units and scale of pressure measurement- Atmospheric pressure, Absolute pressure, Gauge pressure, and Vacuum pressure, Piezometer, U-Tube manometer, Single column manometer, U-tube differential manometer, Inverted U-tube differential manometer, micro manometers, Mechanical pressure gauges.

Total pressure and center of pressure, pressure diagram, Total pressure on plane surfaces and curved 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 –theoretical and experimental method, Oscillation of floating body

Fluids in relative equilibrium, Static fluid subjected to uniform linear acceleration, Liquid containers subjected to constant horizontal acceleration, Liquid containers subjected to constant vertical acceleration.

Unit 3: FLUID KINEMATICS

(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 flow-Steady and unsteady flow, Uniform and non-uniform flow, Laminar and turbulent flow Rotational

and irrotational flow, Compressible-Incompressible flow, Rotational and Irrotational flow, Subcritical, critical and Supercritical flow, Compressible and Incompressible flow, One, Two and three dimensional flow, circulation and vorticity, Velocity potential and stream function, flow net, Equipotential Line, Methods of drawing flow net, uses and limitations of flow net.

SECTION-II

Unit 4: FLUID DYNAMICS

(7 Hrs)

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 5: FLOW THROUGH PIPES

(7 Hrs)

Classification of Flows:

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

Turbulent Flow – Velocity Distribution and Shear Stresses in turbulent flow, Prandtl's mixing length theory, Nikuradse's Experiment, Introduction to Moody's Chart, Nomographs and Pipe Diagram and Concept of turbulent flow in smooth and rough pipes.

Energy Losses in pipe flow (Major and Minor Losses): Darcy Weisbach Equation, Factors affecting friction, Concept of Equivalent length and Equivalent diameter of pipe, Hydraulic power transmission by pipe.

Unit 6: PIPE NETWORKS and BOUNDARY LAYER ANALYSIS

(8 Hrs)

Pipes in Series and Parallel, Concept of Siphon and two reservoir problem and Hardy Cross method for solving pipe network, concept of water hammer and surge tank, its function and location and use. Rigid and Elastic water column theory.

Boundary Layer Theory- Development of Boundary layer on flat plate, displacement, momentum and energy thickness, laminar turbulent and transitional boundary layer, laminar sub layer, local and mean drag coefficient, Hydro dynamically smooth and rough boundaries, Boundary layer Separation and its control, Drag and Lift coefficients.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

(A) Measurement of discharge: Calibration of measuring tank, Measurement of pressure (Piezometer, Manometers, Pressure gauges) Use of hook or point gauge.

(B) At least six experiments from the following.

- 1) Verification of Bernoulli's Theorem.
- 2) Determination of metacentric heights.
- 3) Plotting of streamlines, flow nets.
- 4) Calibration of an orifice/mouthpiece.
- 5) Calibration of Venturimeter/orifice meter.
- 6) Study of factors affecting coefficient of friction for pipe flow (at least for two different material and two different diameters)
- 7) Determination of loss of head due to
 - i) Sudden expansion,
 - ii) Contraction,
 - iii) Elbow,
 - iv) Bend,
 - v) Globe valve etc.
- 8) Study of a laminar flow.
- 9) Study of Moody's charts, nomograms for pipe design.
- 10) Simple computer programs. (At least 3 based on the syllabus).

