

FACULTY OF SCIENCE & TECHNOLOGY

NEP 2020 Complaint Curriculum for B. Tech. Civil Engineering with effect from 2023-24



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		Engagement Hours		Engagement Hours		Credits	FA		SA	Total
			L	Р		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	Enga Hour	igement rs	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		14	20	210	190	200	600
		Democracy, Elections and Good Governance *				50			

*For IKS activity report should be submitted

BSC-Basic Science Course

PCC-Programme Core Course,

IKS- Indian Knowledge System,

VSEC-Vocational and Skill Enhancement Course

- Legends used-
 - L Lecture
 - T Tutorial
 - P Lab Session

ESC- Engineering Science Course,

AEC- Ability Enhancement Course,

CC-Co-curricular Courses,

FA Formative Assessment

SA Summative Assessment

- ESE End Semester Examination
- ISE In Semester Evaluation
- ICA Internal Continuous Assessment

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

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

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

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

- 2. # 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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NEP 2020 Compliant Curriculum

With effect from 2024-2025

Semester -III

Distribution	Course Code	Name of the	En Ho	gage urs	ment	Credits	FA		Tota		
		Course		T	Р		ESE	ISE	ICA	OE/ POE	l
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,

CC- Co-curricular Courses,

AEC - Ability Enhancement Course,

PEC-Programme Elective Course, IKS- Indian Knowledge System, VSEC-Vocational and Skill Enhancement Course

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



FACULTY OF SCIENCE & TECHNOLOGY NEP 2020 Compliant Curriculum

With effect from 2024-2025

Semester -IV

Distributio n	Course Code	Name of the	En Ho	gage ours	ment	Credits	FA	SA			Total
		Course	L	Τ	Р		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,

AEC- Ability Enhancement Course,

CC- Co-curricular Courses,

PEC-Programme Elective Course IKS- Indian Knowledge System, VSEC-Vocational and Skill Enhancement Course

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



FACULTY OF SCIENCE & TECHNOLOGY NEP 2020 Compliant Curriculum

With effect from 2025-2026

Semester -V

Distribution	Course Code	Name of the	Eng Hot	Engagement Hours		Credits	FA SA			Total	
		Course	L	T	Р		ESE	ISE	ICA	OE/ POF	
PCC	CIVPCC-07	Design of Steel Structures	3			03	70	30		TUL	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,

AEC- Ability Enhancement Course,

PEC-Programme Elective 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.



FACULTY OF SCIENCE & TECHNOLOGY NEP 2020 Compliant Curriculum

With effect from 2025-2026

Semester -VI

Distribut ion	Cours e	Name of the	En Ho	gage urs	ment	Credits	FA	SA			Total
	Cod e	Course	L	Τ	Р		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,

AEC- Ability Enhancement Course,

PEC-Programme Elective Course IKS- Indian Knowledge System, VSEC-Vocational and Skill Enhancement Course.

CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Co MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.



FACULTY OF SCIENCE & TECHNOLOGY NEP 2020 Compliant Curriculum

NEI 2020 Compnant Curricum

With effect from 2026-2027

Semester -VII

Distribut	Course Code	Name of the		Engagement Hours		Crodits	FA	SA		Tota	
ion		Course		T	P	Creuus	ESE	ISE	ICA	OE/ POE	l l
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

PCC- Programme Core Course,

IKS- Indian Knowledge System,

VSEC-Vocational and Skill Enhancement Course

ESC- Engineering Science Course, AEC- Ability Enhancement Course, CC- Co-curricular Courses,



FACULTY OF SCIENCE & TECHNOLOGY NEP 2020 Compliant Curriculum

With effect from 2026-2027

Semester -VIII

Distribution	Course Code	Name of the		gage urs	ement	Credits	FA		SA		Total
		Course	L	T	Р		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,

AEC- Ability Enhancement Course,

PEC-Programme Elective Course IKS- Indian Knowledge System, VSEC-Vocational and Skill Enhancement Course

CC- Co-curricular Courses, VSEC-Vocational and Skill Enhancement Cours MDM-Multidisciplinary Minor: It should be selected from other UG Engineering Minor Programme.

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 bos="" by="" list="" per="" provided="" the=""> CIVPEC – 04E : <as bos="" by="" list="" per="" provided="" the=""></as></as>
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 bos="" by="" list="" per="" provided="" the=""> CIVPEC – 05D: <as bos="" by="" list="" per="" provided="" the=""></as></as>

A. Multidisciplinary Minor in "Product Design and Commercialization"

Semester	Course Code	Course Title
ш	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
Ш	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		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		Engagement Hours		FA	Sz	4	Total
			L	T	Р		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																																								

B. Honors in Infrastructure Engineering

Semester	Course Code	Name of the	Engagement Hours		Credits	FA	SA		Total	
		Course	L	Т	Р		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

C. Honors in Sustainability Engineering

Semester	Course Code	Name of the	Engagement Hours		Credits FA		SA		Total	
		Course	L	Т	Р		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

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

Semester	Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
			L	Τ	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-03D	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

Honors with Research^{*}

Semester	Course Code	Name of the	Engagement Hours	Credits		SA	Total	
		Course	Р		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.

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: III List of open elective - I

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





Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) – I, Semester- V CIVPCC-07: DESIGN OF STEEL STRUCTURES

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: Introduction to Design of Steel Structures

- a) Steel as a structural member, Philosophy of limit state design for strength and serviceability, various types of standards rolled sections, IS Recommendations.
- b) Introduction History Advantages of PEB Applications of PEB Materials used for Manufacturing of PEB. Difference between Conventional Steel Buildings and Pre-Engineer buildings.
- c) Plastic moment, moment curvature relationship, plastic hinges, yield spread in section, shape factor for cross-sections, Types of mechanisms, theorem of plastic analysis, collapse load, complete, partial and over complete collapse, application of virtual work method to beams. Classification of cross section such as plastic, compact, semi-compact and slender.

Unit 2: Design of Connections

- a) Bolted Connections, Types of bolts and bolted joints, Failure of bolted joints, Specifications of bolted connections Efficiency of bolted connections.
- b) Welded connections, types of welded joints, Design strength of fillet weld, Design strength of butt weld

(8 Hrs)

(7Hrs)

Unit 3: Tension Members

Various cross sections such as solid threaded rod, cable and angle sections, net effective area of bar, angle, tees and flats, Limit strength due to yielding, rupture and block shear, Load carrying capacity, Design of tension member, connections of member with gusset plate by bolts and welds, Design of tension splice.

Section-II

Unit 4: Compression Members-Struts and Columns

- a) Common sections used for compression members, buckling classification as per geometry of cross section, buckling curves, effective length and slenderness ratio, permissible stresses, Load carrying capacity, design of struts, connections of members with gusset plate by bolts and welds.
- b) Simple and built-up section, Design of built-up column, lacing and battening, connection of lacing/battening with main components by bolts and welds, column subjected to axial force and bending moment.

Unit 5: Beams

Laterally supported and unsupported beams, Design of laterally supported/ laterally unsupported beams subjected to low/ high shear. Secondary and main beam arrangement for floor of building, design of beam-to-beam connections using bolt / weld.

Unit 6: Column Bases

Column base under axial load: design of slab base, gusseted base, design of anchor bolts, design of pedestal, Column base for axial load and uniaxial bending.

Note:

Use of IS: 800-2007, Steel Table, IS: Handbook No. 1 for steel section and steel table is permitted for theory examinations.

ASSIGNMENTS

At least one assignment on each topic.

TEXT BOOKS

- 1. Design of Steel Structures, N. Subramanian, Oxford, 2008
- 2. Limit State Design of Steel Structures, S. K. Duggal.
- Design of steel structure by Limit State Method as per IS: 800- 2007 by Bhavikatti
 S. S, I K International Publishing House, New Delhi
- 4. Limit state design in Structural Steel by Dr M. R. Shiyekar

(8 Hrs.)

(7Hrs.)

(6 Hrs.)

(9 Hrs.)

- 5. Design of Steel structures by K. S. Sai Ram
- 6. Design of Steel structures by L. S. Jayagopal and D. Tensing
- K.S.Vivek &P. Vaishavi Pre Engineered Steel Buildings, Lambert Academic Publishing

REFERENCE BOOKS

- 1. Limit state design of Steel Structure by V. L. Shah & Gore, Structures Publication, Pune
- 2. Limit State Design of Steel Structures by D. Ramchandra & Virendra Gehlot, Scientific Publishers
- 3. Design of Steel Structures by K. S. Sai Ram, published by Dorling Kindersley (India) Pvt. Ltd.
- 4. Structural Design and Drawing Reinforced Concrete and Steel by N. Krishnaraju,
- 5. Universities Press (India) Pvt. Ltd. Hyderabad.
- 6. Teaching Resource Material by INSDAG
- 7. Bureau of Indian Standards, IS:800-2007, IS:875 part- I to III
- 8. Steel Tables SP: 6(1) and SP: 6(6)
- 9. Alexander Newman, Metal Building Systems Design and Specifications, 2nd Edition



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

CIVPCC08: TRANSPORTATION ENGINEERING

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

Course Outcomes

By the end of the course the students should be able to

- 1. Explain the Fundamentals of Transportation, Highway Planning, and Alignment.
- 2. Apply Highway Geometric Design Principles and Characterize Highway Materials.
- 3. Design Flexible Pavements and Evaluate Pavement Performance.
- 4. Understand Railway Engineering Components and Geometric Design.
- 5. Explain Airport Planning, Runway Design, and Heliport Characteristics.
- 6. Understand Dock, Harbour, and Tunnel Engineering Fundamentals.

SECTION – I

Highway Engineering

Unit: 1 Introduction to Transportation engineering

Introduction to Transportation engineering: Modes of transportations, their importance and limitations. Highway Development and Planning: Principles of Highway planning, Road development in India, Classification of roads, road network patterns

Highway Alignment: Requirements, Engineering Surveys

Unit: 2 Highway Geometric Design

Highway Geometric Design: Cross Section elements, carriageways, camber, stopping and overtaking sight distances, design of super elevation, extra widening, transition curves.

Highway Materials: Properties of sub grade and pavement component materials, Tests on subgrade soils (CBR and Plate load tests), aggregates and bituminous materials, Applications of Geosynthetics in road construction.

(8 Hrs.)

(7 Hrs.)

