SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

CIVIL ENGINEERING

Syllabus for

S.E. (Civil Engineering) w. e. f. Academic Year 2017-18

Choice Based Credit System

Program Educational Objectives (PEOs): Civil Engineering

The Program Educational Objectives for 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): Civil Engineering

The program outcomes of 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.

w.e.f. academic year 2017-18

SOLAPUR UNIVERSITY, SOLAPUR
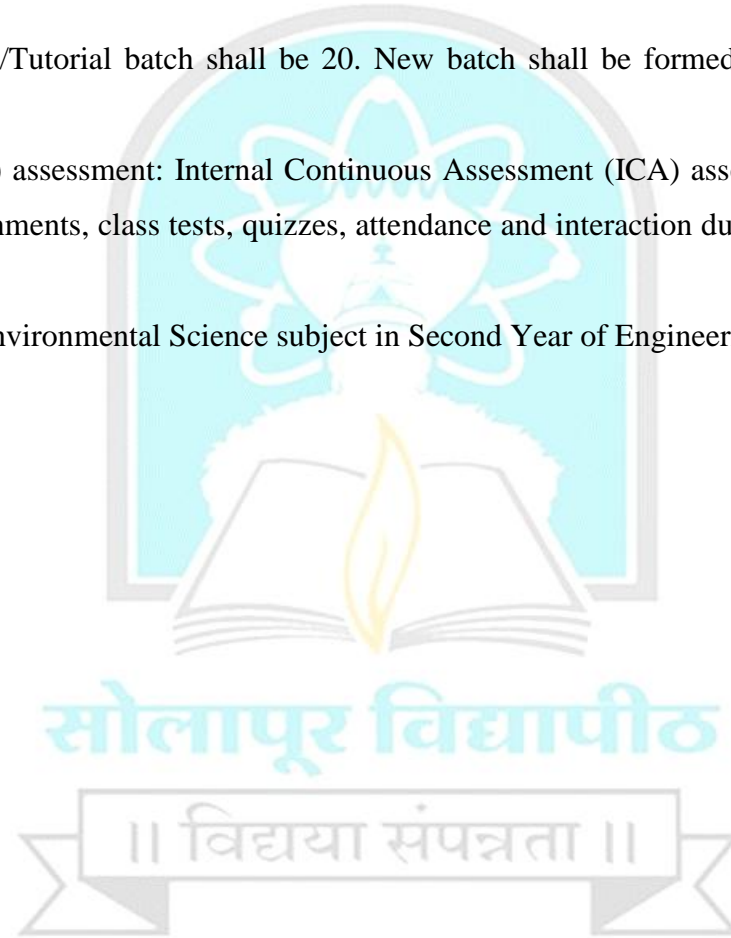
Faculty of Engineering & Technology

Credit System structure of S. E. Civil Engineering, Semester-I, (W.E.F. 2017-2018)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
CV211	Concrete Technology	3	-	-	-	3	30	70	-	100
CV212	Structural Mechanics-I	3	1	-	-	4	30	70	25	125
CV213	Surveying –I	3	-	-	-	3	30	70	-	100
CV214	Building Construction & Drawing	3	-	-	-	3	30	70	-	100
CV215	Fluid Mechanics-I	3	-	-	-	3	30	70	-	100
CV216	Engineering Geology	2	-	-	-	2	30	70	-	100
	Total	**17**	**1**	_	**-**	**18**	**180**	**420**	**25**	**625**
	Laboratory/Drawings							POE	OE	
CV211	Concrete Technology	-	-	2	-	1	-	-	-	25	25
CV213	Surveying –I	-	-	2	-	1	-	25	-	25	50
CV214	Building Construction & Drawing	-	-	-	2	1	-	-	-	25	25
CV215	Fluid Mechanics-I	-	-	2	-	1	-	25	-	25	50
CV216	Engineering. Geology	-	-	2	-	1	-	25	-	25	50
CV217	Lab. Practice	-	-	2	-	1	-	-	-	25	25
	Total		**-**	**10**	**2**	**7**	**-**	**75**		**150**	**225**
	Grand Total	**17**	**1**	**10**	**2**	**25**	**180**	**495**		**175**	**850**
ENV21	Environmental Studies	1	_	_	_	_	_	_		_	_

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

Note:

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

(2) Internal Continuous Assessment (ICA) assessment: Internal Continuous Assessment (ICA) 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.

	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CV221	Structural Mechanics-II	3	1	-	-	4	30	70		25	**125**
CV222	Surveying –II	3	-	-	-	3	30	70		-	**100**
CV223	Building Planning & Design	3	-	-	-	3	30	70		-	**100**
CV224	Fluid Mechanics-II	3	-	-	-	3	30	70		-	**100**
CV225	Water Resources Engineering- I	3	-	-	-	3	30	70		25	**125**
CV226	Engineering Mathematics-III	3	1	-	-	4	30	70		25	**125**
	Total	**18**	**2**	**-**	**-**	**20**	**180**	**420**		**75**	**675**
	Laboratory/Drawings:							POE	OE		
CV222	Surveying –II	-	-	2	-	1	-	-	--	25	**25**
CV223	Building Planning & Design	-	-	-	2	1	-	-	25	25	**50**
CV224	Fluid Mechanics-II	-	-	2	-	1	-	-	-	25	**25**
CV227	Computer Programming & Numerical Methods	2	-	-	-	3	-	50	-	25	**75**
	Total	**2**	**-**	**6**	**2**	**6**	**-**	**50**	**25**	**100**	**175**
	Grand Total	**20**	**2**	**6**	**2**	**26**	**180**	**495**		**175**	**850**
ENV22	Environmental Studiies	1	_	_	_	_	_	_		_	_

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

w.e.f. academic year 2017-18

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

Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV211 - CONCRETE TECHNOLOGY

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

Course 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.

Course Outcomes
   On completion of the course students will be able to:
1) Select appropriate type of concrete for specific requirements.
2) Select appropriate type of admixtures and construction chemicals depending upon requirements of concrete
3) Design a concrete mix of required strength and durability using suitable ingredients

Unit 1: Ingredients of concrete

(a) 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.

(b) Ingredients of concrete-Coarse Aggregates, Fine Aggregates and Water: **(5 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 2: Properties of fresh concrete   **(4 Hrs)**

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

Unit 3: Introduction to Admixtures   **(4 Hrs)**

Admixtures in concrete & construction chemicals, Types of admixtures, plasticizers and super plasticizers and their effects on workability, air entraining agents, accelerators, retarders, their effects on proportion of concrete.

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 w/c ratio and admixture on strength properties of concrete . Concrete mixes for different strength as per IS-456-2000.

SECTION-II

Unit 5: Creep and Shrinkage   **(5 Hrs)**

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

Unit No 6: Durability of Concrete   **(5 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 No 7: Concrete Mix Design   **(8 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.

Unit No 8: Types of Concrete   **(4 Hrs)**

Types of concrete: Light weight concrete, Mass concrete, no fines concrete, plum concrete. Quality control of concrete – Factors causing variations, field control.