TEXT BOOKS

1. Fluid Mechanics – A. K. Jain-Khanna Pub., Delhi.
2. Fluid Mechanics – 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 – R. W. Fox, P.J. Prichard, A. T. McDonold- Wiley India.
6. Fluid Mechanics- Sadhu Singh, Khanna Books, Delhi
7. Fluid Mechanics- R.K. Bansal, Laxmi Publications
8. Fluid Mechanics, Hydraulics and Hydraulic Machines, K.R. Arora, Standard Publishers Distributors

REFERENCE BOOKS

1. Fluid Mechanics – V. I. Streeter and E. B. Wile – McGraw – Hill International Book Co., Auckland.
2. Elementary Fluid Mechanics – H. Rouse – Toppan C. Ltd., Tokyo.
3. Fluid Mechanics – Shames – McGraw – Hill International Book Co.
4. Fluid Mechanics –Munson, Young- Wiley India.
5. Mechanics of Fluids – M.C. Potter, Wiggert, Ramadan- Cengage Le



PUNYASHLOK AHILYADEVI HOLKAR

SOLAPUR UNIVERSITY, SOLAPUR

S. Y. B. Tech. (Civil Engineering) – I, Semester- III

CV215: ENGINEERING GEOLOGY

Teaching Scheme

Lectures – 2 Hrs/Week, 2 Credits

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

ESE – 70 Marks

ISE - 30 Marks

ICA- 25 Marks

ESE (POE) - 25 Marks

Course Objectives:

- 1) To identify the main and most common igneous, sedimentary and metamorphic rocks encountered by foundations and construction.
- 2) To identify and define the main morphological and geological characteristics as shown on maps.
- 3) Analyse geological parameters important in geotechnical engineering studies.
- 4) To establish and describe topographical and geological sections,
- 5) Identify potential geological hazards such earthquakes, landslides, flooding to various civil engineering structures and ways of preventing and dealing with them

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:

(3 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:

(8 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:

(4 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:

(4 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:

(3 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:

(3 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
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CV216: INTRODUCTION TO SOLID MECHANICS

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Tutorial – 1 Hr/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

ESE –70 Marks

Course Objectives:

1. To comprehend about of various elastic constants and their relationships to evaluate stresses and strains in the material.
2. To impart knowledge of the behavior of structural members under various types of external loadings and calculation of their strength in tension, compression, shear, bending and torsion.
3. To educate the students about Principal planes and Principal stresses and strains, due to combination of axial forces, bending moments and shear.
4. To analyze statically determinate beams to calculate shear force and bending moment under different loading condition
5. To impart knowledge of drawing 'Influence line diagrams' for shear force, bending moment on a girder due to rolling loads.

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.
3. Draw Shear force diagrams and bending moment diagrams of statically determinate beams.
4. Evaluate bending and shear stresses in beams.
5. Analyse the behavior of structure under moving load using Influence line diagrams

Section-I

Unit 1: (7 Hrs)

Scope of the subject, Behaviour 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: (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: (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: (5 Hrs)

Theories of elastic failures- Maximum principal stress, Maximum Principal strain, Maximum shear stress, Total strain energy and distortion energy.

Section -II

Unit 5: (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: (6 Hrs)

Bending Stresses: 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:**(4 Hrs)**

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

Unit 8:**(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: - Tutorial 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
CV217: ENERGY SCIENCE & ENGINEERING**

Teaching Scheme

Lectures – 1 Hrs/Week, 1 Credit

Examination Scheme

ISE - 25 Marks

Course Objectives:

To provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.

- 1) To explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear.
- 2) To emphasize energy conservation methods from Civil Engineering perspective.
- 3) To lay a good foundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.

Course Outcomes:

Upon successful completion of the course, the students will be able to:

- 1) List and explain the main sources of energy and their primary applications nationally and internationally
- 2) Understand effect of using different energy sources on the environment and climate
- 3) Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
- 4) List and describe the primary renewable energy resources and technologies.
- 5) Understand the Engineering involved in projects utilising these energy sources

Syllabus:**Unit 1: Introduction to Energy Science:****(2 Hrs)**

Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

Unit 2: Energy Sources:**(3 Hrs)**

Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration e.g. Pumped storage hydro power projects.

Unit 3: Energy & Environment:**(3 Hrs)**

Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability, How future energy use can be influenced by economic, environmental, trade, and research policy.

Unit 4: Civil Engineering Projects connected with the Energy Sources:**(3 Hrs)**

Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings.