Unit: 3 Pavement Design and Drainage

Pavement Design: Types of pavements, IRC method of flexible pavement design based on CSA method using IRC-37-2018. Analysis of wheel load and temperature stresses of rigid pavement, joints.

Highway Construction and Maintenance: Specifications, construction steps and quality control tests pavement, Cement Concrete pavement. Pavement failures, causes, Pavement Evaluation Functional and Structural, **Highway drainage:** Surface and sub-surface drainage.

SECTION-II

Railway, Airport Engineering, Dock, Harbors & Tunnel

Unit 4: Railway Engineering

History of Indian Railways- Component parts of railway track, Wheel and axle arrangements, Coning of wheels, Various resistance and their evaluation, Hauling capacity, Tractive effort.

Permanent way component parts - Types of rail section, Creep- wear and failure in rails, Sleeper Requirements and types, Tracks fixtures and fastenings, Bearing plates, Cross sections and Drainage. **Geometric Design** - Alignment, Horizontal curves, Super elevation, Equilibrium cant and cant deficiency, Gradients and grade compensation

Points and Crossing -Functions of turn outs, Design of simple turn out, various types of track junction and their configurations.

Unit 5: Airport Engineering

Air transport development - Airport scenario in India-Stages of development, Aircraft characteristics, Airport planning, Site selection, Obstruction and zoning laws, Imaginary surfaces, Approach zone and turning zones.

Runway and Taxiway - Typical Airport layout, Element of runway, Orientation and configuration, Basic runway length and correction by ICAO and FAA specification, Exit taxiway, Separation clearance, Holding Aprons, Terminal building, Gate position, Airport marking and lighting.

(7 Hrs.)

(8 Hrs.)

Unit 6: Dock and Harbor, Tunnel Engineering

Dock and Harbors: Definition of Dock and Harbour, Classification of ports, Requirement of a good port, classification of Harbours — Docks —break waters, transit sheds, navigation aids.

Tunnel Engineering: Introduction to tunneling, size and shape of tunnel and suitability, tunneling through soils, soft and hard rocks, tunnel lining, drainage and ventilation.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

- 1. CBR test on soil
- 2. Impact test on aggregate
- 3. Crushing strength test on aggregate
- 4. Abrasion Test on aggregate
- 5. Soundness test on aggregate
- 6. Shape test on aggregate
- 7. Specific gravity test on bitumen
- 8. Penetration test on bitumen
- 9. Flash and Fire point test on bitumen
- 10. Ductility test on bitumen
- 11. Softening Point test on bitumen
- 12. Viscosity test on Tar
- 13. Marshall Stability Test on bitumen mix

Note: From the above tests, Minimum 8 Tests have to be performed & 6 Assignments based on syllabus. In addition to this there must be technical visit based on syllabus with report.

Text Books

- Highway Engineering By C.E.G.Justo, A. Veeraragavan & S.K.Khanna., Nemchand Bros.
- 2. Traffic and Transport Planning By L.R. Kadiyali, Khanna publisher, New Delhi.
- 3. Highway Engineering By L.R. Kadiyali., Khanna Publishers, New Delhi.
- 4. Harbour, Dock and Tunnel engineering By R. Shrinivasan, Charotar Publishing House.

- 5. Transportation Engineering By Subramanian. K.P Scitech Publications, Chennai.
- Principles of Transportation and Highway Engineering By Rao, G.V., McGraw Hill Publishing Company Limited, New Delhi.
- Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
- 8. Airport Engineering by Khanna & Arora Nemchand Bros, New Delhi.
- Docks and Harbour Engineering by Bindra S.P. Dhanpathi Rai & Sons, New Delhi.
- 10. RDSO Codes

Reference Books:

- 1. Principles of Transportation Engineering, By Chakroborty and Das, PHI Publication.
- 2. Transportation Engineering an Introduction, by Khistry, C.J., PHI Publication.
- Specifications of Road and Bridge Works (MoRTH) Publication —5s Revision. New Delhi
- 4. IRC: 37-2012, IRC: 58-2015 and other relevant IRC codes.
- 5. Railway Engineering 'by Saxena & Arora Dhanpat Rai, New Delhi.
- Transportation Engineering Planning Design' by Wright P.H. & Ashfort N.J. John Wiley & Sons.
- 7. Airport Engineering by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
- 8. Transportation Engineering' by Srinivasa Kumar R, University Press, Hyderabad
- 9. Railway and track Engineering- by Mundrey J.S.- Tata McGraw-Hill Education
- 10. Docks and Harbour Engineering Oza, Charotar Publication House



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- V CIVPCC09: GEOTECHNICAL ENGINEERING

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

Course Outcomes:

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

- 1. Determine various index properties of soil in the laboratory to characterize and classify the soil.
- 2. Estimate the permeability and seepage through soil mass by applying basic hydraulic flow principles.
- 3. Draw stress contours in soil mass by applying stress distribution theory.
- 4. Determine shear strength parameters of soil under various drainage conditions
- 5. Determine compaction properties and consolidation settlement of soil for given loading conditions.
- 6. Determine earth pressure for earth retaining structure.

Section-I

Unit 1:

Introduction: - Definition of soil, formation and type of soil, Application areas of soil mechanics, 3- phase soil system.

Index properties of soil:- Terminology used in basic soil properties (Voids ratio, Porosity, Degree of saturation, Percentage air voids, air content, different densities & unit weights) and their inter relationship, Method for determination of field density viz. Sand Replacement and Core Cutter. Specific gravity and its determination methods, Density index, Soil consistency: - Atterberg's limits and their significance.

Soil classification: Soil classification based on particle size and consistency, Grain size distribution by mechanical & sedimentation analysis, I.S. classification system of soil (IS-1498).

Unit 2:

(9 Hrs.)

Flow of water through soil: - Permeability — head, gradient and potential, Darcy's law and its validity, Factors affecting permeability, Field and laboratory methods of determining

(8Hrs)

permeability, seepage pressure, Quick sand condition, critical hydraulic gradient, Derivation of

Laplace's equation, flow net and its application, Construction of flow net, Piping phenomenon,

Unit 3

Shear strength :- Concept of shear, Coulomb's theory and failure envelope, Total stress approach, effective stress approach and pore water pressure, Representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesion less in terms of total stress & effective stress, Application of shear strength parameters in the field.

Different types of shear tests: - Unconsolidated Undrained (U-U), Consolidated Undrained (C-U) and consolidated drained test (C-D). Choice of type of test, Box shear test, Triaxial compression test with pore pressures and volume change measurements, Unconfined compression test, Vane shear test, Sensitivity and thixotropy of cohesive soils, factors affecting shear strength.

Section-II

Unit 4

Compaction: - Theory of compaction, factors influencing compaction, Laboratory Standard and Modified compaction test, Method and measurement of field compaction with their suitability, field compaction control. (Different equipment for field compaction)

Stress Distribution in Soil: Concept of total, neutral & inter granular stress. Boussineq's Equation for point load, Vertical pressure under uniformly loaded circular area and uniformly loaded rectangular area, Pressure bulb and its Significance, Newmarks's Chart. Contact pressure distribution under rigid footing.

Unit 5 Compressibility and consolidation

Compressibility :- Definition, compressibility of laterally confined soil, compression of sand and clay, e-p curve, e-log p curve, compression index, Consolidation, Basic terminology, Terzaghi's theory of one dimensional consolidation, relevance of one dimensional consolidation to field condition, consolidation test, determination of coefficient.

Unit 6 Earth pressure theories

Concepts, area of application, Earth pressure at rest, active and passive conditions. Rankin's and Coulomb's theory of earth pressure, Graphical solution- Trial wedge method, Culman's method Rehbhan's construction and modification. Critical depth of open cut in cohesive soil.

(7Hrs)

(7 Hrs)

(07 Hrs.)

(7Hrs.)

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall consist of at least eight of following experiments in the laboratory:

- 1. Specific gravity determination of coarse and fine gained soil
- 2. Particlesizedistribution-Mechanicalsieveanalysis, wetsieveanalysis
- 3. Determination of Atterberg's consistency limits
- 4. Permeability-Determination of coefficient of permeability
- 5. Field density determination: Sand replacement &Core cutter method.
- 6. Proctor compaction test: Light & Heavy
- 7. Direct box shear test
- 8. Unconfined compression test
- 9. Tri-axial test
- 10. Laboratory Vane Shear Test.
- 11. One dimensional consolidation test

TEXT BOOKS:

- 1. Soil Mechanics and foundation Engineering- B.C. Punmia (Laxmi publications (Pvt) Ltd, New Delhi)
- 2. Geotechnical Engineering-Purushottam Raj (Tata Mc graw hill company Ltd, New Delhi)
- Basic and applied Soil Mechanics (Revised Edition) Gopal Rajan and Rao A.S.R. (New Age, New Delhi. 1998)
- 4. Soil Mechanic and Foundation Engineering -Dr. K .R .Arora,(Standard Publication)
- Soil Mechanics and Foundation Engineering -V.N.S. Murthy (UBS publishers and distributors, New Delhi)
- 6. Geotechnical Engineering-Kasamalkar B. J. (Pune Vidyarthi Griha Prakashan ,Pune)
- 7. Geotechnical Engineering-C.Venkatachalam (New Age International (I) Ltd,NewDelhi)
- Principals of Geotechnical Engineering- Braja M. Das (Cengage Learning India Pvt. Ltd, New Delhi)

REFERENCE BOOKS:

- 1. Soil Mechanics in Engineering Practice- Terzaghi and Peck ,John Wiley and sons, New York
- 2. Fundamentals of Soil mechanics-Taylor D.W,(John Wiley, New York)

- 3. Soil mechanics in theory and practice -Alam Singh (Asian Publishing House, Bombay)
- 4. Soil Testing-T.W. Lambe (Willey Eastern Limited, New Delhi)
- 5. Geotechnical Engineering by Shashi K. Gulati & Manoj Datta, Tata McGraw Hill

Programme Elective Course –I

PEC/ Sem	Course code and name
CIVPEC - 01/V	CIVPEC – 01A: Advanced Concrete Technology
	CIVPEC – 01 B: Engineering Geology and Material Science
	CIVPEC – 01 C: Water and Sanitation Infrastructure



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- V CIVPEC-01A: Advanced Concrete Technology

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

Course Outcomes:

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

- 1. Select proper admixtures to obtain concrete of desired properties
- 2. Adopt appropriate method for repairs and rehabilitation of concrete structures.
- 3. Adopt appropriate type of special concrete for desired results
- 4. Adopt special processes for particular types of structures
- 5. Select suitable types of plant for RMC.
- 6. Design a concrete mix of required strength and workability properties

Section-I

Unit 1 Addition to Concrete

Review of types covering pulverized fuel ash, ground granulated blast furnaces slag and silica fume, Rice husk Ash, Metakolin, manufacture, physical characteristics, effects on properties of concretes. Admixtures: - Plasticizers, Super plasticizers, retarder, accelerators, Curing compounds and their effects on properties of concrete.

