Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2022
'B^{++}' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Syllabus:- Civil Engineering

Name of the Course: S. Y. B. Tech. (Sem.– III & IV)

(Syllabus to be implemented from-2024-25)

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FACULTY OF SCIENCE & TECHNOLOGY

NEP 2020 Compliant Curriculum

With effect from 2023-2024

Semester I (Common for All Engineering Branches)

Course Type	***Course Code***	***Name of the Course***	***Engagement Hours***		***Credits***	***FA***	***SA***		***Total***
			L	***P***		***ESE***	***ISE***	***ICA***	
BSC	BS-01/ BS-02	Engineering Physics / Engineering Chemistry $	3	2	4	70	30	25	125
	BS-03	Engineering Mathematics-I	3	2	4	70	30	25	125
ESC	ES-01/ ES-02	Basics of Civil and Mechanical Engineering /Basic Electrical & Electronics Engineering $	3	2	4	70	30	25	125
	ES-03	Engineering Mechanics	3	2	4	70	30	25	125
AEC	AE-01	Communication Skills	1	2	2		25	25	50
CC	CC-01	Sports and Yoga or NSS/NCC/UBA (Liberal Learning Course-I)	1	2	2			25	25
SEC	SE-01	Workshop Practices		2	1			25	25
		Total	**14**	**14**	**21**	**280**	**145**	**175**	**600**
		Student Induction Program**							

Semester II (Common for All Engineering Branches)

Course Type	*Course Code*	*Name of the Course*	*Engagement Hours*		*Credits*	*FA*	*SA*		*Total*
			L	*P*		*ESE*	*ISE*	*ICA*	
BSC	BS-01/ BS-02	Engineering Physics / Engineering Chemistry $	3	2	4	70	30	25	125
	BS-04	Engineering Mathematics - II	3	2	4	70	30	25	125
ESC	ES-01/ ES-02	Basics of Civil and Mechanical Engineering / Basic Electrical & Electronics Engineering $	3	2	4	70	30	25	125
		Engineering Graphics and CAD		4	2		25	50	75
SEC	SE-02	Data Analysis and Programming Skills	1	2	2		25	25	50
CC	CC-02	Professional Personality Development (Liberal Learning Course-II)	1	2	2		25	25	50
IKS	IKS-01	Introduction to Indian Knowledge System	2		2		25	25*	50
		Total	**13**	**14**	**20**	**210**	**190**	**200**	**600**
		Democracy, Elections and Good Governance *	**1**			**50**			

***For IKS activity report should be submitted**

BSC- Basic Science Course ESC- Engineering Science Course,

PCC- Programme Core Course , AEC- Ability Enhancement Course,

IKS- Indian Knowledge System, CC- Co-curricular Courses ,

VSEC-Vocational and Skill Enhancement Course

- Legends used–

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

- **Notes-**

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

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

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

and will take up course of Engineering Physics (theory & laboratory) in semester II.

2. # - For the Course (C113) Basic Electrical & Electronics Engineering, Practicals of Basic Electrical Engineering and Basic Electronics Engineering will be conducted in alternate weeks.

3. @ - For the Course (C113) Basics of Civil and Mechanical Engineering, Practicals of Basics of Civil Engineering and Basics of Mechanical Engineering will be conducted in alternate weeks.

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

   Internal Continuous Assessment Marks (ICA) is calculated based upon student‘s performance during laboratory sessions / tutorial sessions.

5. *- Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However, student must complete End Semester Examination (ESE) of 50 marks (as prescribed by university) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree.
6. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

**** GUIDELINES FOR INDUCTION PROGRAM (C119)**

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

An induction program for the new UG entrant students is proposed at the commencement of the first semester. It is expected to complete this induction program before commencement of the regular academic schedule.
Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.
The Induction Program shall encompass (but not limited to) below activity –

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

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

1. Attendance and active participation
2. Report writing

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FACULTY OF SCIENCE & TECHNOLOGY

NEP 2020 Compliant Curriculum

With effect from 2024-2025

Semester -III

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CIVPCC-01	Structural Mechanics -I	3			03	70	30			100
PCC	CIVPCC-02	Fluid Mechanics and Machines	3			03	70	30			100
PCC	CIVPCC-03	Surveying and Geomatics	3		2	04	70	30	25	25	150
CEP/FP	CIVFP-01	Fluid Mechanics Lab			2	01			25	25	50
CEP/FP	CIVFP-02	Building and Infrastructure Drawing Lab			2	01			25	25	50
Entrepreneurship	EM-01	Product Development and Entrepreneurship	1	1		02		50	25		75
OE	OE-01	Open Elective-I	2		2	03	70	30	25		**125**
MD M	MDM-01	MD Minor-I	2		2	03	70	30	25		**125**
VEC	VEC-01	Universal Human Values	1		2	02	50*		25		**75**
		Total	**15**	**1**	**12**	**22**	**400**	**200**	**175**	**75**	**850**
		Environmental Science	**1**								

***For VEC-01: MCQ-based examination to be conducted.**

PCC- Programme Core Course, PEC-Programme Elective Course,
AEC - Ability Enhancement Course, IKS- Indian Knowledge System,
CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.

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Semester -IV

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CIVPCC-04	Structural Mechanics-II	3			03	70	30			100
PCC	CIVPCC-05	Building and Infrastructure Planning	2		2	03	70	30	25		125
PCC	CIVPCC-06	Environmental Engineering	3		2	04	70	30	25	25	150
SEC	CIVSEC-03	Concrete Technology, Material Testing and Evaluation	1		2	02			25	25	50
Economic/ Management	EM-02	Project Management and Economics	2			02		25	25		50
OE	**OE-02**	Open Elective-II	**2**		**2**	**03**	**70**	**30**	**25**		**125**
MDM	**MDM-02**	MD Minor-II	**2**		**2**	**03**	**70**	**30**	**25**		**125**
VEC	**VEC-02**	**Professional Ethics**	**1**		**2**	**02**	**50***		**25**		**75**
		Total	**16**		**12**	**22**	**400**	**175**	**175**	**50**	**800**
		Environmental Science	**1**				**40**	**10**			**50**

***For VEC-02: MCQ-based examination to be conducted.**

PCC- Programme Core Course, PEC-Programme Elective Course

AEC- Ability Enhancement Course, IKS- Indian Knowledge System,

CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course

MDM - Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.

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With effect from 2025-2026

Semester -V

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CIVPCC-07	Design of Steel Structures	3			03	70	30			100
PCC	CIVPCC-08	Transportation Engineering	3		2	04	70	30	25		125
PCC	CIVPCC-09	Geotechnical Engineering	3		2	04	70	30	25	25	150
PEC	CIVPEC-01	Programme Electives Course -I	3		2	04	70	30	25		125
AEC	AEC-02	**Creativity and Design Thinking**	1		2	02	50*		25		75
OE	**OE-03**	**Interdisciplinary Mini Project**	**1**		**2**	**02**			**25**	**25**	**50**
MD M	**MDM-03**	MD Minor-III	**2**		**2**	**03**	**70**	**30**	**25**		**125**
		Total	**16**		**12**	**22**	**400**	**150**	**150**	**50**	**750**

***For AEC-02: MCQ-based examination to be conducted.**

PCC- Programme Core Course, PEC-Programme Elective Course

AEC- Ability Enhancement Course, IKS- Indian Knowledge System,

CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course

MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.

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Semester -VI

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CIVPCC-10	Design of Concrete Structures -I	3			03	70	30			100
PCC	CIVPCC-11	Hydrology and Water Resources Engineering	3			03	70	30	25		125
PCC	CIVPCC-12	Construction Management Practices	2		2	03	70	30	25	25	150
PEC	CIVPEC-02	Programme Elective Course -II	3		2	04	70	30	25	25	150
PEC	CIVPEC-03	Programme Elective Course -III	3		2	04	70	30	25		125
SEC	**CIVSEC-04**	Mini Project on Design of Infrastructure (MPDI)			**4**	**02**			**25**	**50**	**75**
MDM	**MDM-04**	MD Minor-IV	**2**		**2**	**03**	**70**	**30**	**25**		**125**
		Total	**16**		**12**	**22**	**420**	**180**	**150**	**100**	**850**

PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System,
CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course.
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.

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Semester -VII

Distribution	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***			***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	***OE/ POE***	
PCC	CIVPCC-13	Design of Concrete Structures-II	3			03	70	30			100
PCC	CIVPCC-14	Estimating Costing and Valuation	2		2	03	70	30	25		125
PEC	CIVPEC-04	Programme Elective Course -IV or MOOCS##	4			04	100				100
Project	CIVProject	Capstone Project			8*	04			100	100	200
RM	**RM**	**Research Methodology and IPR**	**3**		**2**	**04**	**70**	**30**	**25**		**125**
MD M	**MDM-05**	MD Minor-V	**2**			**02**	**70**	**30**			**100**
		Total	**14**		**12**	**20**	**380**	**120**	**150**	**100**	**750**

Students should attend MOOCs in that 4 hrs, if MOOCs is choosen,
Mini Project/ Assignment related to MOOCs and ICA marks to be given based on that.
List of MOOCs related to CIVPEC-04 will be provided by BOS time to time.
* Load Based on Project Groups

BSC- Basic Science Course
ESC- Engineering Science Course,
PCC- Programme Core Course,
AEC- Ability Enhancement Course,
IKS- Indian Knowledge System,
CC- Co-curricular Courses,
VSEC-Vocational and Skill Enhancement Course

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Semester -VIII

Distribution	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*			*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	*OE/ POE*	
PCC	CIVPCC-10	Professional Practice, Law & Ethics	4#			04	100				100
PEC	CIVPEC-05	**Programme Elective Course -V or MOOCs**	4#			04	100				100
OJT	**CIVOJT**	**On-Job Training**			**24**	**12**			**200**	**100**	**300**
		Total	**8**		**24**	**20**	**200**		**200**	**100**	**500**

Students will practice or attend in Self-Learning mode.
PCC- Programme Core Course, PEC-Programme Elective Course
AEC- Ability Enhancement Course, IKS- Indian Knowledge System,
CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Course
MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.
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List of MOOCs related to CIVPEC-05 will be provided by BOS time to time.