Unit 5: Engineering for Energy conservation:**(3 Hrs)**

Concept of Green Building and Green Architecture; Green building concepts , LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption.

Text/Reference Books:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaia
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
5. Ristinen, Robert A. Kraushaar, Jack J. A. Kraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
6. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company
8. Energy Technology, O.P. Gupta, Khanna Book Publishing Co. (P) Ltd., Delhi
9. Energy Engineering & Management, Chakrabarti A., PHI Publications.
10. Related papers published in international journals





**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CV218: Lab Practice**

Teaching Scheme

Practical – 2 Hrs/Week, 1 Credit

Examination Scheme

ICA – 25 Marks

Course Objectives:

- 1) To teach students to read, construct and understand basic Civil engineering drawings.
- 2) 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.

‘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. Civil Engineering Program.



PUNYASHLOK AHILYADEVI HOLKAR

SOLAPUR UNIVERSITY, SOLAPUR

S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CV221: WATER SUPPLY ENGINEERING

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Practicals- 2 Hrs/Week, 1 Credit

Examination Scheme

ISE – 30 Marks

ESE –70 Marks

ICA-25 Marks

Course Objectives:

1. To acquaint the students with drinking water quality standards and forecast water demands.
2. To study the various units of water treatment plants, treatment procedures and sequencing of water treatment units for various sources of water.
3. To enable the students to carry out design of water distribution systems and appurtenances using appropriate methods.
4. To acquaint the students with various water supply systems, and their operation and maintenance.

Course Outcomes

Upon successful completion of course the student 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
5. Identify operation and maintenance problems in water supply systems and suggest suitable solutions.

SECTION I

Unit 1: Quantity and Quality of Water

(6 Hrs)

Sources of water, Quality & Quantity of water sources, Intake work, Demand of water, factors affecting demand, Fluctuation in water demand and its effect, Design period, Population forecast. Calculations for fire demand, Water quality parameters, characteristics and their significance, Drinking water quality standards.

Unit 2: Primary Treatment Units

(8 Hrs)

- a. **Water Treatment:** Principles of water treatment operations and processes, water treatment flow sheets.
- b. **Aeration:** principle and concepts, necessity, methods, Removal of test and odor
- c. **Sedimentation:** Plain and chemical assisted- principle, efficiency of an idle settling basin, settling velocity, types of sedimentation tanks, design of sedimentation tanks, introduction and design of tube settlers.
- d. **Coagulation and flocculation:** Principle of coagulation, common coagulants, alum and ferric salts, introduction to other coagulants aids like bentonite clay, lime stone silicates and Polyelectrolytes, introduction to natural coagulants, Concept of Flocculation chamber, Design of Clari-flocculator.

Unit 3: Secondary Treatment Units

(9 Hrs)

- a. **Filtration:** Theory of filtration, mechanism of filtration, filter materials, Types: Rapid, Gravity, Pressure filter, Multimedia and Dual media filters, components, Under drainage system, Working and cleaning of filter, Operational troubles, Design of rapid and gravity filters.
- b. **Disinfection:** Mechanisms, factors affecting disinfection, Types of disinfections, Types and methods of chlorination, Break point chlorination, Bleaching powder chlorination.

- c. **Demineralization methods:** Lime- soda, Ion-Exchange, Reverse Osmosis, Ultra filtration and Electro dialysis.
- d. **Fluoridation and Defluoridation**

SECTION II

Unit 4: Conveyance of Water (8 Hrs)

Transmission of water, pumping and gravity mains, choice of pipe materials, stresses in pipes, economic size of conveying main.

Distribution reservoir, service storage, necessity, location, and Design (head and capacity) requirements.