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 aggregate
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
I) Proportioning of Mix (calculations): IS method, ACI method, Road research Laboratory method
II) Proportioning as well as Experimental (Casting of mix)- Above methods can be used. At least IS method shall be demonstrated.

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

REFERENCE BOOKS

1) Concrete Technology by A.M. Neveille, 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

w.e.f. academic year 2017-18

Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV212 - STRUCTURAL MECHANICS-I

Teaching Scheme	Examination Scheme
Lectures – 3 Hrs/Week, 3 credits	**ESE – 70** Marks
Tutorial – 1 Hr/Week*, 1 credit	**ISE –** 30 Marks
	ICA- 25 Marks

Course objectives:
1) To comprehend about of various elastic constants and their relationships to evaluate stresses and strains in the material.
2) To make students understand, 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 the behavior of composite members under axial loading.
4) To impart knowledge of the Strain energy stored by body in axial loading, bending, shear and torsion.

Course Outcomes

On completion of this course:
1) The students will be able to employ the knowledge of structural mechanics to describe the behavior of structures.
2) The students will be able to analyze determinate structural members subjected to different types of loadings.
3) The students will be able to analyze special structures such as composite beams and thin walled cylinders.

SECTION I

Unit 1. (05 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, temperature stresses in composite sections.

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Unit 2.   **(06 Hrs.)**

Combined direct and bending stresses, 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 3.   **(06 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 4.   **(06 Hrs.)**

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

SECTION II

Unit 5.   **(05 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 6.   **(06 Hrs.)**

Composite beams: Bending stresses in composite beams of two different materials, Equivalent sections, Flitched beams.

Unit 7.   **(05 Hrs.)**

Torsion of circular shafts: Torsion formula, solid and hollow circular shafts, transmission of power through circular shafts.

Unit 8.   **(06 Hrs.)**

a) Thin walled cylinders and spheres, wire wound thin cylinders
b) Strain energy due to axial force gradually, suddenly applied and impact load, Resilience, strain energy due to shear force, bending moment and torque.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

(A) Experiments (any six):
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. Bending test on Mild Steel Beam (Flexure Formula).
7. Torsion test on Mild Steel and Cast Iron.
8. Impact test on Mild Steel, Aluminum, Brass, Copper and Cast Iron

(B) Experiments (any two):
1. Flexural test & Abrasion test on flooring tiles.
2. Water absorption, Efflorescence and Compression test on burnt Bricks
3. Compression test on stones.

(C) At least one assignment on each unit of syllabus.

Note: *Laboratory tests and experiments included in syllabus of 'Structural Mechanics-I' 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.

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,Dhanpatrai & Sons, New Delhi
4. Strength of Materials by R.S.Khurmi, S.Chand Pubication, New Delhi
5. Mechanics of Structures (Part I) by S.B.Junnarkar, Charotar Book House, Anand.
6. Strength of Materials by R.K.Rajput, S.Chand Pubication, New Delhi

REFERENCE BOOKS
1. Analysis of Structures (Vol- I) by Vazirani and Ratwani, Khanna Pub., Delhi.
2. Elements of Strength of Materials, (Recent Edition) by S. Timoshenko and J. Young Affiliated East-West
3. Strength of Materials by F.L. Singer, Harper and Row Pub., New York.
4. Introduction to Mechanics of Solids by E. P. Popov. Prentice-Hall of India.
5. Mechanics of Materials by Gere and Timoshenko, C.B.S. Delhi.

Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV213 - Surveying-I

Teaching Scheme	**Examination Scheme**	
Lectures– 3 Hours/week, 3 Credits	**ESE –**	70 Marks
Practical – 2 Hour/week, 1 Credits	**ISE –**	30 Marks
	ICA-	25 Marks
	POE-	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. Solve numerical problems on bearing, leveling, traversing.
2. Use and adjust the levels, theodolites, plane table and total station.
3. Derive area and volume measurement formula under different conditions.
4. Describe applications of modern surveying equipments.
5. Prepare plans, maps and reports for surveying projects.

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Section- I

Unit 1 – LEVELLING   (05 Hrs.)

a) Electromagnetic waves and their properties, phase, phase comparison, modulation, Types of EDM instruments: Geodimeter, Tellerometer, Distomat: Principle, construction and use

b) Total station: Construction and use of 'Total Station'.

Unit 5-PLANE TABLE SURVEY   (07Hrs)

Equipment and accessories, advantages, disadvantages, temporary adjustments, methods: Radiation, Intersection, Traversing and Resection: two point and three point problems, tangent clinometer, telescopic alidade

Unit 6- AREA AND VOLUME DETERMINATION   (07Hrs)

a) Contouring: Characteristics, Direct and Indirect methods, Interpolation techniques and uses of contour maps.

b) Computation of area and volume: coordinate method, Trapezoidal Rule, Prismoidal Rule, Planimeter, Capacity Contours.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

(A) Field book containing the following experiments

1) Levelling:
    a) Revision of differential leveling
    b) Reciprocal leveling
    c) Sensitiveness of bubble tube
    d) Permanent adjustments of dumpy level
    e) Auto level and tilting level

2) Study of Theodolite:
    a) Measurement of horizontal angle by various methods,
    b) Measurement of magnetic bearing and
    c) Vertical angle by Theodolite
    d) Trigonometrical leveling
    e) Practicals on Tacheometry
        a. Determination of constants of tacheometer
        b. Computation of horizontal distance and elevation by Tacheometry

3) Giving lineout for small residential plan

4) Minor instruments
   a) Hand Level
   b) Abney Level
   c) Box sextant
   d) Ghat tracer
   e) Proportional compass
   f) Planimeter

5) Methods of plane table survey
   a) Radiation
   b) Intersection
   c) Two Point & Three Point Problems

6) Hydrographic Survey:
   a) Study and use of Nautical Sextant and measurement of angles.
   b) Solution of Three point problem by Analytical and any one graphical method.

7) Study and use of Total Station

(B) Survey Projects:
   1) Block contouring project
   2) Theodolite traversing project
   3) Plane Table Survey of a closed traverse of minimum four sides for at least 0.5 Ha. Area with details such as buildings roads etc.

   Note: Practical and oral examination shall be based on the above syllabus.