Basket of Programme Elective Course (PEC)

PEC/Sem	Course code and name
CIVPEC - 01/ V	CIVPEC – 01A: Advanced Concrete Technology CIVPEC – 01B: Engineering Geology and Material Science CIVPEC – 01C: Water and Sanitation Infrastructure
CIVPEC - 02/ VI	CIVPEC – 02A: Foundation Engineering CIVPEC – 02B:Urban Transportation Planning CIVPEC – 02C:Air and Noise Pollution and Control
CIVPEC - 03/ VI	CIVPEC – 03A: Construction Productivity CIVPEC – 03B Planning for Sustainable Development CIVPEC – 03C Earthquake Engineering
CIVPEC - 04/ VII OR	CIVPEC – 04A: Hydraulic Structures and Water Power Engg. CIVPEC – 04B: Repair and Rehabilitation of Structure CIVPEC – 04C: Industrial Structures
CIVPEC - 04/ VII	MOOC Courses CIVPEC – 04D : <As per the list provided by BoS> CIVPEC – 04E : <As per the list provided by BoS>
CIVPEC - 05/ VIII OR	CIVPEC – 05A: Concrete Composites CIVPEC – 05B:TQM and MIS in Civil Engineering CIVPEC – 05C:Disaster Management
CIVPEC - 05/ VIII	MOOC Courses CIVPEC – 05D: <As per the list provided by BoS> CIVPEC – 05D: <As per the list provided by BoS>

A. Multidisciplinary Minor in "Product Design and Commercialization"

Semester	Course Code	Course Title
III	CIVMDM-01A	Design Thinking: Business Innovation Framework
IV	CIVMDM-02A	Entrepreneurship ,Leadership and Management
V	CIVMDM-03A	Design Optimization
VI	CIVMDM-04A	New Product Development
VII	CIVMDM-05A	Finance Management and Marketing

B. Multidisciplinary Minor in "Applied Civil Engineering"

Semester	Course Code	Course Title
III	CIVMDM-01B	Introduction to Geographic Information Systems
IV	CIVMDM-02B	Urban Planning and Design
V	CIVMDM-03B	Operation Research and Management
VI	CIVMDM-04B	Disaster Management and Mitigation
VII	CIVMDM-05B	Sustainable Engineering and Trends

A. Honors in **Innovation and Design Engineering**

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		**Total**
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CIVHON-01A	Design Thinking	3	1		4	70	30	25	125
IV	CIVHON-02A	Managing Innovation and Entrepreneurship	3		2	4	70	30	25	125
V	CIVHON-03A	Engineering Systems and Design Optimization	3		2	**4**	70	30	25	125
VI	CIVHON-04A	Civil Engineering System Analysis and Design	3		2	**4**	70	30	25	125
VII	CIVHON-05A	Mini Project			4*	**2**			50	50
		Total	12	1	10	**18**	280	120	150	550

* Indicates Contact Hours

B. Honors in **Infrastructure Engineering**

Semester	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	
III	CIVHON-01B	Applications of Information Technology and Information Systems	3	1		4	70	30	25	125
IV	CIVHON-02B	Planning and Design of Rural Roads	3		2	4	70	30	25	125
V	CIVHON-03**B**	Roads and Highway Project Development	3		2	**4**	70	30	25	125
VI	CIVHON-04B	Bridge and Grade Separated Structures	3		2	**4**	70	30	25	125
VII	CIVHON-05B	Mini Project			4*	**2**			50	50
		Total	12	1	10	**18**	280	120	150	550

* Indicates Contact Hours

C. Honors in **Sustainability Engineering**

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CIVHON-01C	Environmental Laws and Impact Assessment	3	1		4	70	30	25	125
IV	CIVHON-02C	Construction Materials: Sustainability and Usability	3		2	4	70	30	25	125
V	CIVHON-03**C**	Sustainable Materials and Green Buildings	3		2	**4**	70	30	25	125
VI	CIVHON-04C	Sustainable Engineering and Technology	3		2	**4**	70	30	25	125
VII	CIVHON-05C	Mini Project			4*	**2**			50	50
		Total	12	1	10	**18**	280	120	150	550

* Indicates Contact Hours

D. Honors in **"Railway Infrastructure"**

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CIVHON-01D	Railway Track structure	3	1		4	70	30	25	125
IV	CIVHON-02D	Elevated structures in Railway	3		2	4	70	30	25	125
V	CIVHON-03**D**	Underground structures in Railway	3		2	4	70	30	25	125
VI	CIVHON-04D	High speed Railway infrastructure	3		2	4	70	30	25	125
VII	CIVHON-05D	Mini Project			4*	2			50	50
		Total	12	1	10	18	280	120	150	550

* Indicates Contact Hours

Honors with Research*

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*	*Credits*	*SA*		*Total*
			P		*ICA*	*OE*	
VII	CIVRES-01	Research Project Phase-01	9 #	9	100	100	200
VIII	CIVRES-01	Research Project during OJT	9 ##	9	100	100	200
		Total	18	18	200	200	400

Along with 9 hours of engagement hours, 4.5 Hrs. activities for preparation for community engagement and service, preparation of reports, etc.

Along with 9 hours of engagement hours 4.5 Hrs. activities for preparation for community engagement and service, preparation of reports, etc. and independent reading during On Job Training and preferably related to On Job Training activities.

These Courses are open for students of all the UG Engineering Program.

Semester: III List of open elective - I

Sr. No.	List of Open Electives
1.	OE-01A: Advanced Mathematics and Statistics
2.	OE-01B Digital Marketing and E- Commerce
3.	OE-01C Humanities and Social Sciences
4.	OE-01D Industrial and Quality Management
5.	OE-01E Mathematics for Software and Hardware
6.	OE-01F Soft Skills and Personality Development

Semester: IV List of open elective – II

Sr. No.	List of Open Electives
1.	OE-02A Entrepreneurship and Innovation
2.	OE-02B Environmental Sustainability
3.	OE-02C Renewable Energy
4.	OE-02 D Measurement, Instrumentation and Sensors
5.	OE-02E Operation Research
6.	OE-02F Computational Mathematics
7.	OE-02 G Professional Business Communication

List of Open Electives 01 (Semester –III)

1. **OE-01A: Advanced Mathematics and Statistics**
2. **OE-01B Digital Marketing and E-Commerce**
3. **OE-01C Humanities and Social Sciences**
4. **OE-01D Industrial and Quality Management**
5. **OE-01E Mathematics for Software and Hardware**
6. **OE-01F Soft Skills and Personality Development**

List of Open Electives 02 (Semester –IV)

1. **OE-02A Entrepreneurship and Innovation**
2. **OE-02B Environmental Sustainability**
3. **OE-02C Renewable Energy**
4. **OE-02D Measurement, Instrumentation and Sensors**
5. **OE-02F Operation Research**
6. **OE-02F Computational Mathematics**
7. **OE-02 G Professional Business Communication**

Open Electives 03 (Semester –V)

1. **Interdisciplinary Mini Project**

Semester III

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – I, Semester- III
CIVPCC-01: STRUCTURAL MECHANICS-I

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credits	**ISE –** 30 Marks
	ESE –70 Marks

Course Outcomes:

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

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

Section-I

Unit 1: Simple stress & strains (7 Hrs)

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

Unit 2: Principal stresses - strains and Combined Bending – Torsion (11 Hrs)

a. 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.

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

Unit 3: Three Hinged Arches (4 Hrs)

Concepts, types of arches, analysis of parabolic with supports at same level. Determination of horizontal thrust, radial shear and normal thrust.

Section –II

Unit 4: Shear Force and Bending Moment (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 5: Bending Stresses and Shear Stresses in Beams (11 Hrs)

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

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

Unit 6: Influence Line Diagrams and Rolling Loads (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.

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 Pubication, 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 Pubication, 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) –Semester- III
CIVPCC02: FLUID MECHANICS AND FLUID MACHINES

Teaching Scheme	**Examination Scheme**
Lectures – 3 Hrs/Week, 3 Credits	**ISE –** 30 Marks
	ESE –70 Marks

Course Outcomes

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

1. Comprehend physical properties of fluids and relationship between them.
2. Identify and analyse the hydrostatic forces on submerged and floating bodies.
3. Analyse fluid motion with and without forces.
4. Quantify water flow through Notches & Weirs.
5. Determine head losses through pipes and solve pipe networks.
6. Explain the working of hydraulic turbines and pumps along with their performance parameters.

SECTION - I

Unit 1: FLUID PROPERTIES (5 Hrs.)

Definition of Fluid and fluid mechanics, Physical properties of fluids: Density, Specific weight, Specific volume, Relative density Cohesion, Adhesion, Viscosity- Newtonian and Non- Newtonian fluids, Classification of fluids, compressibility, Surface tension, Capillarity, Vapor pressure, Cavitation, Problems involving use of above Fluid Properties.

Unit 2: FLUID STATICS (8 Hrs.)

Pascal‘s law, Hydrostatic Law, units and scale of pressure measurement, types of pressure, Piezometer, U-tube manometer, U-tube differential manometer, Inverted U-tubedifferential manometer; Mechanical pressure gauge – Bourdon tube.

Total Pressure on vertical and inclined plane surfaces submerged in fluid, depth of Center of Pressure. Concepts of: Buoyant force, Buoyancy and Center of Buoyancy, Archimedes Principle, Metacenter and Metacentric height, Equilibrium of floating and submerged bodies.

Unit 3: FLUID KINEMATICS & DYNAMICS (8 Hrs.)

a) Methods of describing fluid motion, Concept of Control Volume, Streamlines, Path lines, Streak lines and Stream tubes, Types of fluid flows, Rate of flow, Continuity equation, Velocitypotential and stream function, Equipotential Line, flow net.

b) Forces acting on fluid mass in motion, Euler‘s equation of motion along a streamline, Bernoulli‘s Theorem, Limitations and Applications, Measurement of discharge-through Venturi meter, Orifice meter and Orifice, Measurement of velocity through Pitot tube.

SECTION-II

Unit 4: Notches and Weirs (5 Hrs.)

a) **Notches**: Types of notches, Derivation of discharge equation, velocity due to approaches, Francis formula, Errors in measurements of head.

b) **Weir:** Sharp & Broad crested weirs, calibration of weirs, time required to empty the tank with

notches and weirs, Ventilation of weirs, Types of nappe.

Unit 5: Flow through Pipes and Boundry Layer Analysis (7 Hrs.)

a) **Energy Losses in pipe flow:** Major and Minor Losses, Darcy Weisbach Equation, Pipes in Series and Parallel, Concept of Equivalent length and Equivalent diameter of pipe; Concept of HGL, TEL and Syphon, Water Hammer; Hardy Cross Method for solving pipe network.

b) **Boundary Layer Theory**- Development of Boundary layer on flat plate, laminar, turbulent and transitional boundary layer, laminar sub layer, displacement, momentum and energy thickness, Hydro dynamically smooth and rough boundaries.