Unit 5: Distribution of Water (9 Hrs)

Water distribution systems, method of distributing water, system configuration, appurtenances, basic system requirements, hydraulic analysis head balance method, quantity balance method, equivalent pipe concept,

Unit 6: Maintenance of water supply System (5 Hrs)

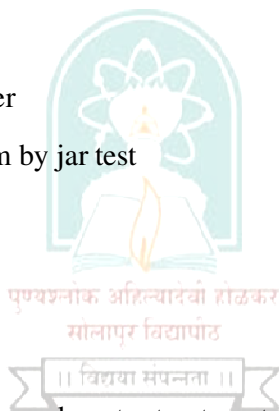
Operation & Maintenance of conveyance system, Types of Corrosion and control measures. Maintenance of water distribution systems, leak detection, variations in Water quality and pressure distribution systems. Water pollution and control act -Terminology and significance

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. p^H 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) Environmental Engineering by Peavey, H. S. Rowe, D.R. and Tchobanoglous
McGraw Hill Book Company.
- 2) Water Supply and Pollution Control by Viessman W. and Hammer M.J.
Harper Collins College Publishers.
- 3) Water and Waste Water Technology by Hammer M.J. Prentice-Hall of India Private
Ltd.
- 4) Water and Wastewater Technology by G.S. Birdie and J.S. Birdie
- 5) Water Supply by Duggal K.N., S. Chand and Company.
- 6) Water Supply by Garg S.K., Khanna Publishers.
- 7) Water Supply and Waste water Disposal by Fair and Gayes, John Wiley Publication.
- 8) Water Supply Engineering by B.C. Punmia, Ashok Jain, Arun Jain, Laxmi
Publications
- 9) Environmental Engineering, S.C. Sharma, Khanna Publishing House
- 10) Basic Environmental Engineering, R.C. Gaur, Newage Publications
- 11) Water Supply and Sanitary Engineering, Rangwala, Charotar Publications

Reference Books

1. Manual on Water Supply and Treatment- Government of India Publication.-1993.
2. “Water and Waste Water Engineering Vol. I & II”, John Wiley Publication, 1966. Fair
G.M, Geyer J. C, and Okun D. A.
3. “Water and Waste Water Technology”, Prentice Hall of India Private Limited, 1996.
Hammer M. J.



**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CV222: BUILDING PLANNING AND DESIGN**

Teaching Scheme

Lectures – 3 Hours/week, 3 Credits

Drawing – 2 Hour/week, 1 Credit

Examination Scheme

ESE – 35 Marks

(Theory Paper of 2 Hours duration)

ISE – 15 Marks

ESE (POE) - 75 Marks

ICA- 50 Marks

Course Objectives:

- 1) To impart knowledge of the principles of planning and building byelaws, rules and regulations
- 2) To enable students to draft 'Municipal building permission drawings' of a residential buildings
- 3) To impart knowledge of various building services.
- 4) To impart the knowledge of sustainable buildings, Green buildings, low cost housing and rain water harvesting techniques.
- 5) To introduce to the principles of acoustics, sound insulation and fire insulation

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 a 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. (6 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 (6 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 (8 Hrs)

- Educational Building: Pre-primary and primary school, Secondary and Higher Secondary 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

(5 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

(5 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

(5 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

(6 Hrs)

- Acoustics:- Sound Frequency, Intensity, sound decibel rating, absorption of sound-Variety of 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

(4 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)

- 1) Line Plans of residential buildings (4 Numbers): Detached house, Semi-detached house, Row house and Apartment Building
- 2) Line plans of any 2 Public buildings.
- 3) 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 International Publishers
- 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
CV223: Hydraulic Engineering**

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credit

Practical – 2 Hr/Week, 1 Credit

Examination Scheme

ESE- 70 Marks

ISE- 30 Marks

ICA- 25 Marks

Course Objectives:

- 1) To impart knowledge of gradually varying flow and rapidly varying flow phenomenon
- 2) To introduce to fluid discharge measuring devices viz. notches & weirs and fluid machines like pumps, turbines.
- 3) To impart knowledge of design of open channels for fluid flow.
- 4) To provide an insight into dimensional analysis & model analysis.