TEXT BOOKS

1. Surveying –B. C. Punmia,,S.K.Jain, Vol. I and II, Laxmi Publication, New Delhi
2. Surveying and Leveling – T. P. Kanetkar and S. V. KulkarniVol.IandII , -Pune
   Vidyarthigriha Publication
3. Surveying – Agor -Khanna Publishers, Delhi
4. Surveying – K. R. Arora Vol. 1 and 2
5. Surveying and Leveling –N.N. Basak, Tata McGraw Hill Publishing Co., New Delhi
6. Surveying –S. K. Duggal Vol. 1and 2 Tata McGraw Hill Publishing Co., New Delhi

REFERENCE BOOKS

1. Plane and Geodetic Surveying – David Clark
2. Surveying - Bannister and Raymond
3. Surveying – Jawaharlal Sharma CBS Publishers, Delhi
4. Plane Surveying - Alok De
5. Text book of Surveying – S.K.Husain, M.S. Nagraj, S.Chand& Co. Ltd.,Bombay
6. Surveying- Narinder Singh – Tata McGraw Hill Co. Ltd, New Delhi.
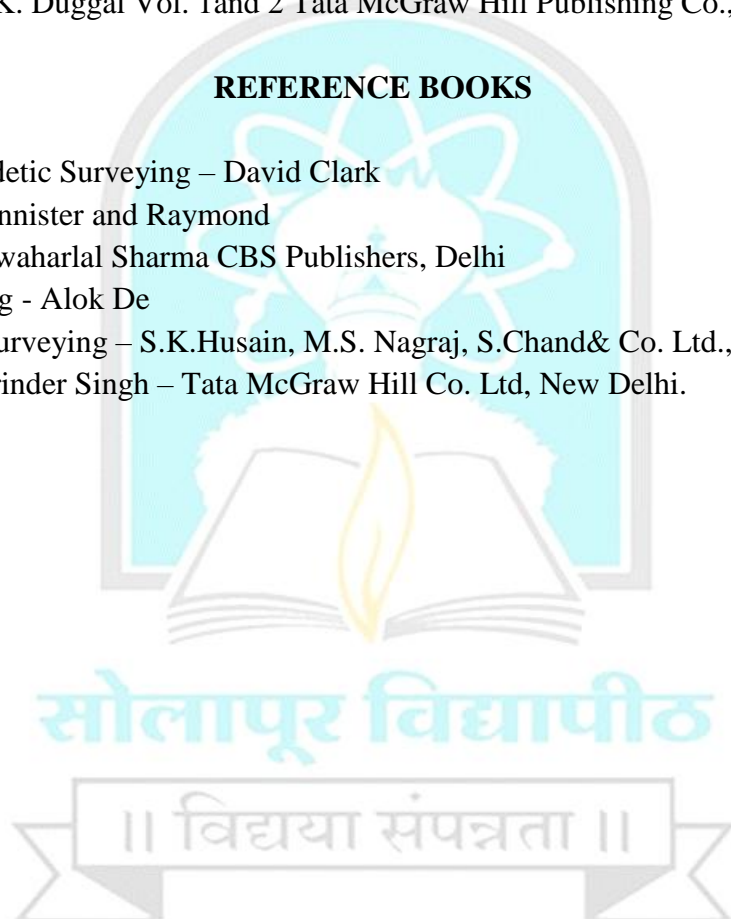
Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV214 - BUILDING CONSTRUCTION AND DRAWING

Teaching Scheme
Lectures – 3 Hours/week, 3 Credits

Drawings – 2 Hour/week, 1 Credit

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. The impart knowledge of various building components such as door, windows, arches, floors etc along with its functions and method of construction..
3. To explain methodology adopted for design of various types of staircase.
4. To educate students about different types of building services
5. To make the student conversant with various building, finishes, ventilation and air conditioning principles

Course Outcomes:

After successful completion of this course:
1. Students will be able to elucidate functional Requirements of buildings and types of Foundation and its suitability.
2. Students will be able to draw neat drawings of different building components such as doors, windows, stairs etc.
3. Students will be able to design different types of staircases commonly used in residential and public buildings.
4. Students will be able to adopt proper type of building services while preparing permission drawings.
5. Students will be able to 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 structure- 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: Type of Masonry and Walls (8 Hrs)

- 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.

Unit 3: Doors, Windows, Stairs and Arches (6 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.
- Lintels and Chajjas: - Necessary and types: Steel , RCC, Wood, Stone.
- Arches: - Types of Arches based on shape, mechanism of load transfer.

Unit 4: Floors and Roofs (4 Hrs)

- Ground and upper floor; factors for selection of floorings.
- Types of floor tiles and fixing procedure.

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- Types of Roofs.
- Selection and suitability of Roof and Roofing materials.

SECTION –II

Unit 5: Building Services   (7 Hrs)

Plumbing Systems:- Significance of Plumbing and Drainage plan, Water Supply Requirements for Buildings, various types of traps, Fittings, Chambers and various type of materials like PVC, GI, AC, CI, HDPE, Stoneware.
- Rain Water Harvesting: - Introduction, Concept of rain water harvesting.
- Electrification: - Concealed and open wiring system, requirements and locations of various Electrical points, Concept of Earthing.

Unit 6:- Lighting, Ventilation, Thermal Insulation, and Air Conditioning.   (8 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   (7 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)

(One turn of 2 Clock hours, per batch, per week)

Half Imperial Sheets: - Total 10 exercises of Building Elements.(To be drawn on both sides of the drawing sheet)

1. Sheet No 1:- Lettering, Symbols and line work. (Not to the Scale)
2. Sheet No 2:- Building Types (Not to the Scale)
3. Sheet No 3:- Types of foundation- Isolated footing and Combined footing.(To the Scale)
4. Sheet No 4:- Types of foundation- Strap footing and Pile footing.(To the Scale)
5. Sheet No 5:- Types of Brick Masonry (any two types of bonds-one brick thick) (To the Scale)
6. Sheet No 6:- Types of Brick Masonry (any two types of bonds-one and half brick thick) (To the Scale)
7. Sheet No 7:- Types of Doors (Any two types) (to the Scale
8. Sheet No 8:- Types of Windows (Any two types) (to the Scale
9. Sheet No 9:- Staircase (Any two types) (to the Scale)
10. Sheet No 10:- Floor and Roof (To the Scale)

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.

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.

Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV215 - FLUID MECHANICS-I

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credits	**ESE – 7**0 Marks
Practical – 2 Hr/Week, 1 Credit	**ISE** - 30 Marks
	ICA- 25 Marks
	POE- 25 Marks

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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 understand characteristic of turbulent flow and flow through pipes.
6) To provide an insight into boundary layer analysis.

Course Outcomes

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

1) Identify and obtain values of fluid properties and relationship between them.
2) Recognize the principles written in form of mathematical equations and to apply these equations to analyze problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.
3) Conduct experiments, interpret and analyze data with experimental results in hydraulic engineering.
4) Carry out calibration of discharge measuring equipments.
5) Analyze fluid flows and will be able to design pipe networks.

SECTION - I

Unit 1: FLUID PROPERTIES   (07 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, Time of emptying
a tank with orifice. Mouthpiece- classification, Concept of HGL and TEL.

Unit 5: FLOW THROUGH PIPES   **(7 Hrs.)**
Classification of Flows:
A) **Laminar Flow** – Reynold's Experiment, Coutlee and Hazen Poiseuille, Equations for
Viscous Flow between Parallel Plates and Circular Pipes.
B) **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 BOUNDRY LAYER ANALYSIS   **(8 Hrs)**

A. Pipes in Series and Parallel, Concept of Syphon 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.
B. 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 Venturi meter/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.