Unit 2 Properties of Fresh and Hardened Concrete

Workability, setting Time, bleeding and segregation of Concrete. Theory and application principles governing in concrete placing and compaction of concrete.

Properties of Hardened Concrete: Durability & impermeability, microstructure and carbonation of concrete, distress in concrete, Non- destructive test, crack repair techniques, damage assessment procedure, deterioration- causes & prevention.

(8Hrs)

(9Hrs)

Special Processes & technology for particular types of structures: Mass concrete, Sprayed concrete, Ferro-cement concrete, pumped concrete, Roller compacted concrete, Sustainability of concrete industry. Introduction to Cement Blanket & Mivan Technology

Ready mixed Concrete: Types of plants, Concrete specification, Process adopted for central RMC plant, Distribution & transport, Code recommendations,

Quality concepts: Definitions, principles & standards quality control in concrete Construction, tools for quality management.

Unit 6

Unit 4:

Unit 5

Review of methods & philosophies, mix design for special purpose (High grade concrete), variability of results.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

It shall consist following experiments

- 1. Tests on fresh concrete Workability tests,
- 2. hardened concrete: Strength test- compression, flexure
- 3. Effects of admixtures in concrete: Effects on workability and strength of concrete.
- 4. Mix design for special concrete
- Non-destructive testing of concrete- Rebound hammer and Ultra sonic pulse velocity test 5.

TEXT BOOK

- 1. Concrete Technology, Theory and Practice by M.S. Shetty, S, Chand Publications, NewDelhi
- 2. Concrete Mix Design- N. Krishna Raju - Sehgal Publishers

Unit 3 Special Concretes

High performance concrete, High Strength concrete, fiber reinforced concrete, Light weight concrete, High density and radiation shielding concrete, high volume fly ash concrete, Selfcompacting concrete, Introduction to 3D Printing Technology in construction sector.

Section-II

(7Hrs)

(7Hrs)

(6Hrs)

(8Hrs)

REFERENCE BOOKS

- 1. High performance concrete by P.C. Aitkin, Tailor and Francis, New York NY 10016
- 2. Concrete Technology by A.R. Santhakumar, Oxford university press, New Delhi
- 3. Concrete Technology by Neville, Pearson education limited, London
- 4. Advanced Concrete Technology Constituent materials- John Newman, Ban SengChoo- London Press.
- 5. Concrete- P.K. Mehta, P J M Monteiro, Prentice Hall, New Jersey.


Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- V

CIVPEC-01B: Engineering Geology and Material Science

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

Course Outcomes:

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

- 1. To introduce the fundamentals of geology and material science for civil engineering applications.
- 2. To understand the properties and classification of materials used in construction.
- 3. To study the geological structures and their influence on civil engineering projects.
- 4. To analyze material behavior under different conditions and select suitable materials for engineering applications.
- 5. To explore modern and sustainable materials for construction.

Section-I

Unit 1: Introduction to Engineering Geology

Importance of geology in civil engineering, Branches of geology: Physical, structural, and engineering geology, Earth's structure and composition, Weathering and soil formation.

Unit 2: Minerals and Rocks

Types of minerals and their identification, Rock cycle and classification: Igneous, sedimentary, and metamorphic rocks, Engineering properties of rocks and their suitability for construction, Geological structures: Folds, faults, joints, and their impact on construction.

Unit 3: Geological Investigations and Site Selection

Geological **m**apping and remote sensing, Site investigation techniques for foundation design, Influence of groundwater on construction projects, Natural hazards: Landslides, earthquakes, and mitigation strategies.

(7Hrs.)

(8Hrs.)

(8Hrs.)

Unit 4: Introduction to Material Science

Classification of materials: Metals, ceramics, polymers, and composites, Mechanical properties: Stress-strain behavior, elasticity, plasticity, toughness, Thermal, electrical, and chemical properties of materials, Laboratory testing methods for materials.

Unit 5: Concrete and Construction Materials

Cement: Composition, types, and hydration process, Aggregates: Properties and classification, Concrete mix design, strength, and durability, Special concretes: Self-compacting, fiber-reinforced, geopolymer concrete, Steel and polymer-based construction materials.

Unit 6: Advanced and Sustainable Materials

Smart materials: Shape memory alloys, piezoelectric materials, self-healing materials, Sustainable construction materials: Recycled aggregates, green concrete, bamboo, and bio-based materials, Nanotechnology applications in construction materials, Case studies on material failures and innovations in civil engineering.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall consist of following experiments in the laboratory:

- 1. Identification of common rock-forming and economic minerals based on their physical properties (color, luster, hardness, cleavage, streak, etc.).
- 2. Classification and identification of igneous, sedimentary, and metamorphic rocks based on their texture and composition.
- 3. Interpretation of topographic and geological maps to understand geological structures, rock distribution, and faulting patterns.
- 4. Study of folds, faults, joints, and unconformities using models and diagrams.
- 5. Understanding groundwater flow, aquifers, and water table fluctuations.
- 6. Soil and rock logging, core drilling techniques, and subsurface exploration methods.
- 7. Analysis of seismic zones and landslide-prone areas using case studies.

(7Hrs.)

(8Hrs.)

TEXT BOOKS:

- 1. "Engineering and General Geology" Parbin Singh, S.K. Kataria & Sons
- 2. "Textbook of Engineering Geology" R.B. Gupte, Pune Vidyarthi Griha Prakashan
- 3. "A Textbook of Geology" P.K. Mukerjee, World Press Pvt. Ltd.
- 4. "Engineering Geology" N. Chenna Kesavulu, Laxmi Publications
- "Materials Science and Engineering: An Introduction" William D. Callister & David G. Rethwisch, Wiley
- 6. "Material Science and Engineering" V. Raghavan, PHI Learning Pvt. Ltd.

REFERENCE BOOKS:

- 1. "Principles of Engineering Geology" K.M. Bangar, Standard Book House
- 2. "Fundamentals of Engineering Geology" F.G. Bell, Butterworth-Heinemann
- 3. "Engineering Geology for Civil Engineers" D.V. Reddy, Oxford University Press
- 4. "Geology for Engineers and Environmental Scientists" Alan E. Kehew, Pearson
- "Materials Science and Engineering" Donald R. Askeland & Wendelin J. Wright, Cengage Learning
- 6. "Construction Materials: Their Nature and Behavior" J.M. Illston & P.L.J. Domone, CRC Press
- 7. "Concrete Technology" A.R. Santhakumar, Oxford University Press
- 8. "Nanotechnology in Construction Materials" Kaushik Kumar & Divya Zindani, CRC Press



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- V **CIVPEC-01C: WATER AND SANITATION INFRASTRUCTURE**

Teaching Scheme Lectures - 3 Hrs/Week, 3 Credits **Practical** – 2 Hr/Week, 1 Credit

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

Course Outcomes:

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

- 1. Understand the importance of water and sanitation in sustainable development
- 2. Explore various sources of water, intake and conveyance system.
- 3. Design various water treatment units and plan their operations.
- 4. Plan and design the layout of sewage collection system for different types of sewers.
- 5. Design primary and secondary waste water treatment processes and plan their operations.
- 6. Identify operation and maintenance problems in water supply & sewerage systems and suggest suitable solutions.

Unit 1: Introduction to Water and Sanitation Infrastructure (5Hrs)

Importance of water and sanitation, Global and regional challenges in water and sanitation access, Sustainable Development Goals (SDGs) and their relevance to water and sanitation

Unit 2: Conveyance of water

Source works: Types of sources, Intake (Types and location), Design of river intake, Jack well, Pumping system, Power and capacity of pump.

Conveyance system: Types (Gravity fed and Pressure fed), Materials (Ductile Iron, Mild steel and Plastic), Joints, Laying, Hydraulic testing, Break pressure tank, Forces acting, Economic design of conveying main, Thrust block design.

Unit3: Water Treatment Infrastructure

Aeration: Types of aerator, Design of cascade aerator

Sedimentation: Efficiency of an idle settling, Design of sedimentation tanks (Horizontal and vertical)

Coagulation: Design of rapid mixer Flocculation: Theory, Design of slow mixer (hydraulic and mechanical). Calculation of G (Temporal mean velocity gradient)

(6Hrs)

(6Hrs)

Filtration: Design of slow sand filter and rapid sand filters, backwashing, under- drainage systems, Water softening: Hardness, Removal of temporary and permanent hardness, estimation of lime and soda

SECTION II

Unit4: Design of sewerage systems and sewer appurtenances

Assumptions in sewer design, design data, maximum velocity, degree of self-cleansing, egg shaped sewer, storm water drainage, methods of ventilation, maintenance and cleaning of sewers.

Unit5: Design of sewage treatment plant

Design of screening units, criteria for grit removal basins, stokes law, design of conventional and high rate trickling filters, efficiency, design of sedimentation tanks and sludge digestion tanks, design considerations involved in ASP, septic tanks and oxidation ponds.

Unit6: Maintenance of water supply and Sanitation System

Operation & Maintenance of conveyance system, Types of Corrosion and control measures. Maintenance of water distribution systems, Smart metering, real-time monitoring variations in Water quality and pressure distribution systems. Leakage: Causes, Detection and Control, Water pollution and control act —Terminology and significance. Maintenance of sewerage systems, Sewage and sludge pumping, location, capacity and pumping station design.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

It shall consist following experiments

- 1. Testing the pH of wastewater.
- 2. Testing for coliform bacteria and E. Coli using the Most Probable Number (MPN) method.
- 3. Measuring the properties of sludge settlement (Sludge Volume Index) in the wastewater treatment units.
- 4. Determining the F/M ratio i.e., food/Microbes ratio for wastewater.
- 5. Determining the COD of a waste water sample.
- 6. Determining the BOD of a waste water sample.
- 7. Determine the oil and grease content of a wastewater sample.