Unit 6: IMPACT OF JET, HYDRAULIC TURBINES AND PUMPS (9 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, Francis and Kaplan turbines, Draft tube, Specific speed, Design and governingof Pelton Wheel, Prediction of performance in terms of unit quantities and specific quantities, selection of turbines on the basis of head and specific speed.

c) Classification of Hydraulic Pumps, Centrifugal Pump - Components, Working of Centrifugal pump, inlet and outlet velocity triangles, Work done by impeller, Types of Heads and efficiencies, Concept of priming of pump, multistage pumping, operational difficulties in Centrifugal Pump, Introduction to submersible pumps and reciprocating pumps, Selection of Pumps.

TEXT BOOKS

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

REFERENCE BOOKS:

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) – Semester- III
CIVPCC03: 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- 25Marks
ICA – 25 Marks

Course Outcomes:

On completion of the course students will be able to:

1. Carry out temporary adjustments of modern surveying equipment.
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: - 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.

b) Light Detection and Ranging (LiDAR) LIDAR: Introduction

c) Unmanned Aerial Vehicle (Drone) -Introduction

d) Electromagnetic remote sensing: Physics of radiant energy: Nature of Electromagnetic radiation, Electromagnetic spectrum. Energy sources and its characteristics. Atmospheric influences: Absorption, Scattering. Energy interaction with Earth Surfaces, 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, 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.

b) Project Surveys

c) Building Lineout and layout

d) Route Survey

e) Culvert and Bridges

f) 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 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 Publication

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- III

CIVFP-01 FLUID MECHANICS LAB

Teaching Scheme
Practical – 2 Hr/Week, 1 Credit

Examination Scheme
POE – 25 Marks
ICA – 25 Marks

Course Outcomes

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

1. Comprehend physical properties of fluids and relationship between them.
2. Determine metacentric height and apply Bernoulli's equation
3. Carry out calibration of various flow measuring instruments.
4. Determine head losses through pipes and solve pipe networks.
5. Explain the working of hydraulic turbines and pumps along with their performance parameters.

CONTINUOUS ASSESSMENT (ICA) shall be based on assignments on the curriculum and below listed experiments

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

1) Measurement of pressure (Piezometer, Manometers, Pressure gauges)
2) Determination of Metacentric heights.
3) Verification of Bernoulli's Theorem
4) Calibration of Venturimeter/Orifice meter.
5) Calibration of an Orifice/Mouthpiece.
6) Determination of loss of head in pipe flow.
7) Calibration of V-Notch/Rectangular Notch.
8) Calibration of Broad/Sharp crested suppressed weir
9) Study of Moody's Chart and Nomogram for pipe design.
10) Turbines and Pumps: At least TWO experiments from the following.
    1) Impact of jet.
    2) Study of turbines (demonstration).
    3) Study of centrifugal pump. (Demonstration)

Practical Oral Examination End Semester Examination (Practical – Oral Examination): shall be based on the knowledge of students in the curriculum and performance in above listed ICA.

TEXT BOOKS and REFERENCE BOOKS:

a. Fluid Mechanics -A. K. Jain-Khanna Pub., Delhi.
b. Fluid Mechanics - S. Nagrathanam Khanna Pub., Delhi.
c. Fluid Mechanics - Garde, Mirajgaonkar Nemchand and Bross., Roorkee.
d. Fluid Mechanics - R. W. Fox, P.J. Prichard, A. T. McDonold- Wiley India.
e. Fluid Mechanics - K.L. Kumar Eurasia Publishing House, Delhi.
f. Fluid Mechanics & Hydraulic Machines, SS Rattan, Khanna Publishing Houe
g. Fluid Mechanics and Fluid Machines - Modi and Seth Standard Book House, Delhi.
h. Fluid Mechanics - Streeter McGraw Hill-International Book Co., Aucklard.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- III

CIVFP-02 Building and Infrastructure Drawing Lab

Teaching Scheme
Practical – 2 Hrs./Week, 1 Credit

Examination Scheme
POE – 25 Marks
ICA – 25 Marks

Course Outcomes:

After successful completion of the course, students will be able to

1. Draw neat drawings of different building components such as doors, windows, and stairs and various types of bonds.
2. Design different types of staircases commonly used in residential and public buildings.
3. Plan and design a ―Residential Building‖ according to requirements adhering to National Building Code norms and standards
4. Prepare ―Permission Drawing‖ for Residential buildings for obtaining building permission from competent authority by using suitable ―Computer Aided Drawing and Design‖ application software.
5. Plan and design appropriate building services layout for ―Furniture requirement, Electrification points, Water supply and Drainage System‖ for a building as per standards norms by using suitable, Computer Aided Drawing and Design‟ application software

INTERNAL CONTINUOUS ASSESSMENT (ICA)

For drawing session

(A) Sketching in sketchbook consisting of the following 5 drawing exercises:

1. Lettering, Symbols and line work.
2. Building structures (Load bearing & Framed structures)
3. Brick bonds
4. Arches and Roofs, Doors, and Windows.

Staircases

(B) Planning and designing of residential building (G+1) and preparation of full set of CADD drawings for the residential building with the considering Building Planning Byelaws and Regulations as per SP-7, National Building Code of India. Full set of the following CADD drawing prints shall be submitted as a part of term work.

1. Municipal Building Permission drawing
2. Water supply, drainage layout plan and Electrification layout plan.
3. Furniture layout plan

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.

Site Visit for learning construction details of a residential building. A visit report to be drafted and submitted as a part of term work.

(C) 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 (Practical - Oral)

1. Practical examination shall be based on assessment of knowledge of students about planning skill and AutoCAD drafting skills. (Maximum two hours shall be allotted to students to complete given task on AutoCAD during Practical and viva Exam.)
2. In addition Oral examination shall be based on Practical and ICA.

Text Books

1. A text book of Building Construction- Arora & Bindra- Dhanpat Rai Publication, New Delhi.
2. Building Construction- Sushil Kumar- Standard Publishers, Delhi.
3. Principles of Building Drawing- M.G. Shah and C.M. Kale.
4. A course in Civil Engineering Drawing- V.B. Sikka – S.K.Katariya & Sons, Delhi.
5. Civil Engineering Construction Materials, S.K. Sharma, KBP House
6. Engineering Drawing + AutoCAD , by K.Venugopal , New Age International Publishers
7. 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.

A. Multidisciplinary Minor in "Product Design and Commercialization"

Semester	Course Code	Course Title
III	**CIVMDM-01A**	Design Thinking: Business Innovation Framework
IV	**CIVMDM-02A**	Entrepreneurship ,Leadership and Management
V	**CIVMDM-03A**	Design Optimization
VI	**CIVMDM-04A**	New Product Development
VII	**CIVMDM-05A**	Finance Management and Marketing

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- III
CIVMDM-01A Design Thinking: Business Innovation Framework

Teaching Scheme	**Examination Scheme**
Theory – 2 Hrs./Week, 2 Credit	**Theory-** ESE-70Marks
Tutorial - 2 Hr/Week, 1Credit	**ICA –** 25 Marks
	ISE-30 Marks

Course Outcomes:

After successful completion of the course, students will be able to

- Explain the fundamentals of Design Thinking and innovation
- Empathize and analyses model action plan.
- Analyze the steps of Design Thinking for the process of innovation
- Apply design thinking techniques for given tasks.
- Apply the design thinking techniques for solving problems in various sectors.

Section I

Unit No. 1: Introduction Design Thinking

Introduction & History of Design Thinking, Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Applications of Design Thinking.

Design Thinking Process: Phases of Design Thinking, Tools of design thinking - person, costumer, journey map, brain storming, and product development.

Unit No 2: Innovation, Creativity and Design Thinking

Concepts of creativity, design and innovation, Learn to apply Creativity, role of creativity and innovation, and in organizations, Design thinking for product and process innovation Difference between engineering design and design thinking.

Unit No. 3: Leadership & Business Models:

Defining Leadership; Global Leadership Attributes; Practicing Leadership, Types of leadership, Exemplary practices of effective leadership, Case studies, Aligning values, skills, and job activities for optimal performance, Leadership actions audit, Marketing of Innovation, Technology, Innovation Process, Technological Innovation Management Planning, Technological Innovation, Management Strategies, Technology Forecasting.

Section II

Unit No. 4: Product Solution Fit & Product Market Fit.

Understanding the development lifecycle, Product Solution Fit, and Product Market Fit, Decision-Making Process, Decision making in innovation, The Creative Process for Making, Decisions, Decision making in relation to problem solving, Utilization of cognitive technology, Predictiveanalytics, Critical thinking process in a business scenario.

Unit No. 5: Design thinking for Service Design:

How to design a service, Principles of service design, Benefits of service design, Service blueprint, Design strategy, organization, principles for information design, principles of technology for service design.

Unit No. 6: Developing a Product/ Service:

Lean Canvas model, Business Canvas model and Agile Industrial Design concepts/aspects in Products, Intellectual Property, and Design Thinking for Sustainability.

Design thinking in various sectors: Case studies in Various Engineering Sectors.

Internal Continuous Assessment (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the following –

1. Write a Case study for demonstrating all the steps of Design Thinking.
2. Perform a Group Discussion for generating ideas
3. Assignments (One Assignment on each unit)

Text Books

1. Karl T. Ulrich and Steven D. Eppinger. Product design and development, McGraw-Hill
2. ‒Designing for growth: A design thinking tool kit for managers‖, Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1
3. ‒The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems‖, by Michael Lewrick, Patrick Link, Larry Leifer., 2018, ISBN 978-1- 119-46747-2

A. Multidisciplinary Minor in “Applied Civil Engineering”

Semester	Course Code	Course Title
III	CIVMDM-01B	Introduction to Geographic Information Systems
IV	CIVMDM-02B	Urban Planning and Design
V	CIVMDM-03B	Operation Research and Management
VI	CIVMDM-04B	Disaster Management and Mitigation
VII	CIVMDM-05B	Sustainable Engineering and Trends

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- III

CIVMDM-01B Introduction to Geographic Information System

Teaching Scheme	**Examination Scheme**
Theory – 2 Hrs./Week, 2 Credit	**Theory-** ESE-70Marks
Tutorial - 2 Hr/Week, 1Credit	**ICA –** 25 Marks
	ISE - 30 Marks

Course Outcomes:

On completion of the course students will be able to:

1. Acquire a basic understanding of GIS modeling concepts, components, requirements and applications.
2. Create spatial and non-spatial models for presentation, analysis and decision-making.
3. Use of GIS software modules.
4. Design and execute a workflow using GIS techniques appropriate to an applied field

Section I

Unit 1: Basic concepts of GIS (5Hrs.)

Information systems, spatial and non-spatial information, geographical concepts and terminology, advantages of GIS, basic components of GIS, commercially available GIS hardware and software, organization of data in GIS

Unit 2: GIS data (6Hrs.)