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

d) 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 – Arora.

6) Fluid Mechanics – R. W. Fox, P.J. Prichard, A. T. McDonold- Wiley India.

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 Learning.

Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV216 - ENGINEERING GEOLOGY

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

Course Objectives

1) To introduce the scope, relation and application of geology in civil engineering.
2) To acquaint students with general geology, mineralogy, petrology, structural geology and engineering geology.
3) To impart knowledge of rocks, minerals and building stones.
4) To elaborate Geological aspects of earthquakes and landslides.
5) To impart knowledge of geological site investigation for dams, reservoir, bridges and various other Civil engineering structures.

Course Outcomes:

At the end of this course:

1) Students will be able to identify different type of rocks and minerals and building stones.
2) Students will be able to draw geological maps.
3) The students will be able judge the suitability of sites based on geological aspects of site
4) This course will be able to carry out preliminary geological investigation of site related to civil engineering projects.

SECTION – I

Unit 1. GENERAL GEOLOGY   (04 Hrs.)

Introduction, Definition, Scope and Subdivision of the Geology subject, interrelation between Geology and civil Engineering.

Earthquake: Definition and terminology related with earthquake, causes seismic waves, Seismograph, Effects, reservoir induced seismicity.

Landslides: Types, causes and preventions of landslides Interior of earth.

Volcano: Products of volcano, central and fissure type of volcanoes, Causes, Distribution of volcanoes.

Mountains: Types, process of formation with Indian Examples.

Unit 2. MINERALOGY   (02 Hrs.)

Definition, Physical properties of minerals, Study of Silica, Feldspar, Amphibole, Pyroxene and mica mineral groups.

Unit 3. PETROLOGY   (05 Hrs.)

Definition, Classification of rocks, rock cycle.
a) Igneous rocks: Formation, mineral composition, Texture and structures, classification
b) Sedimentary rocks: Formation, Texture and Structures, classification
c) Metamorphic rocks: Agents and Types of metamorphism, Structures, products of metamorphism depending on type of metamorphism and parent rock.
d) Civil engineering significance of rocks

Unit 4. STRUCTURAL GEOLOGY   (04 Hrs.)

a) Outcrop, Dip and Strike, Unconformity- Types, outliers and inliers, overlap.
b) Folds: Parts, important types, causes
c) Faults: Parts, important types, causes.
d) Joints: Types
e) Civil Engineering Significance of geological structures.

SECTION II

Unit 5. GEOLOGICAL INVESTIGATIONS   (05 Hrs.)

Preliminary Geological investigations and Building Stones: Various steps of geological studies of a project site, engineering consideration of structural Features like dip, strike, joints, fracture, fault, folds, dyke etc. Exploratory drilling, Observations during the process of drilling, preservation of core, core logging, core recovery, R.Q.D., Graphical representation of core log, limitation of exploratory drilling method.
Engineering properties of rocks such as crushing strength, shear strength, tensile strength, Modulus of elasticity, Durability, Appearance, field character, requirement of good Building Stone, Building Stones in India.

Unit 6. DAMS (03 Hrs.)

Geology of a Dam site: Important civil engineering terms in dams and reservoirs, influence of geological condition on various aspect of Dam such as Location, alignment, design and type of a dam, requirement of good dam site, precautions to be taken to counteract unsuitable condition such as unfavorable dips, occurrence of fault fracture, and dyke etc. Dams on carbonate rocks, Dams on various types of rocks, dams on various geological structures

Unit 7. RESERVOIR (02 Hrs.)

Geology of Reservoir site: Requirements of a good reservoir site, Dependence of water tightness of reservoir area on geological structures and physical properties of rocks, Geological conditions suitable and unsuitable for reservoir site, Effect of rise in the level of groundwater in the reservoir area, rate of silting and its dependence on geological conditions.

Unit 8. TUNNELS AND BRIDGES (05 Hrs.)

Definition, Important civil engineering terms, difficulties in tunneling such as over break, seepage of subsurface water, rate of tunneling, roof falls, side collapse etc. Influence of geological condition on tunneling, lining after tunneling, Geological condition while choosing tunnel alignment, tunneling through various structures

Bridge: Definition and suitable types of bridges depending on geological conditions.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

1) Mineralogy: Physical properties of Minerals. Study of Physical properties.
2) Identification of the following Minerals: Crystalline, Cryptocrystalline and amorphous Varieties of Silica, Orthoclase, Plagioclase, Microcline, Zeolite, Muscovite, Biotite, Augite, Hornblende, Olivine, Talc, Serpentine, Chlorite, Kyanite, Asbestos, Beryl, Tourmaline, Garnet, Calcite, Gypsum, Fluorite, Corundum etc. Important ores such as Hematite, Magnetite, Limonite, Pyrite, Psilomelane, Chromites, Chalcopyrite, Galena, Malachite, Graphite
3) Petrology: Study and Identification of the following Rock types
   a) Igneous Rocks: Granite and its varieties, Syenite, Diorite, Gabbro, Rhyolite, Pumice, Trachyte, Andesite, Varieties of Basalt, Obsidian, volcanic breccia, tachylite, Pegmatite, Dolerite.

b) Secondary Rocks: Laterite, Bauxite, Conglomerate, Breccia, Sandstone, ferruginous Sandstone, Grit, Arkose Shales, Mudstone, chemical and organic Limestone, coal.

c) Metamorphic Rocks: Slate, Phyllite, marble, marble, Mica Schist, Biotite schist, muscovite Schist, Chlorite Schist, Talc Schist, Kyanite Schist, Granite Gneiss, Augen Gneiss.

4) Study of different types of geological maps, Section and their engineering significance. (at least 10)

5) Study of structural Geological models. (at least 5)

6) Study tour to the place worth visiting from Engineering Geological point of view.

7) Study of core samples, Core Logging.

8) Identification of Subsurface rock with the help of Resistivity Instrument.

9) Study of various building stones with respect to engineering properties

1) A journal containing complete record of above practical work shall be examined as a Internal Continuous Assessment. Practical Examination shall be based on practical course.

2) Case study of any engineering structure with respect to geological investigation

TEXT BOOKS

1. Principles of Petrology – By G.W. Tyrrell
2. Textbook of Geology by P. K. Mukherjee
3. A text book of Engineering Geology –By R. V. Gupte- Pune Vidyarthi Griha Prakashan Pune.
4. Engineering Geology for civil Engineering – By Dr. D.V.Reddy.

REFERENCE BOOKS

1. Principles of Engineering Geology and Geo-techniques – by D. P. Krynine, W.R. Judd.
2. Engineering and General Geology- by Prabeen Singh-S.K. Katariya and son
3. Engineering Properties of rocks By L.W. Farmer-Chapman and Hall, London.
4. Groundwater Hydrology_ By Todd D. K.- John Wiley and Son, New York.