(9 Hrs)

(9Hrs)

(6Hrs)

TEXTBOOK

- 1. "Water Supply and Sanitation Engineering" by G.S. Birdie and J.S. Birdie Concrete Mix
- 2. Design- N. Krishna Raju Sehgal Publishers
- 3. "Water Resources Systems Planning and Management"—Loucks & Van Beek
- "Water and Sanitation Services: Public Policy and Management" José Esteban Castro
- 5. "Storm water Management for Smart Cities" B. R. Gurjar, Yamini Gautam
- 6. Water Supply and Sanitary Engineering by G.S. Birdie and J S Birdie, Dhanpat Rai Publishers Delhi

REFERENCE BOOKS

- "Water, Sanitation, and Hygiene Standards for Schools in Low-Cost Settings" —WHO &UNICEF
- 2. Water and wastewater Technology-Hammer M.J, Prentice-Hall of India Private ltd

3. Manual on sewerage & sewage Treatment published by Ministry of Urban Development Govt. of India Msy-2000. 35 PDOP-4-59-85-97, Ministry of Urban development

A. Multidisciplinary Minor in "Product Design and Commercialization"

Semester	Course Code	Course Title	
Ш	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 T. Y. B. Tech. (Civil Engineering) Sem- V CIVMDM-03A DESIGN OPTIMIZATION

Teaching Scheme Lectures – 2 Hrs/Week, 2 Credits Practical - 2 Hrs/Week, 1 Credit

Course outcomes:

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

- 1. Explain the fundamentals of optimization techniques
- 2. Solve the single variables problems using various optimization techniques
- 3. Solve the multivariable problems using various techniques
- 4. Apply specialized methods to provide solutions to practical problems.
- 5. Apply Genetic algorithms and evolutionary approaches for solving the practical problems
- 6. Elaborate various Practical Aspects of Optimization for solving unconventional problems

SECTION I

Unit l: Introduction

Optimization problem formulation, optimization algorithms, applications and examples, different optimization methods available.

Unit2: Single Variable optimization

Optimization criteria, bracketing methods - Exhaustive search method, bound phase method; Region Elimination methods — Fibonacci search method, Golden search method; Gradient based methods - Newton Raphson method, Bisection method; Root finding using optimization technique.

Unit3: Multi Objective Optimization

Optimization criteria, Different search methods, Unidirectional search, Direct search method, Evolutionary optimization method, Powell's conjugate direction method; Gradient based methods — Newton's method and Variable metric method.

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

(5 Hrs)

(5 Hrs)

(5 Hrs)

SECTION II

Unit4: Specialized Methods

Integer programming, Geometric programming, simulated annealing, Global optimization using - steep descent method, simulated annealing.

Unit 5: Genetic algorithms and evolutionary approaches(5 Hrs)

Differences and similarities between genetic algorithms and traditional techniques, operators of GAs, Computer program for simulated annealing, Newton Raphson method, Evolutionary optimization method.

Unit6: Practical Aspects of Optimization (5 Hrs)

Reduction of size of an optimization problem, Fast reanalysis techniques, Sensitivity of optimum solution to problem parameters, Multilevel optimization

INTERNAL CONTINUOUS ASSESSMENT (ICA)

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

TEXT BOOKS

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice, Publisher: John Wiley & Sons

2. Kalyanmoy Deb, —Optimization for Engineering design , Prentice Hall, India, 2005.

3. Kalyanmoy Deb, —Multi objective optimization using Evolutionary algorithms^I, John Wiley, 2001.

REFERENCE BOOKS

1. Ranjan Ganguli, Engineering Optimization : A Modem Approach, Universities Press

2. Hamdy A. Taha Operations Research: An Introduction, Pearson Education India

(5Hrs)

Semester	Course Code	Course Title
Ш	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

B. Multidisciplinary Minor in "Applied Civil Engineering"



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- V CIVMDM-03B OPERATION RESEARCH AND MANAGEMENT

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

Course outcomes:

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

- 1. Lead a team, as well as work as a member of a team, for effective management of Engineering projects.
- 2. Formulate and solve optimization problems and use the results in managerial decision

making process.

- 3. Apply the Waiting Time and Idle Time costs concepts for decision making.
- 4. Apply the various Optimization techniques for decision making in uncertainty, Risk & Conflict environments.
- 5. Understand emerging optimization techniques.
- 6. Successfully manage the inventory of a project or industry and Calculate revenue to date for the project, evaluate the performance of a firm based on financial statements and manage working capital of an organization.

SECTION - I

Unit 1:

Planning: Process of planning, Management by objectives. Organizing: Formal and informal organization, centralization, decentralization, line, line and staff, functional organization. Leading, directing, controlling and coordination. Communication process, motivation.

Unit 2:

Importance of Decision Making, steps in decision making, Decision under certainty: Linear Programming, Formulation of simple L-P model, Graphical method, Duality. Application of Linear Programming in _Transportation Problems': North-West corner method, Least cost method, Vogel's Approximation method (Only Initial Basic Feasible Solution) and Application of Linear Programming in _Assignment problems'.

(10 Hrs)

(6 Hrs)

Unit 3:

Queuing or waiting line theory: Applications, Characteristics, Waiting Time and Idle Time costs, Single channel Queuing Problems for calculating average number of customers and average time in system and queue.

SECTION - II

Unit 4: (8Hrs) Decision under Uncertainty: Wald's, Savage, Hurvitz and Laplace criterion of optimism and regret, Decision under Risk: Expected monitory value, Decision tree. Decision under Conflict: Theory of games (dominance pure and mixed strategy).

Unit 5:

Introduction to Dynamic Programming: Need and characteristics, stage and state, process of dynamic programming. Introduction to emerging optimization techniques: Artificial Neural Networks, Fuzzy Logic, Genetic Algorithms (Only concept of each technique). Monte Carlo Simulation: Concept, procedure, and advantages.

Unit 6:

Inventory control: Introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks.

Financial management: Construction accounting, Chart of Accounts, Financial statements - Profit and loss, Balance sheets, financial ratios, Working capital management, Linear break-even analysis: Problems.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA consists of at least two exercises on each of the above units.

TEXT BOOKS

- 1. Optimization, S. S. Rao, Wiley Eastern Ltd.
- 2. Operation Research, H. A. Taha, Mac-Millan.
- 3. Operation Research, Hira and Gupta, S. Chand.

REFERENCE BOOKS

1. Engineering Optimization, A. Ravindran, K. M. Ragsdell, G. V. Reklaitis, Wiley Publication.

(6 Hrs)

(6 Hrs)

- 2. Lecture Notes by Dr. Nagesh kumar (nptel.iitk.ac.in/courses/Webcourse-contents/IISc-BANG/ OPTIMIZATION METHODS/pdf)
- 3. Operations Research: Theory and application, J.K. Sharma, Macmillan Publishers
- 4. Computational Intelligence for Optimization, Authors: Ansari, Nirwan, Hou, Edwin, Springer Publications

Semester VI



PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY NEP 2020 Compliant Curriculum

With effect from 2025-2026

Semester -VI

Distribut ion	Course Code	Name of the		gage urs	ment	Credits	FA		SA		Tota
		Course	L	T	Р		ESE	ISE	ICA	OE/ POE	l
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, AEC- Ability Enhancement Course, PEC-programme Elective Course IKS- Indian Knowledge System,

CC- Co-curricular Courses,

es, VSEC-Vocational and Skill Enhancement Course. Minor: It should be selected from other LIG Engineering Minor Programm

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



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI CIVPCC-10- Design of Concrete Structures -I

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

Course Outcomes:

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

- 1 Explain design philosophies, limit states, and safety factors; analyze reinforced rectangular sections.
- 2 Design one-way, two-way, and cantilever slabs as per IS code.
- 3 Design simply supported, dog-legged, and open well stairs.
- 4 Analyze and design beams under combined bending, shear, and torsion.
- 5 Design axially and eccentrically loaded columns as per IS code.
- 6 Design isolated column footings under concentric and eccentric loads.

Section-I

Unit 1: Introduction & Limit state of Collapse (Flexure, Shear and Bond) (8 Hrs)

- a) Philosophies of Design and their relative advantages and disadvantages, Types and classification of limit states, Characteristics strength and characteristics load, load factor, Partial safety factors. Limit State of Serviceability Significance of deflection, I.S. Recommendations.
- b) Analysis and Design of singly and doubly reinforced rectangular sections.

Unit 2: Design of Slabs (Limit state method) (7 Hrs)

One Way, Two Way and cantilever slabs as per IS code.

Unit 3: Analysis and design of stairs. (Limit state method) (7 Hrs)

Design of Stairs, types of stairs, design of simply supported and Dog-legged stairs, Open well stairs with solid waist slab

Section-II

Unit 4: Design of beam subjected to combined bending, shear and torsion (7 Hrs)

Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion, Design of beams for torsion.

Unit 5: Design of an axially as well as eccentrically loaded columns (8Hrs)

Analysis and Design of axially and eccentrically (Uni-axial) loaded Circular and Rectangular Columns, Introduction to biaxial bending of columns, Interaction diagrams, Circular columns with helical reinforcement.

Unit 6: Analysis and design of Column Footings

(7 Hrs)

Design of isolated square and rectangular column footing, column footings subjected to eccentric load.

NOTE:

- 1. Only IS: 456-2000 shall be allowed in the University Exam.
- 2. IS 456-2019 Amendment
- 3. Unless otherwise mentioned separately, all the designs should be by Limit State method.
- 4. Assignments One assignment on each topic

TEXTBOOKS

1.Limit State Theory & Design by V.L. Karve and V.M. Shah, Structures Publications, Pune.

2.Reinforced Concrete Design (Limit State) by A.K. Jain, Nem Chand & Bros.