Field data, statistical data, Maps, aerial photographs, satellite data, points, line and area feature, vector and raster data, advantages and disadvantages, data entry through keyboard, digitizers and scanners, digital data, preprocessing of data-rectification and registration, interpolation techniques, use of different plugins.

Unit 3: Data management (5Hrs.)

DBMS, various data models, run-length encoding, and data analysis-data layers, analysis of spatial and non-spatial data, data overlay and modeling, data processing: raster based and vector based, data presentation –hardcopy devices, softcopy devices.

Section II

Unit 4: Remote sensing and GIS integration (6Hrs.)

Principles of electromagnetic remote sensing, imaging characteristics of remote sensing systems, extraction of metric and descriptive information from remotely sensed images, integration of remote sensing and GIS.

Unit 5: Application of GIS (6Hrs.)

Map revision, land use land cover (LULC), agriculture, forestry, archeology, municipal geology, water resources, dam site selection, canal site selection, catchment area detection, rivers and its tributaries location finding, Environmental Impact Assessment, Oceanography, soil erosion, land suitability analysis, change detection.

Unit 6: GIS Project Planning and Implementation (6Hrs.)

Understanding the Requirements, Phases of Planning, Specifications, and Procedure for analysis projects and design projects.

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.

1. Importing maps and layers from various sources
2. Georeferencing and projection
3. Digitization of Points and Lines
4. Editing Map Elements
5. Attribute Data Entry and Manipulation
6. Cleaning, Building and Transformation
7. Data Analysis – Overlay, Buffer
8. Map Generation with Patterns and Legends

TEXT BOOKS

1. Lo C P, Yeung A K W, Concepts and Techniques of Geographic Information Systems, 2 nd edition, Prentice Hall India (August 20, 2006), (ISBN: 013149502X).
2. Kang-tsung Chang, Introduction to Geographic Information Systems, Tata mcGraw Hill, 2007- 7 th edition, (ISBN: 9780078095139)

REFERENCE BOOKS

1. Lo C P, Yeung A K W, Concepts and Techniques of Geographic Information ystems, 2 nd edition, Prentice Hall India (August 20, 2006), (ISBN: 013149502X).
2. Kang-tsung Chang, Introduction to Geographic Information Systems, Tata McGraw Hill, 2007- 7 th edition, (ISBN: 9780078095139)K.
3. Anji Rao, Remote sensing and Geographical Information System, BS Publications, 3 rd edition, 2008, (ISBN: 9788178001357)
4. Principles of GIS for Land Resource Assessment, Burrough, P.A., Oxford Publications, 2005.
5. The design and implementation of Geographic Information Systems, John E. Harmon & Steven J. Anderson., John Wiley & Sons, 2003.

Semester IV

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- II
CIVPCC-04: STRUCTURAL MECHANICS-II

Teaching Scheme	**Examination Scheme**
Theory – 3 Hrs./Week, 3 Credit	**Theory**- ESE-70Marks
	ISE - 30 Marks

Course Outcomes:

On completion of this course the students will be able to

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

SECTION -I

Unit 1: Combined Direct and Bending Stresses (6 Hrs)

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

Unit 2: Behaviour of Axially Loaded Long Columns (5 Hrs)

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

Unit 3: Slope and Deflection of Determinate Beams (8 Hrs)

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

SECTION-II

Unit 4: Introduction of Indeterminate Structures & Flexibility method for beams and frames (9Hrs)

a. Concept of Indeterminate structures and analysis methods, Degree of Static and Kinematic indeterminacy, Degrees of freedom for various types of structures.

b. Derivation of flexibility equation, flexibility coefficients, Development of flexibility matrix, Analysis of beams and portal frames (DSI≤ 3).

Unit 5: Moment Distribution Method (7Hrs)

Concept of stiffness of a member, Relative stiffness, Distribution factors, concept of moment

distribution, Application to beams, non-sway portal frames.

Unit 6: Stiffness Method for Beams and Frames (7Hrs)

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

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) Semester- II
CIVPCC-05 Building and Infrastructure Planning

Teaching Scheme	**Examination Scheme**
Theory – 2 Hrs./Week, 2 Credit	**Theory-** ESE-70Marks
Practical – 2 Hr/Week, 1 Credit	ICA: 25 Marks
	ISE: 30 Marks

Course Outcomes:

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

1. Draw line plans of different public buildings according to requirements adhering to National Building Code norms and standards.
2. Select appropriate ventilation systems.
3. Select appropriate building finishes.
4. Plan appropriate acoustics, and sound insulation arrangements for a building
5. Plan appropriate building services for a building
6. Plan firefighting arrangements for a building

SECTION – I

Unit 1: Planning and Design of Public Buildings (6Hrs)

Site selection criteria for building, 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. 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 2: Lighting, Ventilation, Thermal Insulation, Air Conditioning (6Hrs)

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 3: Building Finishes (4Hrs)

Plastering, Pointing and various techniques. Paints: - Different types and application methods. Varnishes and application methods. Tiles cladding, skirting, dado work withvarious materials.

SECTION II

Unit 4: Acoustics, and Sound Insulation (5Hrs)

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

Unit 5: Floorings and Roofing’s, Green Buildings and Low Cost Housing, and Plumbing systems (6Hrs)

Flooring and types of flooring, floor tiles, selection factors and fixing procedures of floorings. Roofing and types of roofs, Selection factors for Roofing materials

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.

Concepts of Green Building and energy efficient buildings. Low-cost Housing, Materials & methods (Conceptual introduction only).

Unit 6: Fire Resistant Structures (3Hrs)

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, gradingof structural elements and buildings, fire escapes.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A. Line plan of any Five public buildings by using AUTOCAD

B. Site visit for the type of public building selected for planning for Internal Continuous Assessment (ICA) submission

TEXT BOOKS

- Building Construction: Arora and Bindra, Dhanpat Rai Publications
- Building Design and Drawing – Y. S. Sane, Allies Book Stall
- Building Construction by Sushil Kumar, Standard Publishers Distributors, Delhi
- Interior Design- Principles and Practice- M. Pratap Rao, Standard Publishers and Dist.,Delhi
- Building Planning and Design by Kumar Swami and Kameshwar Rao, Charotar PublishingHouse.
- Civil Engg. Drawing- by M. Chakraborty, Published by M. Chakraborty – Kolkata
- Civil Engineering Drawing – by R.S.Malik, G.S.Meo, Computech Publication Ltd New Asian.

REFERENCE BOOKS

- National Building Code, BIS, New Delhi.
- Model Building Bye Laws, Town and Country Planning Departments, Ministry of Urban Development, Government of India.
- Building Construction by Mckay, W. B. & Mckay, J. M. ,Vol.III and IV, Donhead Publishing
- Modern Building Construction by Warland D. E., Vol. I and II, Pitman Publishing
- Building Drawing – Shah, Kale, Patki, Tata McGraw-Hill Education
- Built Environment by Shah, Kale, Patki, Tata McGraw-Hill Education
- Construction science – by Edwin Walker, Selwyn Morgan, Hutchinson Educational
- Time savers standards for buildings – Calendar Pub. McGraw Hill
- Alternative Building Materials & Technology-by Jagdish ,Reddy, Rao Published by New AgeInternational, New Delhi
- Development Control Rules- Building Byelaws of Local Authority.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- II
CIVPCC-06 Environmental Engineering

Teaching Scheme	**Examination Scheme**
Theory – 3 Hrs./Week, 3 Credit	**Theory-** ESE-70Marks
Practical – 2 Hr/Week, 1 Credit	ICA: 25 Marks
	ISE: 30 Marks
	OE: 25Marks

Course Outcomes: -
After studying this course, students will be able to:

1. To evaluate water quality using various parameters and establish water demand
2. Design diverse water treatment units and strategize their operations based on raw water quality and demand
3. Plan and design water distribution systems and identify operation and maintenance problems in water supply systems and suggest suitable solutions
4. Design an appropriate sewage collection system and characterize municipal wastewater
5. Evaluate and design wastewater collection systems and treatment units, and apply low-cost treatment technologies for sewage treatment
6. Determine the suitable method for the disposal of treated or untreated wastewater

SECTION –I

Unit 1: Quantity and Quality of Water (06)

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: Water Treatment Process (08)

Principles of water treatment operations and processes, water treatment flow sheets for surface and ground water.

a. **Aeration:** Principle, concepts, necessity and methods.
b. **Sedimentation:** plain sedimentation and chemical assisted sedimentation, settling velocity, types of sedimentation tanks, types of sedimentation, introduction of tube settlers.
c. **Coagulation and flocculation:** Principle of coagulation, introduction to common coagulants, introduction to natural coagulants, Introduction of Clari-flocculator.
d. **Filtration:** Theory of filtration, introduction of Rapid and Slow sand filter -mechanism of filtration, filter materials, working and cleaning of filter, Operational troubles.

e. **Disinfection:** Mechanisms, factors affecting disinfection, Types of disinfections, Types and methods of chlorination, Break point chlorination, Bleaching powder chlorination.
f. **Demineralization methods:** Lime- soda, Ion-Exchange, Reverse Osmosis, Ultra filtration and Electro dialysis.
g. **Fluoridation and Defluoridation**

Unit 3: Distribution of Water (09)

Water distribution systems, method of distributing water, appurtenances, basic system requirements, equivalent pipe concept, distribution Reservoir.

SECTION-II

Unit 4: Collection and conveyance of Sewage (8)

Waste water sources and flow rate. Municipal waste water characteristics, Sewerage system, layout, types of sewers, collection system. Appurtenances, Introduction of sanitary and storm water sewers, sewage pumping station.

Unit 5: Waste water treatment (10)

Primary treatment- Screening, comminuting, grit removal, oil and grease trap, chemical precipitation.

Secondary treatment- Activated sludge process, modification of ASP, operational problems, MBBR, SBR and MBR, Trickling filter, classification, process considerations, Secondary Clarifications.

Low cost waste water treatment methods- Principle and operation of waste stabilization pond, oxidation ditch and septic tank.

Unit 6: Disposal of waste water (8)

Disposal of waste water stream pollution, Self-purification, DO sag curve, Streeter Phelp‘s Equation, Emerging Technology for wastewater Treatment: objectives of small & decentralized wastewater Treatment systems:

1. Root zone Technology
2. Constructed Wetlands
3. Duckweed Ponds,
4. Fluidized aerobic bed Technology,
5. UASB
6. Anaerobic baffled reactor

INTERNAL CONTINIUOS ASSESSMENT (ICA)

The ICA includes practical work to find the characteristics of water and assignments on each unit

operations

(A) Experiments for the determination of the following (Either for water or for waste water) (Min. 10 experiments)

1. pH value of waste water sample
2. Chloride content of waste water sample
3. Hardness of water sample
4. Turbidity of water sample
5. Residual Chlorine of water sample
6. Total Dissolved Solids through measurement of conductivity meter of water sample
7. Solids – Total, Suspended and dissolved for waste water sample
8. Dissolved Oxygen of water sample
9. Most Probable Number of waste water sample
10. Optimum dose of alum by jar test of water sample
11. Fluorides of water sample
12. Nitrogen of water sample
13. Irons and Manganese of water sample

(B) Visit to water treatment plant/ waste water treatment plant

Internal Continuous Assessment (ICA) submission shall consist of the following –

Practical Journal containing experiments carried out in part A of the Internal Continuous Assessment (ICA)and visit Report on (C).