Course Outcomes:

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

- 1) Apply their knowledge of fluid mechanics in addressing problems in open channels.
- 2) Solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- 3) Carry out hydraulic design of notched, weirs and spillways
- 4) Explain the working of Pelton, Francis and Kaplan turbines and pumps along their performance parameters.
- 5) Apply dimensional analysis to predict physical parameters that influence the flow in fluid mechanics.

SECTION-I

Unit 1: INTRODUCTION TO OPEN CHANNEL FLOW

(7 Hrs)

Classification of channels, Types of Flow in Open Channel and Geometric Properties

- a) Uniform Flow: Chezy's and Manning's Equation, Hydraulically Most efficient rectangular, Triangular and Trapezoidal section, computation of normal depth, conveyance, section factor, Hydraulic Exponent, Uniform flow competitions, concept of Froude number, velocity distribution, kinetic energy and momentum correction factors, measurement of velocity (Pitot tube, current meter, float etc)
- b) Critical Flow: - Specific Energy & Diagram, Alternate depths, Depths Energy relationship in open channel, Specific Force.

Unit 2: Gradually & Rapidly Varied Flow (GVF &RVF)

(8 hrs)

- a) Gradually Varied Flow (GVF):- Dynamic Equation of GVF, Classification & Characteristics of Surface Profile. Direct Step Method of Computing Profile Length.
- b) Rapidly Varied Flow (RVF):- Definition of Hydraulic Jump, Classification of Jump, Equation of Hydraulic Jump in horizontal rectangular channels, computation of length & height of Jump, Energy Loss in Jump. Hydraulic Jump as an energy dissipater.

Unit 3: NOTCHES, WEIRS & SPILLWAYS

(7 hrs)

- a) Types Derivation of discharge equation, velocity due to approaches, Francis formula, calibration of notch & errors in measurements.
- b) Weir & 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 4: IMPACT OF JETS AND TURBINES

(8 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, heads and efficiencies, 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, Characteristic curves, selection of turbines on the basis of head and specific speed.

A site visit is recommended to learn this topic.

Unit 5: CENTRIFUGAL PUMPS

(7 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.

Unit 6: DIMENSIONAL & MODEL ANALYSIS

(8 Hrs)

Dimensions & Dimensional homogeneity, Importance and Use of Dimensional analysis, Buckingham π theorem, statement & applications, Non dimensional numbers and their significance, Difference between model and Prototype, Types of similarities, Model laws, Reynolds and Froude's, distorted model, undistorted model, scale ratios and applications.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

(1) Any 4 of the following

- a. Study of specific energy diagram for different discharges.
- b. Calibration of V notch/rectangular notch.
- c. Calibration of sharp crested suppressed weir and plotting of upper/lower nappe.
- d. Calibration of Ogee Weir.
- e. Study of hydraulic jump
 - i. Verification of sequent depths
 - ii. Determination of loss in jump
 - iii. Plotting the following parameters with respect to Froude number
 - 1) Y_2/Y_1
 - 2) Length
 - 3) Energy loss
- f. Study of flow over broad crested weir.
- g. Study of flow below gates – Discharge verses head relation, Equation of flow, Determination of contraction in flow in downstream of gate.
- h. Velocity distribution in open channel in transverse direction of flow.

(2) Turbines and Pumps

- a. Impact of jet.
- b. Study of turbines (demonstration/test).
- c. Test on a centrifugal pump.
- d. Study of charts for selection of pumps.