3. Reinforced Cement Concrete by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.

4. Design of R.C.C. Structural Elements (Vol. I & II) by S.S. Bhavikatti, New Age International Publishers.

5. Design of R.C.C Structures by S. Ramamrutham, Dhanpat Rai Publications.

REFERENCE BOOKS

1. IS: 456-2000 - Indian Standard Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards.

2. Fundamentals of Reinforced Concrete by B.N. Sinha and S.K. Roy, S. Chand & Company.

3. Limit State Design of Reinforced Concrete by P.C. Varghese, Prentice Hall of India, New Delhi.

4. Handbook of Reinforced Concrete: SP-16 - Bureau of Indian Standards.

5. Reinforced Cement Concrete Design by Neelam Sharma, Katson Books.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI CIVPCC-11- HYDROLOGY AND WATER RESOURCE ENGINEERING

Teaching Scheme Lectures – 3 Hrs/Week, 3 Credits Examination Scheme ISE – 30 Marks ESE - 70 Marks ICA- 25 Marks

Course Outcomes:

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

- 1. Estimate runoff, based on rainfall data and watershed characteristics.
- 2. Estimate design flood for a civil engineering project.
- 3. Calculate yield of open well and tube well for various types of aquifers using knowledge of ground water hydrology.
- 4. Elaborate National and State Water Policies.
- 5. Select appropriate water application technique of irrigation, depending upon type of crop, soil moisture and water availability.
- 6. Select suitable soil & water conservation techniques for particular watershed.

SECTION-I

Unit 1: Introduction to Hydrology

Definition, History and importance of hydrology, The hydrological cycle, Weather and its precipitation potential. Precipitation: Forms and types of precipitation, Different methods of measurement, Factors affecting precipitation at a location, Correcting precipitation data, Estimating missing data, Rain gauge network, Determination of average precipitation over the catchments, Mass rainfall curves, Intensity- duration curves, Concept of depth-area- duration analysis.

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

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

Unit 2: Rainfall – Runoff Relationship & Stream Gauging (10Hrs)

Run-off- Factors affecting runoff, Catchment yield calculations, Rainfall-runoff relationship Hydrograph: hydrograph components, Base flow, Separation of base flow.

Unit Hydrograph – theory, assumptions and limitations, Derivation and use of unit hydrograph, S-curve hydrograph.

(7Hrs)

Stream Gauging: Selection of a site, various methods of discharge measurements, Area velocity method, Slope Area method and other modern methods.

Floods: Definition, Factors affecting, Estimation of peak flow, Rational and other methods, Design flood, Recurrence period.

Unit 3: Ground-water Hydrology

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

SECTION-II

Unit 4: Irrigation

Irrigation: Definition and necessity of Irrigation, Different systems of irrigation- Flow, Lift, Inundation, Storage.

Sources of water- river, well, tanks. Water Application Methods: Methods of lifting water and application of water to soils, Sprinkler, Drip, Basin, Furrow. Layout of Drip Irrigation System. Lift Irrigation: Necessity, General Layout, Main Components of a lift irrigation scheme. Minor Irrigation System: Necessity and general layout of percolation tanks, Bandhara irrigation, Kolhapur type weirs.

Unit 5: Soil and Crop Water Requirements

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

(7Hrs)

(7Hrs)

(5Hrs)

Unit 6: Water Management

Watershed Management: Need of Watershed management, Importance of soil and water conservation measures, Techniques for Rainwater harvesting and Ground water harvesting. Water Management: Canal Water management and distribution- cooperative water users' organizations, Assessment of canal revenue. Warabandi.

Applications of Remote Sensing and Geographic Information Systems in Water Resources Engineering.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

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

TEXT BOOKS

- 1. Irrigation Engineering and Hydraulic Structures-S. K. Garg, Khanna Publishers, Delhi.
- 2. Irrigation and Water Power Engineering- Dr. Punmia, Dr. Pande, Laxmi Publications.
- 3. Engineering hydrology- K. Subramanya, Tata McGraw- Hill Publishers.
- 4. Efficient Use of Irrigation Water-G. H. Sankara Reddi, Kalyani Publishers, Noida.
- 5. Water Management in India-J. V. S. Murthy.
- Water Management, Conservation, Harvesting and Artificial Recharge- Dr. A. S. Patel, Dr. D.

L. Shah, New Age International Publishers.

- 7. Hydrology and Water Resources-R. K. Sharma, Dhanpat Rai & Sons.
- 8. Fundamentals of Irrigation Engineering-Bharat Sing, Nem Chand & Bros, Roorkee.
- 9. Applied Hydrology, K.N. Muthreja, McGraw Hill Publications
- 10. Water Resources Engineering, PN Modi, Standard Publishers

REFERENCE BOOKS

- 1. Irrigation theory & Practice Michael, Vikas Publishing House.
- 2. Water Management-Jaspal Singh, M. S. Acharya, Arun Sharma .Pub-Himanshu Publication
- 3. Design of Minor Irrigation and Canal Structure- Satyanarayan and R. Murthy



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI CIVPCC-12- CONSTRUCTION MANAGEMENT AND PRACTICES

Teaching Scheme	
Lectures – 3 Hrs/Week, 2 Credits	
Practical- 2 Hrs/Week, 1 Credit	

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

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

- 1. Plan the project and prepare Bar chart and Network to optimize the project duration and cost.
- 2. Update the network and re-evaluate the resources.
- 3. Use appropriate project management application software for planning, tracking and reporting progress of civil engineering projects.
- 4. Adopt appropriate safety measures for various Civil Engineering Projects.
- 5. Calculate output of earthmoving, hoisting, compacting equipments.
- 6. Explain prefabricated constructions and advanced formwork.

SECTION-I

Unit 1:

Project Management: Introduction, Steps in Project Management, Work Breakdown Structure (WBS). Gantt (Bar) Chart, Mile Stone chart.

Project Management Software (PMS):

Introduction to applications of PMS (such as MS Excel, MS Project, Primavera, and PRINCE) and Open-Source software (Google Spreadsheet).

Development of network: Representation by Activity on Arrow (AOA) and Activity on Node (AON), Fulkerson's Rule.

Critical Path Method (CPM): Introduction, Time estimates, floats, critical path.

Unit 2:

(8 Hrs)

(7 Hrs)

Network compression: - Least Cost and Optimum Duration.

Resource allocation: Smoothening and levelling. Numerical Problem on Resource Allocation and Levelling.

Updating: Need, steps, project duration, and calculation for updated network. Numerical Problem on Updating.

SECTION-II

Performance Evaluation and Review Techniques (PERT)

Concept of probability, Normal and Beta Distribution, Central limit theorem. Time estimates and calculations of project duration, critical path, slack, probability of project completion.

Unit 4: Construction safety

Unit 3:

Safety against accidents on various construction sites such as building, dam, road, tunnel, bridge, fabrication and erection work, etc. Safety at various stages of construction. Safety measures in construction.

Unit 5: Mechanical v/s Manual construction

Introduction -Conceptual planning of new project, site access and services, Excavation in Earth Earth moving equipment - Tractors, Bulldozers, Scrappers, Power shovel, Hoes, simple numerical problems based on cycle time and production rates, Numerical Problem on Cycle Time frequency of line. Clamshell. Trenchers. and scrapers, Drag **Compactors**efficiencies. performance, operating types and

Unit 6: Prefabricated Units and Advanced formworks

Prefabricated construction –relative economy, elements and simple connections, cranes. Advanced formworks- Aluform, Tunnel Form, Mivan Formwork.

INTERNAL CONTINIUOS ASSESSMENT (ICA)

The ICA shall consist the following.

- It shall be based on the
- 1. Assignments on each Chapter
- 2. Civil Engineering project management reports/tasks/activities using any relevant software.
- Technical/ Industrial Visit to construction site in relevance with syllabus and submission of detailed visit report.

(8 Hrs)

(8 Hrs)

(7 Hrs)

(7 Hrs)

TEXT BOOKS

1. A Management Guide to PERT/CPM: Weist J. D. ,Levy, Prentice Hall of India, New Delhi, 2nd Ed. 1982

2. PERT and CPM Principles and Applications: Srinath L. S., East West Publication, New Delhi, 3rd Ed. 1995.

PERT and CPM- B. C. Punmia, K. K. Khandelwal, Laxmi Publications, New Delhi, 4th Ed.
2012.

4. Computerized Project Management Technique for Manufacturing and construction: Samaras

T.T., Kim Yensueng, Prentice Hall of India, New Delhi, 1979.

5. Principles of Construction Management: Roy Pilcher, Tata McGraw Hill Publications.

6. Construction, Planning, Equipment and methods - R. L. Peurifoy McGraw hill book co New Delhi.

7. Construction Equipment Guide, David A. Day, Neal B. H. Benjamin, John Wiley & Sons.

8. Construction Equipment - Mahesh Varma ,Metropolitan book co ,New York

9. Heavy Construction – Planning, Equipment and methods – Jagman Singh, Oxford and IBH publishers, New Delhi.

10. Construction of Diaphragm Walls, I Hajnal, I Marton, F. Regele Wiley Interscience Publication, John Wiley & Sons.

11. Structural & cut off Diaphragm walls, R.G.H. Boyes, Applied Science Publishers Ltd., London

REFERENCE BOOKS

1. CPM in Construction Practice, Antill J. M., John Wiley and Sons.

2. Construction Project Management – Planning, Scheduling and Control- Chitkara K.K., Tata McGraw Hill Publications New Delhi, 4th Ed. 2002.

3. Construction Planning and Management through System Techniques: Verma M., Metropolitan Publication, 3rd Ed. 1985.

4. Construction Project Management- Bennett J. M. Clough R. H., Butterworth's Wiley John, New Delhi, 1972.

5. Construction Scheduling with Primavera Enterprise- Marchman D.A., Thomson/Brooks-Cole.

Programme Elective Course –II

CIVPEC - 02/ VI	CIVPEC – 02A: Foundation Engineering
	CIVPEC – 02B:Urban Transportation Planning
	CIVPEC – 02C:Air and Noise Pollution and Control



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI CIVPEC-02A FOUNDATION ENGINEERING

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

Course Outcomes:

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

- 1. Explain the suitability of different soil exploration methods.
- 2. Evaluate bearing capacity of soil by various analytical and experimental approaches.
- 3. Perform geotechnical design of shallow foundation such as isolated footing, combined footing, raft foundation.
- 4. Perform geotechnical design of deep foundation such as Pile foundation and Caisson foundation
- 5. Investigate slope stability of embankments
- 6. Apply suitable ground improvement techniques for construction of footing in difficult soil.

SECTION-I

Unit 1:

Introduction:-General requirements for satisfactory performance of foundations.