Detail design and appropriate drawings required for part B of the Internal Continuous Assessment (ICA) work.

END SEMESTER EXAMINATION (Oral)

Oral examination will be based on the above syllabus.

TEXT BOOKS:

1. Raju, B.S.N., ―Water Supply and Wastewater Engineering‖ Tata McGraw Hill Private limited, New Delhi, 2nd Edition, 2000.
2. Garg, S. K. ―Water Supply Engineering‖, Khanna Publishers, 33rd Edition, 2010.
3. Modi, P. N., ―Water Supply Engineering (Environmental Engineering I)‖, Standard Book House, 6th Edition, 2018.
4. Environmental Engineering by Peavey- H. S. Rowe, D.R. and Thobanoglous, McGraw – HillBook Company
5. Water supply and pollution control - Viessman W. and Hammer M.J. Harper Collins College Publishers.
6. Waste Water Engineering Treatment & Disposal - Metcalf & Eddy, Tata McGraw Hill, 1982
7. Sewage Disposal and Air Pollution Engineering - Garg S.K., Khanna Publishers
8. Waste water Supply Engineering by B. C. Punmia
9. Solid Waste Management in Developing countries - Bhide A.D. and Sundersen B.B. Indian National Scientific Documentation Centre, New Delhi
10. Air Pollution- Rao M.N. and Rao H.V.N. Tata McGraw Hill, 1990
11. Environmental Engineering, S.C. Sharma, Khanna Publishing House
12. Basic Environmental Engineering, R.C. Gaur, Newage Publications
13. Environmental Engineering, Dr. A.K. Jain (ISBN: 978-93-86173560),Khanna Publishers

REFERENCE BOOKS

1. ―Manual on Water Supply and Treatment‖, CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
2. Hammer M, J and Hammer M, J, ―Water and Wastewater Technology‖, PHI learning private limited, 7th Edition, 2018.
3. Davis, M, L, and Cornwell, D.A., ―Introduction to Environmental Engineering‖, Tata McGraw Hill Publishing Company, Special Indian Edition, 2010.
4. Nathanson, J. A., ―Basic Environmental Technology‖, PHI Learning private limited, 5th Edition, 2009.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- III

CIVSEC-03: CONCRETE TECHNOLOGY, MATERIAL TESTING & EVALUATION

Teaching Scheme	**Examination Scheme**
Theory – 1 Hrs./Week, 1 Credit	**POE**- 25Marks
Tutorial - 2 Hr/Week, 1Credit	**ICA –** 25 Marks

Course Outcomes:

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

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

SECTION-I

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

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

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

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

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

Unit 3: Properties of fresh concrete (4 Hrs)

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

SECTION-II

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: Concrete Mix Design (7 Hrs)

Design Mix Concrete, nominal Mix Concrete, objectives of mix design, factors governing mix design, methods of expressing proportions ACI method, IS 10262:2019 code method, trial mixes, and Acceptance criteria. Quality control of concrete – Factors causing variations, field control.

Unit 6: Testing of Materials (4 Hrs)

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

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A. Testing of cement

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

B. Testing of aggregates

1. Specific Gravity & Water absorption of Coarse Aggregate & Fine Aggregate
2. Sieve analysis of Coarse Aggregate & Fine Aggregate

3. Bulk density of Coarse Aggregate & Fine Aggregate
4. Flakiness index of Coarse Aggregate
5. Elongation index of Coarse Aggregate
6. Bulking of Fine aggregate
7. Silt Content of Fine Aggregate

C. Tests on Concrete: Workability Tests:

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

Strength Tests:

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

D. Concrete Mix Design

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

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

Experiments

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

TEXT BOOKS

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

REFERENCE BOOKS

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

A. Multidisciplinary Minor in "Product Design and Commercialization"

Semester	Course Code	Course Title
III	CIVMDM-01A	Design Thinking: Business Innovation Framework
IV	CIVMDM-02A	Entrepreneurship ,Leadership and Management
V	CIVMDM-03A	Design Optimization
VI	CIVMDM-04A	New Product Development
VII	CIVMDM-05A	Finance Management and Marketing

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

S. Y. B. Tech. (Civil Engineering) – II, Semester- IV

CIVMDM-02A: Entrepreneurship ,Leadership and Management

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

Course Objectives:-

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

1. Understand importance of innovation and entrepreneurship in economy
2. Explain innovative process
3. Elaborate marketing strategies & sales techniques
4. Understand leadership philosophy & management functions

SECTION-I

Chapter 1: Foundation of Innovation & Entrepreneurship (7 Hrs)

1.1 Definitions : Enterprise, Entrepreneur, Innovation
1.2 Historical perspectives – Different Theories
1.3 Current trends in entrepreneurship & current trends in innovation
1.4 Importance of innovation and entrepreneurship in economy
1.5 Types of businesses & types of entrepreneurship

Chapter 2: The process & journey (8 Hrs)

2.1 The innovation process
2.2 The entrepreneurial journey: steps
2.3 Challenges in innovation
2.4 Challenges in entrepreneurial journey

Chapter 3: Leadership and Management (7 Hrs)

3.1 Leadership fundamentals: styles & theories
(Trait theory, behavioral theory, contingency theory)
3.2 Developing personal leadership philosophy
3.3 Management functions: Types of organizational structures, Organizational Principles
3.4 Impact of Organizational structures on overall performance of the company

SECTION-II

Chapter 4: Managing Innovation projects (7 Hrs)

4.1 Project management Methodologies

4.2 Budgeting and resources allocation, sources of funding for start-ups or fund raising
4.3 Risk management
4.4 Concept of calculated Risk

Chapter5: Entrepreneurial marketing & sales (7 Hrs)

5.1 Marketing strategies for startups: types & real life examples
(Content marketing, social media, guerrilla, SEO, event, etc.)
5.2 Budgeting the marketing
5.3 Sales techniques of start-ups: Types and real-life examples
5.4 Customer: Acquisition, Retention, Repetition
5.4 A case study on Guerrilla Marketing

Chapter6: Sustainability and Economics (5 Hrs)

6.1 Definition: Cash flow, burn-rate
6.2 Managing cash flow & burn-rate
6.3 Sustainable entrepreneurship practices/ concepts
6.4 Scaling up strategies

Internal continuous Assessment (ICA)

Internal continuous Assessment (ICA) submission shall consist of the following-
1. Assignment (One assignment on each unit)

TEXT BOOK

1. Martin, M.J., 1994, –Managing Innovation an Entrepreneurship in Technology based firm‖, John Wiley
2. Ettlie, J.E., 2000, –Managing Technology Innovation‖, John Wiley & Sons
3. Drucker, P. F. (2000), –Discipline of Innovation‖, Harvard Business Review, May, (Originally published 1985, May June , 63(3), 67-72.1)

REFERENCE BOOKS

1. Christensen, C. M. and Raynor, M. E.(2003), The Innovator‘s solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press
2. Drucker, P. F. (1985), Innovation and Entrepreneurship, New York: Harper
3. Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press(2001)
4. Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press(1999)
5. Rogers, E.M.(2003), Diffusion of Innovation, 5th ed.,New York: Simon and Schuster

A. Multidisciplinary Minor in “Applied Civil Engineering”

Semester	Course Code	Course Title
III	CIVMDM-01B	Introduction to Geographic Information Systems
IV	CIVMDM-02B	Urban Planning and Design
V	CIVMDM-03B	Operation Research and Management
VI	CIVMDM-04B	Disaster Management and Mitigation
VII	CIVMDM-05B	Sustainable Engineering and Trends

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
S. Y. B. Tech. (Civil Engineering) Semester- IV

CIVMDM-02B: Urban Planning and Design

Teaching Scheme	**Examination Scheme**
Theory – 2 Hrs./Week, 2 Credit	**ISE-** 30 Marks
Practical – 2 Hr/Week, 1 Credit	**ESE** – 70 Marks
	ICA – 25 Marks

Course Outcomes:

1. Comprehend key urbanization trends and principles, fostering an understanding ofsustainable development and the role of planning regulations.
2. Develop proficiency in spatial analysis and design strategies, aiming to createaesthetically pleasing, functional, and socially inclusive urban environments.
3. Carryout survey to development of an aesthetic plan, urban design schemes.
4. Relevance of Urban design in Planning & Architecture.

Section I

Unit No.1

- Theory of Urban Planning , Scope, purpose and methods of Planning, the nature andpurpose of Town and Country Planning at National, Regional and local levels.
- The physical planning process and the relation between surveys and plan.
- Land-use planning, determinants of Land Use and of spatial patterns of urban landuses, Concentric Zone model, Sector model, Multiple Nuclei model etc.
- Economic base of the city, sectors of the urban economy and base identification etc.
- Various surveys for physical planning and techniques of Analysis realization of theplan.
- The parts of the town and their relationship, planning standards, site layout anddevelopment, zoning and density control.

Unit No.2

- Planning Theories Settlements–rural and urban settlements in their regional setting hinterlands. Towns and cities their geographical characteristics.
- Urban concentrations and growth characteristics factors, historical,

administrative, location, economic, socio-economic consequences. The essential characteristics ofcity/town, importance of morphological aspects in town planning.

- Geological factors affecting urban development. Urban geological factors governing the growth of ancient cities.

Unit No.3

- Urban Growth and System of Cities Growth of cities scale , complexity and its impact on national development, cities as engines of growth, cities as ecosystems, resources incities.
- City – Region Linkages City, fringe and the periphery - physical and functional linkages, peri-urban development.

Section II

Unit No.4

- Urban Design terminologies & definition
- Relevance of Urban design in Planning & Architecture
- Urban Renewal, Rehabilitation, Revitalization, Redevelopment and Conservation
- Urban design – an integral part of Urban planning
- Urban design Theory and Principles

Unit No.5

- Urban form and its determinants by inter – play of masses, voids, building typology
- Scale, harmony, symmetry, colour, texture, light and shade
- Dominance, height, urban signage and graphics
- Public Realm, organization of spaces and their articulation in the form of squares,streets, vistas and focal points
- Image of the city and its components such as edges, paths, landmarks, street features, sky– line

Unit No.6

- Survey techniques for urban aesthetics, Survey techniques for urban design,documentation and representation, Contents and development of an aestheticplan, urban design schemes.
- Steps to carry out Visual survey and its recordings
- Contents and development of an aesthetic plan, urban design schemes.
- Case studies of urban design characteristics of cities in India and abroad relatedissues for public intervention. Townscape Analysis
- Standards and regulatory control on urban design.
- Urban Design in relation to renewal and re-development of central areas.
- Role of urban designer.