Solapur University, Solapur
S.E. (Civil Engineering) Semester-I
CV217 - LAB PRACTICE

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

Course Objectives:

1. To present fundamentals of graphics and drafting appropriate for developing functional skill in computer aided drafting.
2. To provide students with adequate knowledge and experience in preparing engineering drawings using AutoCAD.
3. To teach students to read, construct and understand basic Civil engineering drawings.
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 should be able to:
1. Draw using Software, the geometric constructions, multi-view, sectional view, dimensioning and detail drawings of typical 2-D engineered objects
2. Produce architectural floor plan of a small residential building
3. Develop and draw views like elevation, section, furniture planning for a small residential building
4. Apply computer software to prepare civil engineering drawing

'Lab Practice' consists of learning suitable Computer Aided Drawing and Design (CADD) software 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.E. Civil Engineering , Semester- III of Civil Engineering Program.

Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV221 - STRUCTURAL MECHANICS-II

Teaching Scheme	Examination Scheme
Lectures – 3 Hrs/Week, 3 credits	ESE – 70 Marks
Tutorial – 1 Hr/Week, 1 credit	ISE – 30 Marks
	ICA- 25 Marks

Course Objectives
1) To educate the students about Principal planes and Principal stresses and strains, due to combination of axial forces, bending moments and shear.
2) To study the effects of combination of direct and bending stresses.
3) To learn calculations of slope and deflection of beams under different loading conditions.
4) To understand and digest various theories of 'Elastic failure'.
5) To impart knowledge of drawing 'Influence line diagrams' for shear force, bending moment on a girder due to rolling loads.

Course Outcomes
Students completing the course will be able to:
1) Employ the knowledge of Engineering Mechanics to understand the behavior of structures.
2) Identify principal planes and find principal stresses.
3) Calculate slope and deflection of beams under different loading conditions.
4) Analyze the structures subjected to Rolling loads.

SECTION I

Unit 1. (05 Hrs.)

Behaviour of axially loaded long columns - Effective length, Slenderness ratio. Crippling load by Euler's and Rankine's formula, assumptions, limitations.

Unit 2. (07Hrs.)

Principal stresses and strains for 2-D problems- Normal and shear stresses on inclined plane. Principal plane and Principal stresses, Principal strains, Mohr's circle method, Principal stresses in beams, Stresses trajectories.

Unit 3. (05 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. (04 Hrs.)

Theories of elastic failures- Maximum principal stress, Maximum Principal strain, Maximum shear stress theories, Total strain energy and distortion energy theory, causes of failure, fatigue and creep.

SECTION II

Unit 5. (08 Hrs.)

Slope and deflection of determinate beams-Computation by Double integration, Macaulay's Method, Moment area method, Conjugate beam method.
Deflection of beams by strain energy method, Castigliano's theorem.

Unit 6. (04 Hrs.)

Three hinged arches: 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.

Unit 7. (06 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. I.L.D. for force in members of determinate truss.

Unit 8. (06 Hrs.)

Rolling Loads: Application of influence line diagram for determination of shear force and bending moment in beams due to uniformly distributed load, shorter and longer than span.
Application of influence line diagram for determination of shear force and bending moment in beams due to two concentrated loads at some distance apart, series of concentrated loads, condition of maximum bending moment, absolute maximum bending moment.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) shall consist of numerical assignments on each unit.

TEXT BOOKS

1. Strength of Materials by R. K. Bansal, Laxmi Publications
2. Strength of Materials by R. S. Khurmi, S. Chand Publication, New Delhi
3. Strength of Materials by Ramamurtham, Dhanpat Rai & Sons, New Delhi
4. Mechanics of Structures (Vol I & II) by S.B. Junnarkar, Charator Book House, Anand.
5. Analysis of Structures (Vol I & II) by Vazirani and Ratwani, Khanna Pub., Delhi.
6. Strength of Materials by R.K.Rajput, S.Chand Pubication, New Delhi

REFERENCE BOOKS

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

Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV222 - Surveying-II

Teaching Scheme	**Examination Scheme**	
Lectures– 3 Hours/week, 3 Credits	**ESE –**	70 Marks
Practical – 2 Hour/week, 1 Credit	**ISE –**	30 Marks
	ICA-	25 Marks

Course Objectives:

The students will learn:

1. To derive various methods offsetting horizontal and vertical curves and decide the suitability of each of the type.
2. To use Remote sensing method for collection of geospatial information
3. To make store, retrieve, analyze and interpret the data by using Geographic information system
4. To about types and uses of global positioning system.
5. To survey for road project, bridges/culverts, tunnel/mine and building projects.

Course Outcomes:

1. Student can solve numerical problems on setting horizontal and vertical curves.
2. Student can use remote sensing for data collection.
3. Student can analyze and interpret the geospatial data using GIS software.
4. Student is able to describe applications of GPS equipments.
5. Student can prepare plans, maps and reports for surveying projects

Section I

Unit 1–Curve surveying **(10 Hrs)**

   a) Horizontal curves: Necessity, Types and Designation. Elements, Design. Linear and angular Methods of setting out simple circular, compound, reverse and transition curves (Length of transition curve, Cubic Parabola, Bernoulli's lemniscates)
   b) Vertical curves: Types of vertical curves, Setting out vertical curves

Unit 2–Global Positioning System (GPS)   **(10 Hrs)**

Global Positioning System (G.P.S)-G.P.S. Segments: Spaces Segment, Control Segment, User Segment, Features of G.P.S. Satellites, Principle of Operation, Surveying with G.P.S.: Methods of observations, Absolute Positioning, Relative Positioning, differential G.P.S., Kinematics of G.P.S., G.P.S. Receivers: Navigational Receivers, Surveying Receivers, Geodetic Receivers, Computation of Co- ordinates:- Transformation from Global to Local Datum , Geodetic Coordinates to map co-ordinates , G.P.S. Heights and mean sea level Heights. Applications of G.P.S.

Unit 3–Remote Sensing Techniques (RST)   **(7 Hrs)**

a) Types – Terrestrial and Aerial Photogrammetry, principles, Phototheodolite, Aerial Camera, vertical aerial Photogrammetry: Scale, Relief Displacement, flight planning, Ground control
b) Stereoscopy and photo interpretation: stereoscopes, Parallax Bar, Plotting instruments
c) Electromagnetic remote sensing process. 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.

SECTION II

Unit 4-Geographical Information System (GIS)   **(7 Hrs)**
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.

Unit 5-Project Surveys   **(7 Hrs)**

General specifications, Reconnaissance, Preliminary and Location survey for
i) Route (Highway, railway, Canal)
ii) Culvert and Bridges
iii) Tunnel, Mine: Centre line transfer, Level transfer, Weisbach triangle
iv) Building

INTERNAL CONTINUOUS ASSESSMENT (ICA):

(A) Curves

    a) Setting Simple circular curve linear methods (Successive bisection, Long Chord, Tangents, Chord Produced Method) .

    b) Setting Simple circular curve Angular methods (Rankine's method, Two Theodolite and Tacheometric method).