TEXT BOOKS

- 1) Fluid Mechanics – A. K. Jain-Khanna Pub., Delhi.
- 2) Fluid Mechanics – K.L. Kumar – Eurasia Publishing House, Delhi.
- 3) Flow through Open channels– Rangaraju – Tata McGraw Pub. Co., Delhi.
- 4) Fluid Mechanics – K. Subramanaya – Tata McGraw Pub. Co., Delhi.
- 5) Fluid Mechanics – Hydraulic & Hydraulic Mechanics Modi & Seth –Standard Book House, Delhi.
- 6) Fluid Mechanics – R. W. Fox, P.J. Prichard, A. T. McDonald- Wiley India.
- 7) Fluid Mechanics & Hydraulic Machines, SS Rattan, Khanna Publishing House
- 8) Fluid Mechanics and Machinery, C.S.P Ojha, R. Berndtsson & P.N. Chandramouli, Oxford University
- 9) Fluid Machinery, Sadhu Singh, Khanna Publishing House, Delhi

REFERENCE BOOKS

- 1) Fluid Mechanics – Streeter McGraw Hill-International Book Co., Auckland.
- 2) Flow in open channel – V. T. Chaw – McGraw Hill International Book Co., Auckland.
- 3) Flow in open channel – K. Subramanyam – Tata McGraw Pub.Co., Delhi.
- 4) Fluid Mechanics –Munson, Young- Willy India.
- 5) Mechanics of Fluids – M.C. Potler, Wiggert, Ramdan- Cengage Learning.



PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CV224: ICT for Development (Open Elective-I)

Teaching Scheme

Lectures – 2 Hrs/Week, 2 Credits

Practicals – 2 Hr/Week, 1 Credit

Examination Scheme

ISE – 50 Marks

ICA-50 marks

Course Objectives:

To make the students aware of Information Communication Technologies (ICT), E-services, Information processing tools, LaTeX, Netiquettes & plagiarism.

Course Outcomes:

Students will be able to

- 1) Use Learning Management system like MOODLE
- 2) Prepare documents and Presentations using information processing tools.
- 3) Use spreadsheets & databases for problem solving in civil engineering
- 4) Prepare reports using LaTeX.
- 5) Create basic website using Wordpress.
- 6) Get acquainted with Netiquettes and plagiarism.

1. Basics of ICT :

(2 Hrs)

Introduction to ICT, World Wide Web, Web servers, Web Clients, Web sites, Web Pages, Web Browsers, Blogs, News groups, HTML, Web address, HTTP, FTP, downloading and uploading files from remote site, Web Services, Use of Google Drive, Docs and Forms, Free and open-source learning management system (e.g. - Moodle)

2. **e-Services:** (2 Hrs)
e-Commerce, e-Banking, e-Governance, ICT for sustainable development
3. **Information processing tools (MS-office/Libre Office)**
- a. **Word processing:** (4 Hrs)
Creation/drafting of documents using shapes, smartart, charts, clipart, tables, equations etc. proofing and tracking changes in documents, mailmerge, inserting header, footer, page numbers, sections, watermarks etc.
- b. **Spreadsheets:** (4 Hrs)
Collection and calculation of data, Use of functions (logical, mathematical, statistical etc.) Graphical Representation of data
- c. **Presentation:** (3 Hrs)
Design of slides using shapes, table, smart art, clip art, charts, media clips, hyperlinks etc., Custom animations
- d. **Database:** (4 Hrs)
Create database, create table, insert, update, delete records into tables, import/export data, Query execution
4. **Report writing (LaTeX):** (3 Hrs)
LaTeX on Windows using TeXworks, report writing, letter writing, mathematical typesetting, Equations, tables and figures, Beamer, Bibliography, Feedback diagram with Maths
5. **Netiquettes:** (3 Hrs)
Internet Etiquettes, Netiquette Basics: Core Rules of Netiquette, Introduction to Electronic Mail, Netiquette for Discussion Groups , Netiquette for Information Retrieval, Egregious Violations of Netiquette
6. **Website design:** (3 Hrs)
Word press for website creation, creating blogs
7. **Plagiarism:** (2 Hrs)
Importance, prevention and detection, Tools