Internal Continuous Assessment:

Internal Continuous Assessment **(**Term work) should be based on assignments(Case studies) based on above topics.

Reference Book

1. Urban Design: The architecture of towns & cities / SPREIREGEN, PAUL. D.
2. Townscape / GORDEN GULLEN
3. The Urban Experience / FISCHER, CLAUDE S
4. Design of cities / BACON, EDMUND N
5. Town Design / FREDERICK GIBBERD
6. The urban pattern: city planning and design / GALLION, A B. 7
7. The Image of the City / LYNCH, KEVIN
8. Urban design: Street and square / CLIFF MOUGHTIN
9. The Urban Design Reader/ MICHAEL LARICE, ELIZABETH MACDONALD,ROUTLEDGE
10. Sustainable Urbanism: Urban Design with Nature / DOUGLAS FARR, JOHNWILEY & SONS
11. Landscape Planning: Environmental Applications/ WILLIAM M. MARSH
12. The Urban Pattern by A. B. Gallion, S. Eisner. (Van Nostrand ReinholdCompany)
13. Text Book of Town Planning by G. K. Bandopadhyaya ♣ Urban and RegionalPlanning by Peter Hall
14. Geography of Settlements by F. S. Hudson, Macdonald and Evans Ltd. Estover,Plymouth PL 6 7 PZ UK

Honors Courses in SY Civil Engineering

A. Honors in **Innovation and Design Engineering**

Semester	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		**Total**
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	
III	CIVHON-01A	Design Thinking	3	1		4	70	30	25	125
IV	CIVHON-02A	Managing Innovation and Entrepreneurship	3		2	4	70	30	25	125
V	CIVHON-03A	Engineering Systems and Design Optimization	3		2	**4**	70	30	25	125
VI	CIVHON-04A	Civil Engineering System Analysis and Design	3		2	**4**	70	30	25	125
VII	CIVHON-05A	Mini Project			4*	**2**			50	50
		Total	12	1	10	**18**	280	120	150	550

* Indicates Contact Hours

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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

CIVHON-01A Design Thinking

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

Course outcomes:

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

1. Elaborate the critical design thinking skills needed to either improve an existing product or design a new product.
2. Identify Customer Needs and Product Specifications
3. Apply Creativity and Prototyping in Product Development
4. Apply Design Thinking for Service Sector Problem
5. Formulate Product Architecture and Financial Analysis
6. Apply Design for Environment Principles to a product life cycle

SECTION-I

Unit 1: Design Thinking Skills (06)

Difference between design thinking and other traditional approaches, Design Thinking Skills, Application these skills with some example, Design Thinking Mindset, Principles of Design Thinking

Unit 2: Customer Needs and Product Specifications: (09)

Identification of customer needs, Methods to Identify Customer Needs, draft customer needs statements as your first step towards user innovations. Translation of Customer needs into Product specifications quantitatively, establishment of product metrics to define product specifications.

Unit 3: Creativity and Prototyping: (09)

Learn to apply creativity, brainstorming, and concept generation process in designing needs solutions, Explore prototyping methods, strategies, and real-life examples where these have been applied to create a design that represents customer needs and product specifications.

SECTION-II

Unit 4: Design for Services: (07)

Understand design of services, Principles of service design thinking, Tools for service design thinking, and learn how to apply product development frameworks to the service context.

Unit 5 Product Architecture and Financial Analysis: (07)

Learn to use the modular and integral product architectures in determining the building blocks of a product. Learn to perform financial analysis of your project idea and decide if it is backed by a strong business rationale (Worth-It).

Unit 6 Design for Environment: (07)

Learn how to apply design for environment principles to a product life cycle, Learn to select and implement a product development process (staged, spiral, and agile)that's aligned to your project needs.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the following –

1. Write a Case study for demonstrating all the steps of Design Thinking.
2. Perform a Group Discussion for generating ideas
3. Assignments (One Assignment on each unit)

TEXT BOOKS

1. Karl T. Ulrich and Steven D. Eppinger. Product design and development, McGraw-Hill
2. ‑Designing for growth: A design thinking tool kit for managers‖, Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1
3. ‑The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems‖, by Michael Lewrick, Patrick Link, Larry Leifer., 2018, ISBN 978-1-119-46747-2

REFERENCE BOOKS

1. ―Presumptive design: Design provocations for innovation‖, by Leo Frishberg and Charles Lambdin., 2016, ISBN: 978-0-12-803086-8
2. ―Systems thinking: Managing chaos and complexity: A platform for designing business architecture.‖, ―Chapter Seven: Design Thinking‖, by Jamshid Gharajedaghi, 2011, ISBN 978-0-12-385915-0
3. Websites:
   https://www.gasq.org/files/content/gasq/downloads/certification/Design%20Thinking/DesignThinking_Syllabus_0-6-3_EN.pdf

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

S. Y. B. Tech. (Civil Engineering) – II, Semester- IV

CIVHON-02A Managing Innovation and Entrepreneurship

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

Course outcomes:

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

1. Elaborate the process of Evolution of entrepreneurship
2. Apply the creativity and innovation approaches for product development
3. Apply innovation strategies for transforming the innovation into entrepreneurial activities.
4. Explain the approaches of motivating entrepreneurs
5. Apply problem identification and problem solving approaches

SECTION-I

Unit 1: Introduction to Entrepreneurship (7 Hrs)

Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies. Entrepreneurial growth and development.

Unit 2: Creativity and Innovation: (8 Hrs)

Concepts Shifting Composition of the Economy Purposeful Innovation & the 7 Sources of Innovative Opportunity The Innovation Process.

Unit 3: Innovative Strategies: (7 Hrs)

Strategies that aim at introducing an innovation. Innovation & entrepreneurship: Can they work together? Planning - incompatible with Innovation & entrepreneurship.

SECTION-II

Unit 4: Entrepreneurial Motivation: (7 Hrs)

Need for continuous learning & relearning Acquiring TechnologicalInnovation Entrepreneurial motivation (nAch story) Achievement Motivation in Real life, Case Study.

Unit 5: International Entrepreneurship: (7 Hrs)

Concepts and Nature of International Entrepreneurship. The changing International environment. Ethics and International Entrepreneurship. Strategic Issues in International Entrepreneurship.

Unit 6: Problem Identification and Problem Solving: (8 Hrs)

Problem Identification. Problem solving. Innovation and Diversification.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the following –

1. Assignments (One Assignment on each unit)

TEXT BOOKS

1. Martin, M.J., 1994, –Managing Innovation and Entrepreneurship in Technology based Firm‖, John Wiley.
2. Ettlie, J.E., 2000, –Managing Technology Innovation‖, John Wiley & Sons.
3. Drucker, P. F. (2000), –Discipline of Innovation,‖ Harvard Business Review, May, (originally published 1985, May-June, 63(3), 67-72.1

REFERENCE BOOKS

1. Christensen, C. M. and Raynor, M. E. (2003), The Innovator‟s Solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press.
2. Drucker, P. F. (1985), Innovation and Entrepreneurship, New York: Harper.
3. Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press (2001).
4. Harvard Business Review on Entrepreneurship (Collection of articles), Harvard Business School Press (1999)
5. Rogers, E.M. (2003), Diffusion of Innovations, 5th ed., New York: Simon and Schuster.

B. Honors in **Infrastructure Engineering**

Semester	***Course Code***	***Name of the Course***	***Engagement Hours***			***Credits***	***FA***	***SA***		***Total***
			L	***T***	***P***		***ESE***	***ISE***	***ICA***	
III	CIVHON-01B	Applications of Information Technology and Information Systems	3	1		4	70	30	25	125
IV	CIVHON-02B	Planning and Design of Rural Roads	3		2	4	70	30	25	125
V	CIVHON-03**B**	Roads and Highway Project Development	3		2	**4**	70	30	25	125
VI	CIVHON-04B	Bridge and Grade Separated Structures	3		2	**4**	70	30	25	125
VII	CIVHON-05B	Mini Project			4*	**2**			50	50
		Total	12	1	10	**18**	280	120	150	550

* Indicates Contact Hours

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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

CIVHON-01B **Applications of Information Technology and Information Systems**

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

Course Outcomes:

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

1. Connect digital tools to construction practice and apply techniques to optimize solutions.
2. Describe and model list of items of work and bill of quantities and relate technology through computer program in construction.
3. Design and construct industrial applications through automation and manage and apply linear project construction like roads.
4. Work on integrated solutions and produce models with optimized solutions in construction framework.
5. Create models with integrated automation techniques.

SECTION-I

Unit 1: Introduction Overview of IT Applications in Construction (8 hours)

Construction process – Computerization in Construction – Computer aided Cost Estimation – Developing application with database software.

Unit 2: Optimization Techniques Linear (8 hours)

Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications

Unit 3 Inventory Models Deterministic and Probabilistic Inventory (7 hours)

Models Software applications.

SECTION-II

Unit: 4 Computer Application Advanced planning and scheduling concepts (**6 hours)**

Computer applications – Case study – Adoption 3D Printing in construction.

Unit: 5 Automation Techniques Introduction (6 hours)

Automation techniques in Surveying, Design and Construction – Automation in Road, Tunnel and Bridge Construction.

Unit: 6 Application of software in Linear Project Introduction (**6 hours)**

Project – WBS – Activity – Relationship - Scheduling – Constrains – Schedule data – Resources – Role – Optimizing Project Plan – Execution and Control – Performance

Unit: 7 Building Information Modeling Introduction (**6 hours)**

Parametric modeling – Visualisation – Completion of building modeling – 4D simulation using Navis works – Navigation and Clash detection.

Unit: 8 Contemporary issues (**5 hours)**

INTERNAL CONTINIUOS ASSESSMENT (ICA)

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

Text Books

1. Vinayagam P., VimalaA., (2017), ―Planning and Managing Projects with PRIMAVERA (P6) Project Planner‖ I K International Publishing, New Delhi
2. Sham Tickoo (2017), Autodesk Navisworks 2017, BPB Publications

References

1. Sham Tickoo (2017), Exploring Oracle Primavera P6 R8.4, BPB Publications

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

S. Y. B. Tech. (Civil Engineering) – II, Semester- IV

CIVHON-02B Planning and Design of Rural Roads

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

Course outcomes:

On completion of the course, the students will be:

1. Able to elaborate significance of low-cost roads.
2. Capable of analysing the problem associated with planning of low volume roads, preparing master plan of rural road network.
3. Capable of conducting surveys for rural road alignment and remembering specifications of various geometric features of road.
4. Capable of selecting and analysing different materials and equipment s required for rural road construction.
5. Able to design various drainage structures and cross drainage works giving due importance to maintenance activities.