(B) 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

(C) Collection of field data by using surveying and mapping GPS receiver.

(D) 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.

PROJECT WORK

1) Route Survey project
2) A project using GIS software

TEXT BOOKS

a) B. C. Punmia. Surveying – Vol. II and III, Laxmi Publication, New Delhi

b) T. P. Kanetkar and S. V. Kulkarni - Surveying and Leveling Vol. 2, -Pune Vidyarthi Griha Publication

c) Advanced Surveying by Gopi, Sathikumar, Madhu- Pearson Education

d) Advanced Surveying by Agor. Khanna Publishers, Delhi

e) Surveying Vol. 2 by S. K. Duggal. Tata McGraw Hill Publishing Co. New Delhi.

REFERENCE BOOKS

a) Jawahar Lal Sharma- Advanced Surveying -CBS Publishers New Delhi

b) T. M. Lillisand and R.W. Kaifer, Remote Sensing & Image Interpretation, John

Wiley & Sons Inc

c) Lo C. P. Yeung A K W, Concepts and Techniques of GIS - Prentice Hall, India

d) Kang-tsung Chang, Introduction to GIS, Tata McGraw Hill

e) K. Anjali Rao, Remote sensing and GIS, BS Publications

Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV223 - BUILDING PLANNING AND DESIGN

Teaching Scheme	**Examination Scheme**

Lectures – 3 Hours/week, 3 Credits   **ESE –** 70 Marks

(Theory Paper of 4 Hours duration)

Practical – 2 Hour/week, 1 Credit   **ISE –** 30 Marks

OE- 25 Marks

ICA- 25 Marks

Course Objectives
1. To impart knowledge of the principles of planning and various byelaws
2. To inculcate the skills of preparing municipal building permission drawings for the public buildings.
3. To impart the knowledge of sustainable buildings, green buildings and rain water harvesting techniques.
4. To introduce to the principles of aesthetics, acoustics and fire insulation

Course Outcomes
After successful completion of the course the students will be able to:

1. To apply the principles of building planning and design of Residential and Public buildings with special reference to aesthetics, acoustics and fire fighting.
2. Apply their knowledge for planning of residential and public buildings, according to the prevalent byelaws of municipal bodies.
3. Draw permission drawings of Residential and Public buildings.
4. To design a rain water harvesting system for a building.

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SECTION I

Unit 1– Site Selection of Building, Principles of Building Planning, Orientation and By-Laws and Dimension Relationships.   (07 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　　　　　　(06 Hrs)

- Planning and functional requirements of Residential Building: - Bungalows (Detached), Twin bungalows (Semi Detached), Row houses, Ownership flats, and Apartments.

Unit 3:- Planning and Design of Public Buildings　　　　　　　(08 Hrs)

- Educational Building: Younger age range, Middle age range, older age range, School for mentally retarded.
- Institutional Building:- Health centre and Hospitals.
- Business and Mercantile building – Shops, banks, markets, & departmental stores.
- Office and Other building: Post office, Administrative building etc.

Unit 4:- Building Permissions, Procedure and Perspective　　　　(05 Hrs)

- Procedure and list of document for Building Permission and significance of various certificates (Commencement Certificate, Plinth Completion Certificate and Occupancy certificate).
- Elements of perspective drawings, parallel perspective and angular perspective.

SECTION II

Unit 5:- Green Buildings and Low Cost Housing, and Rain water Harvesting　　(05 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).
- Rain water Harvesting Design solution.

Unit 6:- Acoustic Sound Insulation (06 Hrs)

- Acoustic:- Sound Frequency, Intensity, sound decibel rating, absorption of sound-Various materials. Sabine's formula, optimum reverberation time, conditions for good acoustics, effect of reflectors, flat ceiling, design of an auditorium, defects in auditorium and remedies, acoustics of various buildings such as Auditorium hall, Classrooms, broadcasting room etc.
- Sound insulation:- Acceptable noise level – Noise prevention at its source, transmission of noise, Noise control- general Consideration.

Unit 7:- Fire Resistant Structures (04 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.

Unit 8:- Aesthetics (04 Hrs)

- The Nature of Architecture- Definition and Scope of the study.
- The Aesthetic component of building, terms such as mass, space, proportion, Symmetry, balance, contract, pattern. Introduction to concept of Interior Designing and Landscaping.

INTERNAL CONTINUOUS ASSESSMENT (ICA):

- Planning & designing of residential building (G+1).
- Line Plans:- 4 graph sheets for Residential buildings and 2 graph sheets for Public buildings
- Full set of drawings for the residential building planned of above (strictly on full imperial sheets).
  1. Building Permission drawing.
  2. Water supply, drainage layout plan and Electrification layout plan. (on single sheet)
  3. Furniture layout plan.
  4. Perspective of Object (One sheet)

w.e.f. academic year 2017-18

- Design and Planning Report of Project Building:- Giving alternate line plan, byelaws followed, principles considered and sketches and design calculations for Staircase, Sanitary Requirements, etc.

NOTE:-
- Each student should work on planning of different Residential Buildings for the term work. (No Group projects are allowed)
- Students shall choose 'Residential Building' for drafting full set of drawings.

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.

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).

Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV224 - FLUID MECHANICS-II

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credit	**ESE-** 70 Marks
Practical – 2 Hr/Week, 1 Credit	**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 induce skill to design 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) Conduct experiments and analyze the data collected to produce experimental results.
2) Develop the equations and design principles for open channel flows
3) Exhibit the analytical capabilities of pressure and velocity distribution in an open channel in order to solve practical problems.
4) Suggest solutions to improve performance the existing hydropower systems.

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SECTION-I

Unit 1: INTRODUCTION TO OPEN CHANNEL FLOW (07 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) **(08 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 **(8hrs)**
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 s**ite 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.

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Unit 6: DIMENTIONAL& MODEL ANALYSIS   **(8 hrs)**

Dimensions & Dimensional homogeneity, Importance & Use of Dimensional analysis, Buckingham π theorem, statement & applications, Non dimensional numbers & their significance, Difference between model & 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) Y2/Y1
       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- Wilely India.