Soil Exploration:-Necessity, Planning, Exploration methods, Different types of boring- Hand and continuous flight augers, Wash boring, Rotary drilling. Soil sampling- Disturbed and Undisturbed. Rock drilling and sampling. Core barrels, Core boxes, Core recovery, RQD

Unit 2:

Bearing Capacity Analysis: Bearing capacity – Ultimate, safe and allowable. Modes of failure, Terzaghi's bearing capacity equation with derivation, IS code method of bearing capacity (IS6403-1981), Effect of water table, Eccentricity of load.

Field Test for Bearing Capacity Evaluation: - Plate load test, Standard Penetration test and Pressure meter test. Test procedures and limitation

Foundation Settlement: - Immediate settlement – computations as per IS 8009 – 1976 (part–I) approach and from plate load test observations. Consolidation settlement, Total settlement, Differential settlement, Tolerable settlement, Angular distortion.

(6 Hrs)

(8 Hrs)

Unit 3:

Unit4:

Shallow foundations: - Design of Isolated, Combined, Strap footing (Rigid analysis), Raft foundations (Conventional method), Floating foundations (RCC design is not expected)

SECTION-II

Pile foundation: Classification, Single pile capacity for RCC cast in situ pile in Cohesive, Non cohesive and mixed soils by Static method, Dynamic formulae, and Negative skin friction. Under reamed piles-equipment, construction and precautions. Load carrying capacity of pile group, Group action of piles- Spacing of piles in a group, group efficiency- empirical formulae. **Caisson Foundations:** Box, Pneumatic, open (well) caissons, Shapes of well, components. Forces on caisson, grip length, well sinking, practical difficulties and remedial measures.

Sheet Piles: classification of sheet piles, Design of cantilever sheet pile in cohesion less (approximate method) and cohesive soils

Unit5:

Stability of finite slopes- slip circle method, Semi graphical and graphical methods- Swedish slip circle method, Method of slices, Friction circle method. Fellenius construction to locate critical slip center, Stability Number and its use.

Unit 6:

Cofferdams: Various Types, Cell fill material, Stability of cellular cofferdam. Guidelines and care to be exercised in weak and compressible soil, Expansive soil, Collapsible soil, Corrosive soils

Ground Improvement Techniques: - Pre compression, Sand drains, Vibro-floatation, Grouting, Soil reinforcement Foundations on filled up soils. Contamination of soils and foundation problems. Geosynthetic and its applications: - Geotextiles- Definition and Types, Functions of Geotextiles, Different applications in Civil Engineering (Roads, Railways, Embankments, Earth Retainment, Erosion control etc)

(8 Hrs)

(8 Hrs)

(8 Hrs)

(8 Hrs)

INTERNAL CONTINUOUS ASSESSMENT (ICA)

The ICA shall consist of Field work and Assignments on above topics

A) Assignments: -

- 1 Bearing capacity calculation by various methods
- 2. Settlement calculations
- 3. Design of shallow foundation-Isolated, Combined, Raft using conventional method.
- 4. Pile and Pile group-Load carrying capacity of piles, Design of pile group
- 5. Sheet piles-Cantilever sheet pile in cohesive soil.
- 6. Stability analysis Slip circle, slice method, Fellenius construction, Taylor's Stability Number.

B) Visit to foundation construction sites and preparation of report.

TEXT BOOKS

- Soil Mechanics and foundation Engineering -B.C. Punmia(Laxmi publications Pvt. Ltd, New Delhi)
- 2. Geotechnical Engineering-Purushottam Raj(Tata Mcgraw hill company Ltd, New Delhi)
- Principals of Foundation Engineering Braja M.Das (Cengage Learning India Pvt. Ltd, New Delhi)
- 4. GeotechnicalEngineering-C.Venkatachalam(NewAgeInternational(I)Ltd,NewDelhi)
- 5. Soil mechanics and foundation engineering- V.N.S. Murthy (UBS publisher's and distributers, New Delhi)
- 6. Foundation Design Manual-Dr. N. V. Nayak (Dhanpat Rai and Sons)
- 7. Foundation Engineering-Kasamalkar B.J.(Pune Vidyarthi Griha, Pune)
- 8. SP36-1Compendium of Indian Standards on Soil Engineering Part1
- 9. SP36-2Compendium of Indian Standards on Soil Engineering Part2
- 10. Design of substructure-Swami Saran(Oxford and IBH Publications)

REFERENCE BOOKS

- 1. Foundation analysis and design-BowlesJ.E.(Tata Mc Grawhill company Ltd New Delhi)
- 2. Foundation design and construction-Tomlinson (M.J.English Language Book Society, Essex)
- 3. Foundation Design-Teng W.C, (Prentice Hall publications)
- 4. Soil mechanics in theory and practice –Alam Singh,(Asian Publishing House, Bombay)



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI CIVPEC02B-URBAN TRANSPORTATION PLANNING

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

Course Outcomes:

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

- 1. Design and carry out surveys to provide the data required for transportation planning.
- 2. Prepare zonal demand generation and attraction regression models.
- 3. Prepare and distribution models and modal split models for mode choice analysis.
- 4. Design trip generation rates for specific types of land use developments.
- 5. Compare among planning alternatives that best integrate multiple objectives such as technical feasibility and cost minimization.

Section-I

Unit 1:

Land use and Transportation System: Introduction-Urban system Components-Concepts and definitions-Criteria for measuring urban sprawl—Location theory-urban growth or decline

Unit 2:

Transportation Planning Process: Introduction-Definition-Factors to be considered; Land use transportation planning; systems approach-Stages-Inventory of Existing Conditions-Difficulties in implementation.

Unit 3:

Transport Surveys: Basic Movements- Study Area-Zones-Surveys- Planning of different types of surveys and interpretation, Travel demand; Traffic surveys for mass transit system planning

(6 Hrs)

(8 Hrs)

(8 Hrs)

Section-II

Unit 4: (7 Hrs) Trip Generation and Distribution: Factors governing trip generation and attraction – Application of Regression Analysis-Methods of trip distribution; Growth and Synthetic Models Calibration and Application of gravity model. -Category analysis.

Unit 5:

Modal Split and Assignment:

Factors affecting modal split; Modal split in transport planning; Principles of traffic assignment; assignment techniques.

Mass Transit Systems: Types-Capacity, Fleet Planning and Scheduling

Unit 6: Land Use Models-Lowry Model Hansen s Accessibility Model Density Saturation Gradient Model- Problems (Except on Lowry Model).

Internal Continuous Assessment (ICA)

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on the entire curriculum. Based on the curriculum a site visit should be arranged for OD survey and traffic data analysis

TEXTBOOKS

- 1. `Traffic Engineering and Transportation Planning' -Kadiyali,L.R., Khanna Publication, New Delhi, 2009.
- 2. Transportation Engineering–An Introduction-Jotin Khisty and B. Kent Lall ,PHI ,New Delhi,3rd Indian Edition, 2006.
- 3. 'Principles of Urban Transport System Planning '-Hutchinson ,B.G.,Mc Graw Hill Book Co., London, UK, 1982.

(10Hrs)

(6 Hrs)

REFERENCEBOOK

1. Institute of Traffic Engineers-An Introduction to Highway Transportation Engineering ,NewYork., 1982.

2. "Urban Transportation Planning" by Michael D.Meyer

- 3. "Transportation Planning Handbook" by William W. Haynes
- 4. "Introduction to Transportation Engineering" by James W. Nelson



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI

CIVPEC02C-AIR AND NOISE POLLUTION AND CONTROL

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

Course Outcomes:

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

1. Understand about the various air pollutants, their source of generation ,their impacts, their effect on human, plants, environment and materials.

2. Apply knowledge of meteorology for controlling air pollution and Design air pollution controlling equipment.

3. Apply knowledge of legislation for prevention and control of air pollution.

4. Acquire knowledge to analyze quality of air in the form of air quality index and dispersion modeling.

5. Understand about Noise pollution and its control.

6. Apply the knowledge of sampling and measurements of air Pollutants

SECTION-I

Unit1: Introduction to Air Pollution

Air Pollution, Air and its composition, Structure of the atmosphere, units of measurement. Sources of air pollution (Natural and Artificial, Primary and Secondary, point and Non-Point, Line and Area, Stationary and mobile sources) and its classification, Major air Pollutants and their characteristics ,Specific group pollutants such as CFC ,GHG etc. Air Pollutants from various industrial sectors. Indore Air Quality ,Odor Pollution, Impact of air pollution on human health ,vegetation ,aquatic life flora and fauna and Monuments & Buildings, etc

Unit2: Pollutant Dispersion

Concept of atmospheric stability, Meteorology, Adiabatic and Environmental Lapse rate. Effect of windon Pollutant dispersion. Concept of maximum mixing depth and ventilation coefficient. Wind rose diagram, Plume behavior, Plume rise and Effective stack height.

Air Quality: Introduction to Air quality index and Comprehensive Environmental Pollution Index etc. and its application.

(6Hrs)

(8Hrs)

Unit3: Impacts of Air Pollution

Extreme air Pollution scenarios : Acid Rain , Global Warming, Smog(s), Ozone layer depletion , Urban Heat Islands, etc. Various treaties and protocols :Kyoto Protocol and Montreal Protocol etc. Episodes.

Dispersion modeling: Introduction to Dispersion modeling, its applications and limitations. Introduction to Gaussian Plume model and GLC determination

SECTION - II

Unit 4: Air sampling, analysis and Legislation

Air sampling and pollution measurement methods, principles and instruments, Ambient air quality and emission standards, Air pollution indices (aerosols, fog, smog index ,etc), Air (Prevention and Control) Pollution Act ,1981, legislation and regulations.

Unit5: Control of gaseous pollutants and Pollution

Control principles of Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Introduction to control methods and equipment for Particulate matter and gases. Working of scrubbers, Electrostatic Precipitator, Gravity settlers, Cyclone separator, Filter bags etc. Other mechanisms of air pollution control such as Biochemical Processes, catalytic processes etc

Unit 6: Effects, Standards, Monitoring and Control of Noise

Basics of acoustics and specification of sound ;sound power ,sound intensity and sound pressure levels ; point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria.

Effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation

Internal Continuous Assessment (ICA)

Assignment: Assignment based on each unit

Laboratory Work

- 1. Measurement of air pollutants using different sampling techniques.
- 2. Determination of particulate matter concentration in ambient air.
- 3. Study of air quality index and calculation methods.
- 4. Performance evaluation of air pollution control devices (scrubbers, ESP, etc.).
- 5. Noise level measurement and analysis in different environments.
- 6. Practical applications of dispersion modeling techniques

(8Hrs)

(7Hrs)

(8hrs)

TEXT BOOKS

- 1. Air pollution Wark and Warner
- 2. Air Pollution Rao and Rao, TMH
- 3. Environmental Engineering- by Peavy and Rowe, TMH.
- 4. Air Pollution and Control-Murali Krishna ,Jain Brothers
- 5. EnvironmentalPollutionControlandEngineering,RaoC.S.,NewAgeInternational(P)Limited, 1st Ed., 1991.
- 6. Air Pollution , Perkin, H.G.McGrawHill1974.
- 7. Sources and Control of Air Pollution, R J Heinsohn and R L Kabel, Prentice Hall, 1999
- 8. Air Pollution Control Equipment Calculations ,L Theodore ,John Wiley and Sons, 2008

REFERENCE BOOKS

- 1. Air pollution Martin Crawford
- 2. Air Pollution and Control Technologies-Y. Anjaney ulu, Allied Publishers
- 3. Fundamentals of Air Pollution-Raju BSN, IBH Publisher
- 4. An Introduction to Air Pollution-R .K. Trivedi and Goyal, BS Publications.
- 5. Air Pollution .Physical and Chemical Fundamentals, Sainfeld ,J.H. Mc Graw Hill ,N.Y. 1975.
- 6. Air Pollution: Measurement, Modeling and Mitigation, A Tiwari and J Colls, Taylor & Francis.

Programme Elective Course –III

CIVPEC - 03/VI	CIVPEC – 03A Construction Productivity
	CIVPEC – 03B Planning for Sustainable Development
	CIVPEC – 03C Earthquake Engineering



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI

PROFESSIONAL ELECTIVE COURSE-III

CIVPEC-03A CONSTRUCTION PRODUCTIVITY

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

Course Outcomes:

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

1. Assess productivity effects & reasons of low productivity in construction industry

- 2. Differentiate responsibilities & roles of project participants to improve productivity.
- 3. Measure and analyze productivity using classical methods of data gathering.
- 4. Apply advance construction management approaches to improve productivity.
- 5. Present and implement productivity improvement findings.
- 6. Explore impact factors affecting productivity and quantity lost productivity

SECTION-I

Unit1: Productivity and its measurement Method

Introduction to Productivity—Definitions–Productivity Measurement–Need for Productivity Measurement MPSA Principles – Quantity Measurement Methods –Performance Factor Calculations and Forecasting–Percentage Complete using Earned Value.

Unit 2: Productivity Index and Productivity Through

Productivity index- Causes of low productivity and techniques of their elimination- Improving Productivity through Pre-Planning-Record Keeping, Control, Change Orders and Defect Analysis.

Unit 3: Labour productivity

Labour productivity - Improving labour Productivity with New Technologies -Advantages from increased labour productivity.

SECTION-II

Unit 4: Factors Influencing Productivity

Factors Influencing Productivity–Sources of Lost Time–Tools to Identify Productivity Loss -Productivity

(7Hrs)

(8Hrs)

(7Hrs)

(7Hrs)
Unit 5: Productivity Improvement Methods

Improvement Methods – Influence of Human Factors on Productivity – Motivation –Methods of Motivating for Improved Productivity.

Unit 6: Work Sampling

Introduction to Work Sampling-Productivity Calculations and Spreadsheets Performance Progress. Measurements – Tour Approach – Crew Approach – Foreman Delay Survey – Implementation – Crew Balance Charts – Flow Diagrams.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

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

References

- Productivity Improvement in Construction Oglesby, C., Parker, H., and Howell, G. New York: McGraw Hill, 1989.
- Managing Performance in Construction, Leonard E. Bernold and Simaan M. AbouRizk, John Wiley & Sons.
- Construction Productivity Management Paul O. Olomalaiye , Ananda K.W. Jayawardane, Frank C. Harris, Prentice Hall.
- Construction Productivity: Measurement and Improvement- James J. Adrian, Stipes Pub LLC.
- 5. Labour productivity J P Srivastava, Oxford & IBH Publishing Company, 1982

(8Hrs)



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI

PROFESSIONAL ELECTIVE COURSE-III

CIVPEC-03B PLANNING FOR SUSTAINABLE DEVELOPMENT

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

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

- 1. Evaluate the concept, evolution, and principles of sustainable development, including its link to environmental degradation and poverty.
- 2. Identify key components of sustainable development and assess strategies for promoting sustainability.
- 3. Explore role of innovation and environmental management in sustainable development.
- 4. Apply theoretical frameworks to understand sustainable development and societal transformations.
- 5. Evaluate governance structures and policy responses to environmental degradation.
- 6. Develop research skills in sustainable development and capacity-building for innovation

SECTION-I

Unit 1 :- Introduction

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability

Unit 2:- Components in Sustainable Development

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

Unit 3:- Innovation for Sustainable Development

Innovation for sustainable development- Environmental management and innovation strategies. The role of Information and Communication Technology (ICT) in promoting sustainable development.

(9Hrs)

(7hrs)

(7Hrs)

SECTION-II

Unit4:- Theories of Sustainable Development

Societal transformations. Institutional theory. The Role of Institutions in Sustainability. Equity and Social Justice in Sustainability.

Unit 5:- Governance and Policy Response

Governance for sustainable development. Policy responses to environmental degradation. Institutional frameworks: NITI Aayog, Ministry of Environment, Forest and Climate Change (MoEFCC), and other key players

Unit 6:- Research in Sustainable Development

Capacity development for innovation. Research methods.Identifying the challenges in conducting research for sustainable development.Sustainable Development and Policy Interventions

Internal Continuous Assessment (ICA)

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

TEXT BOOK

- 1. Basic Principles for Sustainable Development, Global Development and Environment by Harris, J.M.
- 2. Some thoughts on the idea of sustainable development Ecological Economics, Robinson,
- J. (2004), 48(4): 369-384.

REFERENCE BOOKS

- Navigating towards Sustainable Development: A System Dynamics Approach Hjorth, P. and A. Bagheri (2006), Futures 38: 74-92.
- Struggling with Sustainability A Comparative Framework for Evaluating Sustainable Development Programs, Mog, J.M. (2004), World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure.
- 3. Global Development and Environment Institute, working paper 00-04. Available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF

(6Hrs)

(8Hrs)

(8Hrs)



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI

PROFESSIONAL ELECTIVE COURSE-III

CIVPEC-03C EARTHQUAKEENGINEERING

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

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

- 1. Apply the principles of Earthquake resistant philosophy in planning, design and construction of building.
- 2. Perform the dynamic analysis of structures under earthquake load.
- 3. Incorporate the Earthquake resistant features for various types of construction.
- 4. Adopt the provisions of IS1893-2016 and IS13920-2016 Codes.
- 5. Incorporate the ductility features in the structures.

SECTION-I

Unit:1 Elements of Seismology

General effects of an earthquake, terminology, structure of earth, causes of an earthquake, plate tectonic theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelerogram, soil liquefaction, prominent earthquakes of India.

Unit: 2 Free vibrations of single degree-of-freedom systems (5Hrs)

Dynamic loads and dynamic analysis, degrees of freedom, Undamped free vibrations, multiple elastic forces, viscously damped vibrations, equations of motion and solution, logarithmic decrement.

Unit:3 Forced vibrations of single degree-of-freedom systems (5Hrs)

Forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and Viscously damped vibrations, equations of motion and solution, Force transmitted to foundation, transmissibility, response to harmonic support excitations.

(3Hrs)

Unit: 4 Response spectrum theory

Response to general dynamic loading, Duhamel's integral, rectangular loading, Earthquake response spectrum, tripartite spectrum, construction of design response spectrum.

SECTION- II

Unit: 5 Principles of earthquake resistant design

Planning aspects, symmetry, simplicity, regularity. Resistance of structural elements and structures for dynamic load, design criteria, strength and deflection.

Unit:6 Evaluations of Seismic Forces

Philosophy of earthquake resistant design, Provisions of IS 1893, Soft storey, Design spectrum of IS 1893, evaluation of lateral loads due to earthquake on multistory buildings. Concept of ductility, different ways of measuring ductility, factors affecting ductility, energy absorption, provisions of IS 13920.

Unit:7 Earthquake resistant construction

Failure mechanism of different types of masonry construction, Construction aspects of Masonry and Timber structures, Retrofitting and strengthening techniques of low cost and low rise buildings .Provisions of I.S.4326 and IS13935.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS:

- 1. Elements of Earthquake Engineering-Jai Krishna, South Asian Pub. NewDelhi
- 2. Earthquake Resistant ,Design of Masonry and Timber Structures-A.S.Arya
- 3. Earthquake Resistant Design of R.C.C. Structures-S.K.Ghosh

REFERENCE BOOKS

- 1. Dynamics of Structures-A.K.Chopra
- 2. Structural Dynamics Mario Paz CBS Publication
- 3. Earthquake Resistant Structures-D.J. Dowrick John Wiely Publication
- 4. Dynamics of Structures-R.M.Clough and Penzian, Mc Graw Hillco.NewDelhi

(4Hrs)

(5Hrs)

(5Hrs)

- 5. Mechanical Vibrations-G.R.Grover Roorkee University, Roorkee
- Analysis and Design of <u>Foundations</u> for Vibrations– P. J. Moove. Oxford and I. B. H. Publication, Delhi
- 7. Foundation Design Manual-N.V.Nayak, Dhanpatrai and sons, Delhi
- $8.\ Manual of Earth quake Resistant Nonengineering Construction, University of Roorkee$
- 9. Elements Seismology–Rochter
- 10. IS1893-2016–PartI,IS13920-2016,IS:4326andIS13935.
- 11. Earthquake Tips published by NICEE, IIT Roorkee.
- 12. Government of Maharashtra Earthquake resistant Design of house guiding lines and assessment of damages.

CIVSEC-04 MINI PROJECT ON DESIGN OF INFRASTRUCTURE



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI

CIVSES-04 Mini Project on Design of Infrastructure (MPDI)

Teaching Scheme Practical- 4 Hrs/Week, 2 Credit Examination Scheme ICA - 25 Marks POE- 50 Marks

Course Outcomes:

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

- 1. Apply Codal provisions in the analysis and design of structures in accordance with relevant IS codes.
- 2. Utilize appropriate software tools to perform structural, environmental, and transportation system design, including analysis, optimization, and documentation.