SECTION-I

Unit 1: Planning of rural road: (7 Hrs)

Planning data base, concept of network planning Rural roads plan, guidelines laid down in recent 20-year plans and in PMGSY Road alignment and surveys, governing factors for route selection Factors controlling alignment; obligatory points, traffic, geometric designs, economy, special considerations in hilly areas.

Unit: 2 Geometric design standards: (7 Hrs)

Classification of rural roads, terrain classification, design speed, basic principles of geometric design cross sectional elements, camber, sight distances. Horizontalalignment: general guidelines, super elevation, transition curve, widening and set back distances, vertical alignment: gradient, grade compensation at curves, valley curves, alignment compatibility, lateral and vertical clearances.

Unit 3: Soil and material surveys: (8 Hrs)

Soil investigations for low embankment, high embankment, cut sections, subgrade, Surveyfor marginal materials and aggregates/ low grade materials Artificial aggregates, waste materials, new materials and stabilizers Design parameters, pavement components Design of flexible pavement as per IRC: pavement thickness, pavement surfacing Design of semi rigid pavement: dry lean concrete / lime fly ash concrete basesDesign of rigid pavement: cement concrete pavement Design of special pavements: concrete block pavement , interlocking concrete block pavement Choice of pavement type and materials

SECTION-II

Unit 4: Types of road drainage: (7 Hrs)

Requirements of surface drain; road side drains, shoulder drains, catch water drains. Requirements subsurface drain. Cross drains; types, requirements, choice of different types of cross drains. Standard designs of culverts. Standard design of small bridges.

Unit 5: Construction and Specification: (7 **Hrs)**

Construction and Specifications: Earth, Sub-base, Base course and surface course – materials, specifications , and construction steps and use of different equipment , construction of special pavements , construction of fly ash embankments ,lime fly ash stabilized soil, lime fly ash bound macadam , lime fly ash concrete ,roller compacted concrete , dry lean fly ash concrete , cement stabilized fly ash , quality control in construction , Specifications and tests for quality control as per IRC .

Unit 6: Maintenance of Rural roads: (8 Hrs)

Types of maintenance, maintenance of unpaved roads, maintenance of paved roads, maintenance of semi-rigid and roller compacted concrete pavements, maintenance of special pavements, Rehabilitation.

INTERNAL CONTINIUOS ASSESSMENT (ICA)

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

Text Books:

1. Khanna, S.K., Justo, C.E.G., and Veeraragavan, A.,`Highway Materials and PavementTesting_, Nem Chand and Bros, Roorkee Reference Books:

2. IRC SP 20 Rural Roads Manual

3. Ministry of Rural Road Development

C. Honors in **Sustainability Engineering**

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CIVHON-01C	Environmental Laws and Impact Assessment	3	1		4	70	30	25	125
IV	CIVHON-02C	Construction Materials: Sustainability and Usability	3		2	4	70	30	25	125
V	CIVHON-03**C**	Sustainable Materials and Green Buildings	3		2	**4**	70	30	25	125
VI	CIVHON-04C	Sustainable Engineering and Technology	3		2	**4**	70	30	25	125
VII	CIVHON-05C	Mini Project			4*	**2**			50	50
		Total	12	1	10	**18**	280	120	150	550

* Indicates Contact Hours

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

CIVHON-01C Environmental Laws and impact assessment

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

Course outcomes:

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

1. Be familiar with the laws, policies and institutions in the field of environment.
2. Acquire the skills needed for interpreting laws, policies and judicial decisions in a holistic perspective.
3. Acquire the ability to evaluate the role of law and policy in conservation and management of natural resources and prevention of pollution
4. Identify environmental attributes for the EIA study and to identify methodology and prepare EIA reports.
5. Perform life cycle inventory analysis of products.
6. Develop strategies to bring energy efficiency in all stages of the product development cycle and Formulate plans for comprehensive environmental protection, in order to comply with environmental laws.

SECTION-I

Unit 1: **(08)**

Introduction to environmental laws in India; Constitutional provisions, General principles in Environmental law: Precautionary principle; Polluter pays principle; Overview of legislations and basic concepts. Evolution and Jurisprudence of Forest and Wildlife laws; Colonial forest policies; Forest policies after independence, statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006. Strategies for conservation–Project Tiger, Elephant, Rhino, Modulew leopard.

Unit 2: **(07)**

National Water Policy and some state policies, Laws relating to prevention of pollution, access and management of water and institutional mechanism: Water Act, 1974; Water Cess Act, 1977, EPA, 1986. Pollution Control Boards, Ground water and law, judicial remedies and procedures, Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act, 1981; EPA, 1986, Legal framework: EPA and rules made thereunder; PLI Act, 199, Principles of strict and absolute liability, Legal framework on environment protection-Environment Protection Act as the framework legislation–strength and weaknesses

Unit 3: **(09)**

Introduction: The Need for EIA, Indian Policies Requiring EIA, EIA Cycle and Procedures, and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. List of projects requiring Environmental clearance, International agreements. Identifying The Key Issues: Key Elements of an Initial Project Description and Scoping, EIA Methodologies, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods

SECTION-II

Unit 4: **(07)**

Environmental index using factor analysis, Cost/benefit analysis, Predictive or Simulation methods. Rapid assessment of Pollution sources method, predictive models for impact assessment, Applications for RS and GIS. Reviewing, EIA Report: Scope, Baseline Conditions, Site and Process alternatives, Public hearing. Construction Stage Impacts, ProjectResource Requirements and Related Impacts, Prediction of Environmental Media Quality, Socio-economic Impacts, Ecological Impacts, Occupational Health Impact, Major Hazard/ Risk Assessment, Impact on Transport System, Integrated Impact

Unit 5: **(08)**

Introduction, Life Cycle Assessment concepts. A brief history of Life-cycle Inventory analysis, overview of methodology, three components, Identifying and setting boundaries for life-cycle stages, issues that apply to all stages, Applications of inventory analysis, Procedural framework of Life-cycle inventory: Introduction, define the purpose and scope of inventory.

Unit 6: **(06)**

General issues in Inventory analysis: Introduction, Using Templates, Data issues, special case boundary issues, Issues Applicable to specific life cycle stages: Introduction, Raw Material acquisition stage, Manufacturing stage, Use/Reuse/Maintenance stage, Recycle/Waste Management stage.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the following –

1. Case study of the implications of environmental laws in developed and developing country (Any Two).
2. Case study of EIA and LCA for and material/product (Any Two)
3. Assignments (One Assignment on each unit)

TEXT BOOKS

1. Divan S. and Rosencranz A. (2005) *Environmental Law and Policy in India***,** 2nd ed., Oxford, New Delhi
2. Leelakrishnan P. (2008) *Environmental Law in India*, 3rd ed., Lexis Nexis, India.
3. Canter, L.W., Environmental Impact Assessment, McGraw Hill Pub. Co., 1997
4. David P. Lawrence, Environmental Impact Assessment: Practical Solutions to Recurrent Problems, John Wiley & Sons, 2003
5. Hosetti, B. B., Kumar A, Eds, Environmental Impact Assessment & Management, Daya Publishing House, 1998
6. Ciambrone , D.F., Environmental Life Cycle Analysis, CRC Press, 1997

REFERENCE BOOKS

1. Birnie P. (2009) *et al., International Law and the Environment*, 3rd ed., Oxford.
2. Desai A. (2002) *Environmental Jurisprudence***,** 2nd ed., Modern Law House**,** Allahabad.
3. *G*adgil M. and Guha R. (1995) *Ecology and Equity***,** Oxford, New Delhi.
4. Gadgil M. and Guha R. (1997) *This Fissured Land*, Oxford, New Delhi.
5. Guha R. (2000) *Environmentalism: A Global History*, Oxford, New Delhi.
6. Kamala S. and Singh U.K. (eds.) (2008) *Towards Legal Literacy: An Introduction to Law in India*, Oxford, New Delhi.
7. Leelakrishnan P. (2006) *Environmental Law Case Book*, 2nd ed, Lexis Nexis, India.

8. Sands P. (2002) *Principles of International Environmental Law*, 2nd ed, Cambridge.
9. Singh C. (1986) *Common Property and Common Poverty*, Oxford, New Delhi.
10. Upadhyay S. and Upadhyay V. (2002) *Hand Book on Environmental Law- Forest Laws, Wildlife Laws and the Environment*; Vols. I, II and III, Lexis Nexis- Butterworths-India, New Delhi.
11. UNESCO, Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development, UNESCO/UNEP, Paris, 1987
12. Anjaneyulu.Y., and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
13. Wathern.P., Environmental Impact Assessment- Theory and Practice, Routledge Publishers, London, 2004

    Handbook on Life Cycle Assessment: Operational guide to the ISO standards, Kluwer Academic Publishers, 2004

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

S. Y. B. Tech. (Civil Engineering) – II, Semester- IV

CIVHON-02C Construction Materials: Sustainability and Usability

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

Course Outcomes:-

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

1. Predict use of sustainable building materials.
2. Categorize material indices and select the best materials (with optimum mechanical, durability, and eco-performance) for a project.
3. Apply the knowledge of eco-materials in civil engineering field
4. Outline efficient cross sections for structural members, and explain various techniques for designing green concrete materials.

SECTION-I

Unit1: Introduction to sustainable building materials (07)

Introduction to sustainable building materials, qualities, use, examples - Natural building materials, locally available and locally manufactured materials, bio materials - Salvaged and recycled materials - Non toxic materials: low VOC paints, coating and adhesives.

Unit 2: Concept of Embodied Energy and Carbon Footprint (08)

Idea of embodied energy - Development of the concept, factors to be considered, calculation techniques for embodied energy - Data sets available for calculation of embodied energy - Case studies of embodied energy calculations - Sample embodied energy calculations for a material - Concept of embodied carbon or carbon footprint of material, calculation techniques, methods to off-set high embodied energy - Cradle to cradle material, whole life cycle and life cycle costing analysis techniques.

Unit 3: Sustainable construction techniques (07)

Alternative construction techniques such as SMB, CSEB, and steam cured blocks, composite beam and panel, funicular shells, filler slabs, reinforced concrete masonry, vaulted roofs, ferro-cement walls etc., - Case studies

SECTION-II

Unit4: Innovative use of materials (07)

Use of waste materials such as paper, glass bottles, tires, shipping containers - Use of post-consumer and industrial waste such as fly-ash, bags, building demolition waste – use of salvaged materials from flooring, columns, beams, timber, glass, etc.