References:

1. <https://moodle.org/>
2. https://en.wikipedia.org/wiki/Information_and_communication_technologies_for_development
3. <https://edu.gcfglobal.org/en/subjects/office/> (MS-Office)
4. <https://spoken-tutorial.org/> (Libre-office and LaTeX)
5. WWW version of the book Netiquette by Virginia Shea, Albion Books (Unit 5)
6. www.wordpress.com (Unit 6)





**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
S. Y. B. Tech. (Civil Engineering) – II, Semester- IV
CV225: STRUCTURAL ANALYSIS**

Teaching Scheme
Lectures – 3 Hrs/Week, 3 Credits

Examination Scheme
ISE – 30 Marks
ESE –70 Marks
ICA-25 Marks

Course Objectives

1. To impart the knowledge of various theories of determination of slope and deflection of beams under different loading conditions.
2. To make students understand the behaviors of structural members like column and arches under various types of external loadings.
3. To impart knowledge of 'Force' and 'displacement' methods of analysis of statically indeterminate structures.
4. To familiarize the students with the matrix methods of structural analysis.
5. To provide hands on experience to the students on application software for structural analysis.

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.
2. Analyze determinate and indeterminate structural members subjected to different types of loadings.
3. Discretize simple structures; identify static and kinematic degrees of freedom
4. Analyze beams, trusses and frames for joint displacements, and forces in members, by force method and displacement method.
5. 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)

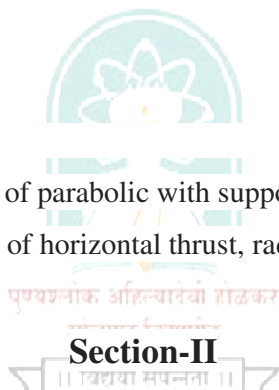
Effective length, Slenderness ratio, Crippling load by Euler's and Rankine's formula, assumptions, limitations.

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, semicircular 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**(8 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
CV226: ENGINEERING MATHEMATICS-III**

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Tutorial – 1 Hr/Week, 1 Credit

Examination Scheme

ESE – 70 Marks

ISE – 30 Marks

ICA – 25 Marks

Course Objectives:

- 1) To introduce higher order linear differential equations and their applications in Civil Engineering
- 2) To introduce partial differential equations of first order.
- 3) To introduce to students the ‘Fourier series’ of periodic functions
- 4) To introduce to students Laplace and inverse Laplace transforms.
- 5) To introduce concepts of Statistics and Probability.

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 $f_1(p, x) = f_2(q, y)$, 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: Probability

(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 Prasas & 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) Part-II, Semester-IV

CV227: COMPUTER PROGRAMMING AND NUMERICAL METHODS

Teaching Scheme

Lectures – 2 Hrs/Week, 2 Credits

Practical- 2 Hr/Week, 1 Credit

Examination

POE– 50 Marks

ICA-25 Marks

Course Objectives

- 1) To enable students to develop computer algorithms for solving Civil Engineering problems.
- 2) To develop the student's ability to analyze, formulate and solve Civil Engineering problems by using programming language 'C'
- 3) To develop a thorough understanding of principles of numerical methods of analysis, useful to solve civil engineering problems

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)

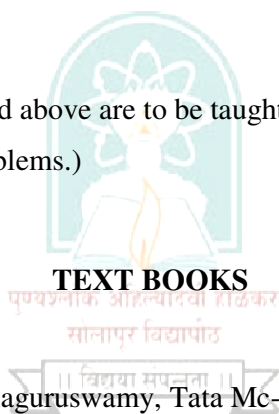
Mean, standard deviation and Median, Least square method, Regression analysis – Linear, parabolic curve fitting.

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.)



- 1) Numerical Methods: E. Balaguruswamy, Tata Mc-Graw Hill Publications.
- 2) Computer Programming and Numerical methods- Revised edition with C- N. Datta
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