3. Evaluate design alternatives by considering technical, economic, and environmental constraints to optimize system performance.

Section-I

1. Design of RCC Structure using Relevant Software

Design a G+1 RCC residential building, using relevant software ensuring compliance with IS codes. Perform structural analysis, design of beams, columns, slab and generate detailed drawings.

2. Drinking Water System or Irrigation System Design

Design a drinking water supply system for a community, including source selection, water treatment plant design, and distribution network or design an efficient irrigation system (surface, drip, or sprinkler) based on crop water requirements and available water sources. Conduct hydraulic analysis using relevant software and optimize the layout for uniform water distribution.

3. Highway Design and Alignment

Design a highway alignment connecting two urban centers, including geometric design, pavement design. Use relevant software for alignment planning and ensure compliance with IRC standards.

Section-II

1. Steel Structure Workshop Shade Design

Design a steel structure workshop shade considering loads (dead, live, wind, seismic) using relevant software. Perform structural analysis, design of trusses, columns, and connections, and provide detailed drawings and cost estimation.

2. Sewage System Design

Design a sewage collection, conveyance, and treatment system for urban or rural areas, ensuring environmental compliance. Use relevant software for hydraulic analysis and design the treatment units for safe discharge as per CPCB norms.

3. Traffic Signal Design and Intersection Improvement

Analyze and design a traffic signal system for an urban intersection to optimize traffic flow and improve safety. Use relevant software for traffic simulation and propose geometric improvements for safety and visibility.

NOTE:

Students are required to choose one project from Section I and one project from Section II for their mini-project work.

TEXTBOOKS

1.Limit State Theory & Design by V.L. Karve and V.M. Shah, Structures Publications, Pune.

2.Limit State Design of Steel Structures, S.K. Duggal.

3. Water Supply Engineering - S. K. Garg, Khanna Publishers

4.Irrigation Engineering and Hydraulic Structures – Santosh Kumar Garg, Khanna Publishers

5. Highway Engineering – S. K. Khanna & C. E. G. Justo, Nem Chand & Bros

6. Traffic and Highway Engineering - Nicholas J. Garber & Lester A. Hoel, Cengage

REFERENCE BOOKS

- 1.IS: 456-2000 Indian Standard Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards.
- 2.CPHEEO Manual on Water Supply & Treatment Guidelines for Design of Water Supply Systems
- 3.IS 15842:2009 Design of Drip and Sprinkler Irrigation Systems.
- 4.IRC 37:2018 Guidelines for the Design of Flexible Pavements
- 5.IRC 93:1985 Guidelines for Design of Traffic Signals

A. Multidisciplinary Minor in "Product Design and Commercialization"

Semester	Course Code	Course Title
ш	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



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MDM-04A NEW PRODUCT DEVELOPMENT

Teaching Scheme

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

Course Outcomes:

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

- 1. Understand the importance of engineering design and product lifecycle considerations.
- 2. Analyze customer needs and implement tools like Quality Function Deployment (QFD).
- 3. Apply creative thinking techniques for concept generation and selection.
- 4. Evaluate decision-making processes in product development.
- 5. Develop product architecture with an understanding of modularity.
- 6. Assess cost implications and sustainability factors in new product development

UNIT 1: Introduction to New Product Development (5 Hours)

Product development and its significance in engineering design, the importance of engineering design, types of design, the design process, product lifecycle considerations, designing to codes and standards, societal considerations, phases of product development, planning for products, market segmentation, and market research.

UNIT 2: Customer Need Identification and Requirements Analysis (5 Hours)

Identifying customer needs, voice of the customer, need gathering methods, affinity diagrams, hierarchy of human needs, establishing engineering characteristics, competitive benchmarking, Quality Function Deployment (QFD), House of Quality (HoQ), and product design specification with case studies.

UNIT 3: Concept Generation and Creative Thinking (5 Hours)

Creativity in product development, problem-solving techniques, creative thinking methods, functional decomposition, morphological methods, TRIZ methodology, axiomatic design, and systematic methods for generating innovative design concepts.

UNIT 4: Decision Making and Product Architecture (5 Hours)

Decision-making theories, utility theory, decision trees, concept selection methods such as the Pugh Matrix and Weighted Decision Matrix, the Analytic Hierarchy Process (AHP), introduction to embodiment design, product architecture types, modularity in design, and steps for developing product architecture..

UNIT 5: Design for Manufacturing, Costing and Sustainability (5 Hours)

Human-centered design, user-friendly design, design for serviceability, design for the environment and sustainability, prototyping and testing, cost evaluation, cost categories, overhead costs, activity-based costing, methods of cost estimation, manufacturing costs, and value analysis in product costing.

UNIT 6: Product Testing, Validation and Commercialization (5 Hours)

Types of prototypes, rapid prototyping techniques, reliability testing, product safety and compliance standards, test planning, market launch strategies, intellectual property rights (IPR), patenting, branding, and strategies for successful product commercialization.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the one assignment on each unit

TEXT BOOKS

1. Karl T. Ulrich, Steven D. Eppinger, Product *Design and Development*, 4th Edition, Tata McGraw-Hill Education.

2. Kevin Otto, Kristin Wood, Product Design, Indian Reprint 2015, Pearson Education.

REFERENCE BOOKS

1. Clive L. Dym, Patrick Little, *Engineering Design: A Project-based Introduction*, 3rd Edition, John Wiley & Sons.

2. George E. Dieter, Linda C. Schmidt, Engineering Design, McGraw-Hill International Edition.

3. Yousef Haik, T. M. M. Shahin, Engineering Design Process, 2nd Edition, Cengage Learning.

Semester	Course Code	Course Title
Ш	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

B. Multidisciplinary Minor in "Applied Civil Engineering"



Punyashlok Ahilyadevi Holkar Solapur University, Solapur T. Y. B. Tech. (Civil Engineering) Sem- VI

MDM-04B DISASTER MANAGEMENT AND MITIGATION

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

Course Outcomes:

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

1. Elaborate the basic concepts of various types of disasters.

2. Acquire the skills of managing the various types of disasters

3. Identify the impacts of various types of disasters

4. Identify the disaster Determinants

5. Acquire the skills needed for organizing and effective dissemination of

information during disaster

6. Apply the knowledge of advanced technologies for warning systems in

disaster management

Unit 1: Introduction

Introduction of terminology: Hazard, Risk, Vulnerability, Disaster, Nature, Importance, Dimensions & Scope of Disaster Management. Disaster Management Cycle.

Unit 2: Natural Disasters

Natural Disasters - Meaning and nature of natural disasters, their types and effects.

Hydrological Disasters - Flood, Flash flood, Drought, cloud burst.

Geological Disasters- Earthquakes, Tsunamis, Landslides, Avalanches, Volcanic eruptions, Mudflow

Wind related Disasters- Cyclone, Storm, Storm surge, Tidal waves, Heat and cold Waves. Climatic Change, Global warming, Sea Level rise, Ozone Depletion

Unit 3: Manmade Disasters

Chemical disasters, biological disasters, radiological disasters, nuclear disasters. Fire – building fire, coal fire, forest fire, Oil fire Accidents- road accidents, rail accidents, air accidents, sea accidents, Pollution - air pollution, water pollution, Deforestation, Industrial waste.

(4Hrs)

(6Hrs)

(5Hrs)

Unit 4: Disaster Case studies

Global Case Studies in Disaster Management: Japan's Tohoku Earth Quake 2011 and Nepal Earthquake (2015), China flood 2016 and Thailand floods 2017, Hurricane Katrina (2005), East Africa Drought (2011), Volcanic Eruptions: Case Studies of Italy.

National Case Studies in Disaster Management: Indian Ocean Earthquake (2004) (Tsunami) and Gujarat Earthquake (2001), Drought Management in Gujarat & Rajasthan, Landslides in Shiwalik Hills Case Study.

SECTION-II

Unit 5: Disaster Determinants

Factors affecting damage – types, social status, habitation pattern, physiology and climate. Factors affecting mitigation measures, prediction, preparation, communication, area and accessibility, population, physiology and climate

Unit 6: Importance of Information in Disasters

Methods of collecting relevant information - libraries, internet, interview questionnaires, survey, observation, Mass media, Meetings. Role of Information from disaster affected community, Disaster management Information System, Organizing and effective dissemination of information: feedback for improving information.

Unit 7: Advanced Technologies for Warning System (5Hrs)

Definition of Early Warning System, Community Early Warning System, and Core Components of People centered Early Warning System, Emergency Communication System, Wireless Communication, Bluetooth Wireless Technology, HAM Radio, GPS Application in Emergency Communication, Remote Sensing and GIS Application in Warning System, Cyclone Warning System and Tsunami Warning System

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) submission shall consist of the one assignment on each unit

TEXT BOOKS

- 1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
- 2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
- 3. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

(5Hrs)

(5Hrs)

 Disaster Management, J. P. Singhal, Laxmi Publications Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi

REFERENCE BOOKS

- Natural Hazards and Disaster Management: Vulnerability and Mitigation by R B Singh, Rawat Publications; Reprint edition (1 January 2006)
- Disaster Management and Mitigation by Prof R B Singh, World Focus (1 January 2016)
- DISASTER MITIGATION: EXPERIENCES AND REFLECTIONS by Alka Dhameja and Pardeep Dhameja, Prentice Hall India Learning Private Limited; New title edition (1 January 2001)
- Management and Mitigation of Natural Disasters by Rajan Kumar Sahoo, Regal Publications; 1st edition (1 April 2014), Deep & Deep Publications (30 March 2007)
- 5. Disaster Mitigation and Management: Post-Tsunami Perspectives by Jegadish P Gandhi,
- 6. Disasters: Strengthening Community Mitigation and Preparedness∥ by Khanna B K, New India Publishing Agency (1 January 2011)
- Strengthening Resilience in Post Disaster Situations: Stories, Experience and Lessons from South Asial by IDRC Academic Foundation (1 January 2011)
- Disaster Management at Health Care Settings Comprehensive Assessment and Effective Mitigation by Shreen Gaber, Lulu.com (18 November 2015)