Unit5:-Eco-audits and eco-audit tools (08)

Eco auditing of Reusable and disposable cups, Grocery bags, Family car - comparing material energy with use energy Legal framework, The material selection strategy: choosing a car, Principles of materials selection, Selection criteria and property charts, Using indices for scaling, Resolving conflicting objectives: trade-off methods, Seven useful charts, Computer-aided selection

Unit6:-Eco-informed materials selection (08)

Eco-informed materials selection introduction, Selection per unit of function, Systematic eco-selection: carbonated water bottles, Structural materials for buildings, Initial and recurring embodied energy of buildings, Transportation -introduction, crash barriers—matching material to purpose, materials for light weight structures, material substitution foreco-efficient design

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the following –Assignments (One Assignment on each unit)

TEXTBOOKS

1. M.F. Ashby (2012) –Materials and the Environment: Eco-Informed Material Choice‖, 2nd Ed., Elsevier, Burlington
2. M.F. Ashby (2011) –Materials Selection in Mechanical Design‖, 4th Ed., Elsevier, Burlington
3. A New Era of Sustainable Technology Development 2nd edition, M.M. Khan,Scrivener Publishing LLC.

REFERENCE BOOKS

1. William McDonough, Michael Braungart, ‑Cradle to Cradle: Remaking the way we make things‖, North Point Press, 2002.
2. Lawrence D.P., Environmental Impact Assessment – Practical solutions to recurrentproblems, Wiley-Interscience, New Jersey, 2003
3. Environmental Assessment Source book-Vol. III: Guidelines for environmentalassessment of energy and industry projects, World Bank,1998
4. Petts J., Handbook of Environmental Impact Assessment, Vol., I and II, BlackwellScience, London, 1999
5. Canter L.W., Environmental Impact Assessment, McGraw Hill, New York. 1996
6. Nick Harvey, Beverley Clarke, Environmental Impact Assessment: Procedures andPractices, Oxford University Press, USA, 2012
7. Gursharan Singh Kainth, Climate Change, Sustainable Development and India,LAP Lambert, 2011
8. Janis Birkeland, Positive Development: From Vicious Circles to Virtuous Cyclesthrough Built Environment Design, Routledge, 2008
9. Sustainable Building - Design Manual: sustainable building design practices-TERI2004
10. Ross Spiegel, Green Building Materials: A Guide to Product Selection andSpecification, 3rd Edition, John Wiley & Sons, 2010
11. K.S. Jagadish, Alternative building materials and technologies, New AgeInternational, 2013
12. The Barefoot Architect: A Handbook for Green Building, Shelter Publication, 2007

D. Honors in **"Railway Infrastructure"**

Semester	*Course Code*	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
			L	*T*	*P*		*ESE*	*ISE*	*ICA*	
III	CIVHON-01D	Railway Track structure	3	1		4	70	30	25	125
IV	CIVHON-02D	Elevated structures in Railway	3		2	4	70	30	25	125
V	CIVHON-03**D**	Underground structures in Railway	3		2	4	70	30	25	125
VI	CIVHON-04D	High speed Railway infrastructure	3		2	4	70	30	25	125
VII	CIVHON-05D	Mini Project			4*	2			50	50
		Total	12	1	10	18	280	120	150	550

* Indicates Contact Hours

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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

CIVHON-01D RAILWAY TRACK STRUCTURE

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

Course Outcome: At the end of this course, the student will be made familiarize with:

1. To select appropriate gauges.
2. To illustrate surveying technique and its significance in construction of railway line.
3. To analyses various types of curves.
4. To illustrate various types of track structure.
5. To illustrate about slope, creep and fastening.
6. To analyses various types of turnouts and crossings.

SECTION – I

Unit No 01: **(7)**

Developments in Indian Railways, Different Modes of Transport, Organization of Indian Railways, Indian Railway Finances and their Control, Commission of Railway Safety, Long-term Corporate, Plan of Indian Railways, Classification of Railway Lines in India, Gauges on World Railways Different Gauges on Indian Railways, Choice of Gauge, Problems Caused by Change of Gauge, Uni-gauge Policy of Indian Railways, Loading Gauge, Construction Gauge**.**

Unit No 02: **(7)**

Need for Construction of a New Railway Line, Preliminary Investigations for a New Railway Line, Types of Surveys, Traffic Survey, Reconnaissance Survey, Preliminary Survey, Preliminary Engineering-cum-traffic Survey, Final Location Survey, Modern Surveying Techniques for Difficult Terrain, Construction of New Lines.

Unit No 03: **(7)**

Necessity of curves, Classification of curves, Setting Out of curves, Degree of curves, Simple curves, Compound curves, Transition curves, Permissible speed on a curve. Necessity for Geometric Design, Details of Geometric Design of Track, Gradients, Grade Compensation on Curves Circular Curves, Superelevation, Safe Speed on Curves, Transition Curve, Compound Curve, Reverse Curve, Extra Clearance on Curves, Widening of Gauge on Curves, Vertical Curves, Realignment of Curves, Cutting Rails on Curves, Check Rails on Curves**.**

SECTION – II

Unit No 04: **(7)**

Function of Rails, Types of Rails, Requirements for an Ideal Rail Section , Rail Manufacture , Rail Wear , Other Defects in Rails , Rail Failure , Rail Flaw Detection, Functions and

Requirements of Sleepers, Sleeper Density and Spacing of Sleepers , Types of Sleepers, Wooden Sleepers , Steel Channel Sleepers , Steel Trough Sleeper , Cast Iron Sleepers , Concrete Sleepers Functions of Ballast, Types of Ballast , Sizes of Ballast, Requirements of a Good Ballast , Design of Ballast Section , Specifications for Track Ballast , Collection and Transportation of Ballasts , Methods of Measurement , Laboratory Tests for Physical Properties of Ballast , Assessment of Ballast Requirements , Guidelines for Provision of Sub-ballast.

Unit No 05: **(7)**

Formation Slopes of Formation, Execution of Earthwork in Embankments and Cuttings, Blanket and Blanketing Material, Failure of Railway Embankment, Site Investigations Rail-to-Rail Fastenings, Fittings for Wooden Sleepers, Fittings of Steel Trough Sleepers, Fittings of CI Sleepers, Elastic Fastenings, Other Fittings and Fastenings, Testing of Fastenings, Theoriesfor the Development of Creep, Causes of Creep, Effects of Creep, Measurement of Creep, Adjustment of Creep, Creep Adjuster, Portions of Track Susceptible to Creep, Measures to Reduce Creep.

Unit No 06: **(7)**

Necessity for Geometric Design, Details of Geometric Design of Track, Gradients Grade Compensation on Curves, Circular Curves, Superelevation, Safe Speed on Curves, Different types of curve, Extra Clearance on Curves, Widening of Gauge on Curves, Vertical Curves, Realignment of Curves, Switches, Design of Tongue Rails, Crossing, Number and Angle of Crossing, Reconditioning of Worn Out Crossings, Turnouts, Turnout with Curved Switches, Layout of Turnout, Inspection and Maintenance of Points and Crossings

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based on assignments on each unit

TEXT BOOKS

1. Modern P Way: M Srinivasan, Lichiberger Bernard: Track Compendium (Formation, Pway Maintenance and Economics)
2. A Textbook of Railway Engineering SC Saxena and SP Arora Dhanpat Rai Publications (p) Ltd.-new Delhi

REFERENCE BOOKS:

Monographs issued by IRICEN Pune

1. Bridge Substructure and Foundation Code
1. Indian Railway Permanent Way Manual
2. Schedule of dimensions Indian Railways
3. Indian Railway Code for the Engineering Department
4. Indian Railway Engineering Code
5. Indian Railway General Rules
6. Indian Railway LWR Manual
7. RDSO manual for formations Rules for opening of Railways
8. Conrad Esweld: Modern Railway Track
9. Technical Diary IPWE publication

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S. Y. B. Tech. (Civil Engineering) – II, Semester- IV

CIVHON-02D ELEVATED STRUCTURES IN RAILWAY

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 Outcome: At the end of this course, the student will be made familiarize with:

1. To acquire knowledge regarding Elevated structures in Railway.
2. To understand various techniques in Elevated Structures.
3. To select and apply appropriate elevated structure at appropriate situation
4. To writing specifications for different items and preparing estimates, tenders of Civil Engineering work.
5. To understand Maintenance Requirements in elevated structures in Railway
6. Prepare tender documents and explain contract procedures.

SECTION – I

Unit No 01: **(7)**

Location of railway bridge, River Phases, Types of Rivers, Meandering Rivers, Various stages of Meandering Formation, Guidelines for Fixing Location of Railway Bridge. Major & Minor Bridges, Investigation for Major & Minor Bridges, Hydrological Investigations.

Unit No 02: **(7)**

Choice of Foundation for Piers and Abutments, Types of Bridges and Loading Standards, Setting out for Piers and Abutments, Open Foundation, Pile Foundations, Well Foundation—Case Studies

Unit No 03: **(7)**

Classification of steel bridges, Various component of girders / span, History of loading on bridges on Indian railway, Standard steel girder for track bridges, Components of girders fabricated for Indian railway, loads of steel girders of railway bridges, codes and specification, Design of gantry girder: Selection of gantry girder, design of cross section, check for moment capacity, buckling resistance, bi-axial bending, deflection at working load and fatigue strength

SECTION – II

Unit No 04: **(7)**

Piers and Abutments, Superstructure—Design Aspects, Superstructure – Construction, Inspection of Bridges, Maintenance of Bridges – substructure, Maintenance of superstructure – Girders

Unit No 05: **(7)**

Embankments, Tests on Compaction, Approaches, Layers in Flexible and Rigid pavements, Quality Control Aspects, Structural drawings: Building, bridges, RCC Box culvert, Foot over bridges, Road over bridges, Steel structures

Unit No 06: **(7)**

Pre−tender planning and tender invitation, Tender opening, processing and finalization, important concepts of GCC, Legal aspects in Contracts & Arbitration, Prevention & settlement

of disputes, Role of officer as an arbitrator, Special Conditions in major contracts, Exposure on supply contracts (P. Way fittings and track machines), Contract Management using IT, FIDIC condition of contracts., Introduction to PPP and some case studies, Project planning & Project management techniques, Quality Management, Practical aspect of project management

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall be based on assignments on each unit

TEXT BOOKS

1. Modern P Way: M Srinivasan, Lichiberger Bernard: Track Compendium (Formation, Pway Maintenance and Economics)
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