REFERENCE BOOKS

1) Fluid Mechanics – Streeter McGraw Hill-International Book Co.,Aucklard.
2) Flow in open channel – V. T. Chaw – McGraw Hill International Book Co., Aucklard.
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- Cenage Learning.
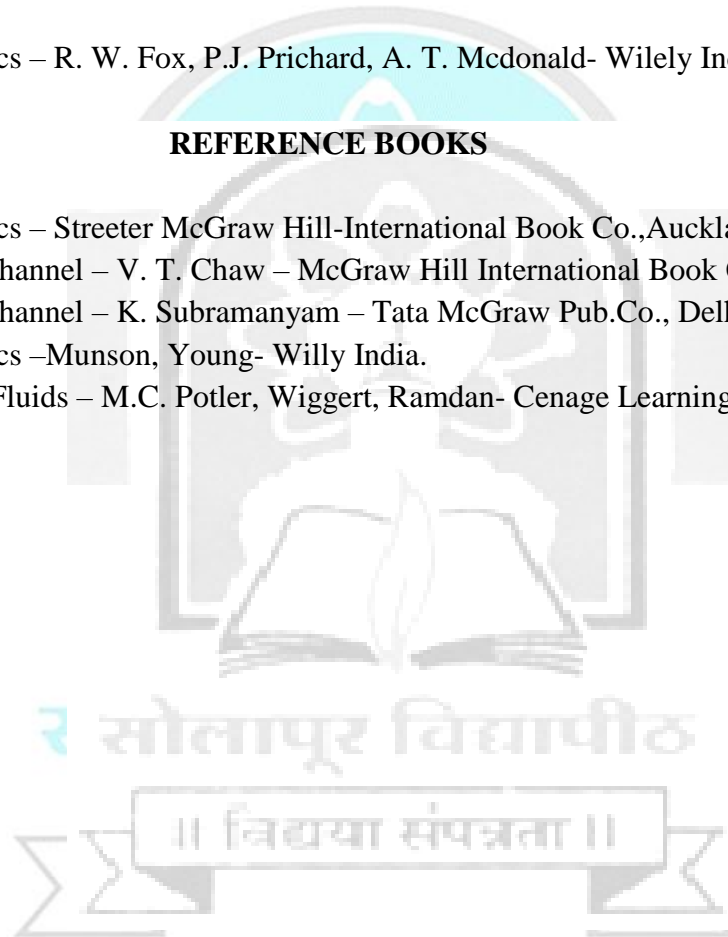
Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV225 - WATER RESOURCES ENGINEERING-I

Teaching Scheme

Lectures – 3 Hrs/Week, 3 Credits

Examination Scheme

ESE – 70 Marks

ISE – 30 Marks

ICA – 25 Marks

Course Objectives:

1) To educate the students about hydrologic data and hydrologic processes
2) To enable the student to predict the storm hydrograph for a given watershed resulting from a given rainfall event.
3) To introduce the students to the basics of groundwater flow processes.
4) To impart knowledge of various Watershed management practices.
5) To enable students to select appropriate method of irrigation depending upon availability of water and crop water requirements.

Course Outcomes:

1) The students will be able to estimate runoff, based on rainfall and geographic data.
2) The students will be able to calculate yield open well and tube well for various types of aquifers using knowledge of ground water hydrology.
3) The students will be conversant with National and State Water Policies.
4) The students will be able to choose suitable water application technique of irrigation, depending upon type of crop, soil moisture and water availability.
5) The students will demonstrate knowledge of soil & water conservation by adopting watershed management techniques.

SECTION-I

Unit- 01   **(7 hrs)**

Introduction to Hydrology: Definition, History and importance of hydrology, The hydrological cycle, Weather and its precipitation potential.
Precipitation :Forms and types of precipitation, Different methods of measurement, Factors

affecting precipitation at a location, Correcting precipitation data, Estimating missing data, Estimation of extreme values, Rain gauge network, Determination of average precipitation over the catchments, Analysis of precipitation data, Mass rainfall curves, Intensity-duration curves, Concept of depth-area- duration analysis, Frequency analysis.

Evaporation and Evapo-transpiration: Factor affecting evaporation, Measurement and control of evaporation upon reservoirs. Evapo-transpiration - definition and measurement

Infiltration: Process of Infiltration, Factor affecting infiltration, Infiltration indices, Effect of infiltration of on runoff and ground water recharge.

Unit- 02   **(6 hrs)**

Runoff: Factors affecting runoff, Catchment yield calculations, Rainfall-runoff relationship
Hydrograph: Base flow, Separation of base flow, Unit hydrograph – theory, assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.

Unit- 03   **(5 hrs)**

Stream gauging: Selection of a site, various methods of discharge measurements, Area velocity method, Slope Area method, S.W.F. and other modern methods.
Floods: Definition, Factors affecting, Estimation of peak flow, Rational and other methods, Design flood, hydrograph components, Recurrence period.

Unit- 04   **(5 hrs)**

Ground water hydrology: Occurrence and distribution of ground water, Specific yield of aquifers, Movements of ground water, Darcy's law, Permeability, Safe yield of basin, Hydraulics of well under steady flow condition in confined and unconfined aquifers, Specific capacity of a well, Well irrigation: tube wells, open wells, their design and construction.

SECTION-II

Unit- 05   **(6 hrs)**

Water Resources Development in India & Maharashtra: National water policy of India, Water Policy of Maharashtra State, Development of irrigation potential through five year plans, Water resources potential of India, Water Resources development in India, Water resources

w.e.f. academic year 2017-18

potential of Maharashtra, Water resources development in Maharashtra, Problems in water resources developments in country and Maharashtra state.

Inter basin transfer of water: Concept of inter basin transfer of water, Proposed inter basin transfer of water from surplus regions of India to deficit regions of India, National perspective plan of India-Himalayan rivers component and peninsular rivers component.

Unit- 06 (6 hrs)

(a) Irrigation: Definition and necessity of Irrigation, Different systems of irrigation-Flow, Lift, Inundation, Storage, Kolhapur type weirs.
Sources of water-river, well, tanks. Water Application Methods: Methods of lifting water and application of water to soils, Sprinkler, Drip, Basin, Furrow. Layout of Drip Irrigation System.
(b) Lift Irrigation: Necessity, General Layout, Main Components of a lift irrigation scheme, Elementary design of Lift Irrigation Scheme.
(c) Minor Irrigation System: Necessity and general layout of percolation tanks, Bandhara irrigation.

Unit- 07 (5 hrs)

Soils: Types of Soils, Suitability of soils for different crops, Soil moisture, Wilting coefficient, Texture and physical structure, Harmful components in soil, Preparation of soil for irrigation.
Crop Water requirements: Cash crops and food crops, Water requirement of different crops, Duty and Delta, Factors affecting duty and delta, Crop Seasons in Maharashtra and India, Command Area- Gross, Cuturable, Irrigable, Calculation of water required.

Unit- 08 (5 hrs)

(a) Watershed Management: Need of Watershed management, Importance of soil and water conservation measures, Reservoir sedimentation. Techniques for Rainwater harvesting and ground water harvesting.
(b)Water Management: Application of water, Water management and distribution, cooperative water users' organizations, Warabandi, Rotational applications, Assessment of canal revenue-Various methods.
(c) Applications of Remote Sensing and Geographic Information Systems in Water Resources Engineering

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on entire curriculum.

TEXT BOOKS

1. Irrigation Engineering and Hydraulic Structures-S. K. Garg, Khanna Publishers, Delhi.
2. Irrigation and Water Power Engineering- Dr. Punmia, Dr. Pande, Laxmi Publications.
3. Engineering hydrology- K. Subramanya ,Tata McGraw- Hill Publishers.
4. Efficient Use of Irrigation Water-G. H. Sankara Reddi, Kalyani Publishers, Noida.
5. Water Management in India-J. V. S. Murthy.
6. Water Management, Conservation, Harvesting and Artificial Recharge- Dr. A. S. Patel, Dr. D. L. Shah, New Age International Publishers.
7. Hydrology and Water Resources-R. K. Sharma, Dhanpat Rai & Sons.
8. Fundamentals of Irrigation Engineering-Bharat Sing, Nem Chand & Bros, Roorkee.

REFERENCE BOOKS

1. Irrigation theory & Practice – Michael, Vikas Publishing House.
2. Irrigation Structures- Milos Holy-CBIP
3. Water Management-Jaspal Singh, M. S. Acharya , Arun Sharma .Pub- Himanshu Publication
4. Design of Minor Irrigation and Canal Structure- Satyanarayan and R. Murthy.
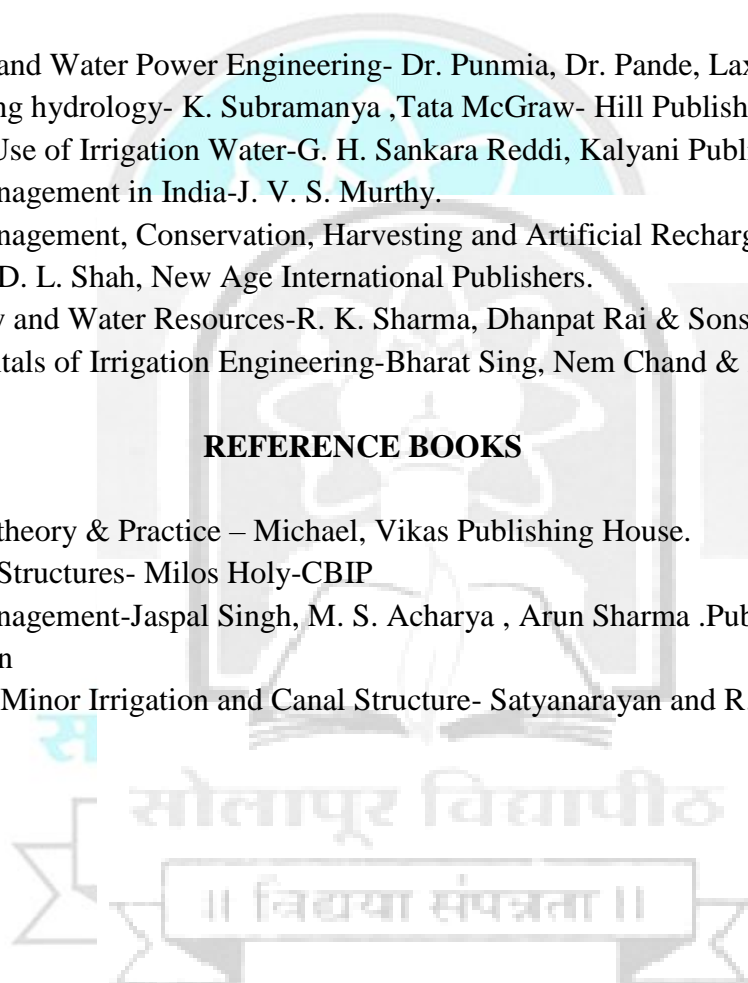
Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV226 – ENGINEERING MATHEMATICS-III

Teaching Scheme	**Examination Scheme**

Lectures – 3 Hrs/Week, 3 Credits   **ESE – 7**0 Marks

Tutorial – 1 Hr/Week, 1 Credit   **ISE –** 30 Marks

          ICA – 25 Marks

Course Objectives:

1. To introduce higher order linear differential equations and their applications to civil Engineering.
2. To introduce to students Laplace and inverse Laplace transforms.
3. To introduce to students Fourier series of periodic functions
4. To introduce concepts of Statistics and Probability.
5. To introduce functions of Complex Variables.

Course Outcomes:

1. Student can solve higher order linear differential equation with constant coefficient
2. Student can apply Laplace and inverse Laplace transforms for solving linear differential equations.
3. Student can express a function in terms of sine and cosine components so as to model simple periodic functions.
4. Student can find the relation between two variables for the given data using regression
5. Student can sketch and explain various probability distribution functions
6. Student can evaluate counter integrations of complex functions.

SECTION – I

Unit 1: Linear differential equations with constant coefficients: (06 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.

Unit 2: Homogeneous Linear Differential equations: **(06 Hrs)**

Legendre's Linear equations, Civil Engineering Applications

Unit 3: First Order Partial Differential equations   **(06 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 equations by Lagaranges method. Solution of partial differential equations by method of separation of variables.

Unit 4: Laplace transform: **(06 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.

SECTION-II

Unit 5: Fourier series: **(06 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.

Unit 6: Functions of Complex variables: **(05 Hrs)**

Analytic functions, Cauchy's Riemann equations, Harmonic functions, Line integral, Cauchy's integral theorem and Cauchy's integral formula.

Unit 7: Statistics: (05 Hrs)

Coefficient of correlation and lines of regression of bivariate data, fitting of curve-Least squares principle.

Unit 8: Probability: (05 Hrs)

Random variable, 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.

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

Solapur University, Solapur
S.E. (Civil Engineering) Semester-II
CV227: COMPUTER PROGRAMMING AND NUMERICAL METHODS

Teaching Scheme	**Examination Scheme**
Lectures – 2 Hrs/Week, 2 Credits	**POE–** 50 Marks
Practical – 2 Hr/Week, 1 Credit	**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
1) Write computer programs for Civil Engineering Problems
2) Write computer programs Matrix operations, which are necessary for structural analysis.
3) Develop computer programs for calculating Roots of equation, Numerical Integration, ordinary differential equations and their various applications in Civil Engineering.
4) Write computer programs for 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.

w.e.f. academic year 2017-18

Unit 2. (5 hrs)

Arrays in C - Declaration and initialization of one dimensional array, accessing elements, array handling. Declaration and initialization of two dimensional array, accessing elements, array handling. Matrix operations on computer: Multiplication and inversion using Cramer's rule, Solution of simultaneous equations using Gauss elimination method.
Civil Engineering based problems and programs using matrix operations.

Unit 3 Roots of equation: (5 hrs)

Trial and error method - Bisection method;
 Derivative based methods - Newton Raphson method,.

Unit 4 Numerical integration method: (4 hrs)

Simpsons rule and Trapezoidal rule.
Civil Engineering based problems and programs using above Numerical methods.

Unit 5 Solution of ordinary differential equation: (5 hrs)

Euler's Method, Modified Euler's method. Runge Kutta method.
Civil Engineering based problems and programs using above Numerical methods.

Unit 6 Statistical analysis: (5 hrs)

Mean, standard deviation and Median, Least square method,
Regression analysis – Linear, parabolic curve fitting.
Civil Engineering based problems using statistical analysis.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

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

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

TEXT BOOKS

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

REFERENCE BOOKS

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