Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus

T.Y. B. Tech (Civil Engineering)

w. e. f. Academic Year 2020-21

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
FACULTY OF SCIENCE & TECHNOLOGY
B. Tech. Civil Engineering

Program Educational Objectives (PEOs)
B. Tech. Civil Engineering

The Program Educational Objectives for B. Tech. Civil Engineering program are designed to produce competent civil engineers who are ready to contribute effectively to the advancement of civil engineering and to fulfill the needs of the community. These objectives are as follows:

PEO1: Practice civil engineering in construction industry, public sector undertaking or as an entrepreneur for successful professional career.

PEO2: Pursue higher education for professional development.

PEO3: Exhibit leadership qualities with demonstrable attributes in lifelong learning to contribute to the societal needs.

Program Outcomes (POs)
B. Tech. Civil Engineering

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

i) **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

ii) **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

iii) **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

iv) **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems:

v) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

vi) **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

vii) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

ix) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

x) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

xi) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

xii) **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

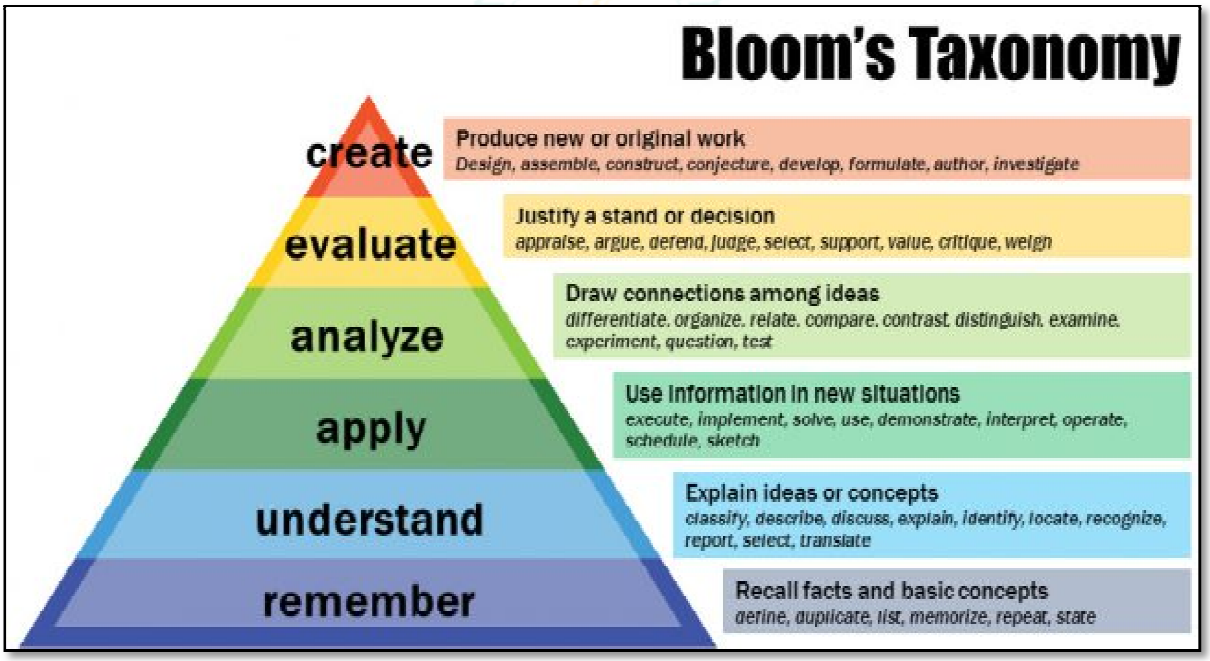
B. Tech. Civil Engineering

1) Graduates will be able to survey, conduct geo-technical investigations, plan, analyze, design, estimate and construct residences, public buildings, industrial buildings, townships and infrastructural projects by adopting appropriate construction methods.

2) Graduates will analyze and design the water resources systems, municipal and industrial waste treatment plants with due consideration to pollution free environment.

3) Graduates will use appropriate application software, develop skills necessary for professional practice as a Civil Engineer and prepare themselves for competitive examinations for higher education & for public service commissions.

BLOOM'S TAXONOMY



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CBCS Curriculum for First Year B. Tech. (All Branches)

W.E.F. 2018-19

1. Semester I : Theory Courses

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
C011/ C012	Engineering Physics / Engineering Chemistry$	3 3			3	70	30		100
C112	Engineering Mathematics I	3			3	70	30		100
C113	Basic Electrical & Electronics Engineering	4			4	70	30		100
C114	Engineering Mechanics	3			3	70	30		100
C115	Basic Mechanical Engineering	3			3	70	30		100
C116	Communication Skills	1			1		25		25
Total		**17**			**17**	**350**	**175**		**525**

- **Semester I : Laboratory / Tutorial Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C112	Engineering Mathematics I		1		1			25	25
C113	Basic Electrical & Electronics Engineering			2	1			25	25
C114	Engineering Mechanics			2	1			25	25
C115	Basic Mechanical Engineering			2	1			25	25
C116	Communication Skills			2	1			25	25
C117	Workshop Practice			2	1			25	25
Total			**1**	**12**	**7**			**175**	**175**
Grand Total		**17**	**1**	**12**	**24**	**350**	**175**	**175**	**700**
C118	Induction Program	*# (Please see note below)*							

- **Semester II : Theory Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C122	Engineering Mathematics II	3			3	70	30		100
C123	Engineering Graphics & Design	3			3	70	30		100
C124	Basic Civil Engineering	3			3	70	30		100
C125	Programming for Problem Solving	2			2		25		25
C126	Professional Communication	1			1		25		25
Total		**15**			**15**	**280**	**170**		**450**
C127	Democracy, Elections and Good Governance					30			30

- **Semester II : Laboratory / Tutorial Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE (POE)	ISE	ICA	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C122	Engineering Mathematics II		1		1			25	25
C123	Engineering Graphics & Design			4	2			50	50
C124	Basic Civil Engineering			2	1			25	25
C125	Programming for Problem Solving			4	2	50#		50	100
C127	Professional Communication			2	1			25	25
Total			1	14	8	50		200	250
Grand Total		**15**	**1**	**14**	**23**	**330**	**170**	**200**	**700**
C128	Democracy, Elections and Good Governance							20	

1. Legends used :

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

Notes:

1. $ - Indicates approximately half of the total students at F.Y B. Tech. will enroll under Group A and remaining will enroll under Group B.
2. 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.
3. 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
4. # - Indicates the subject 'Programming for Problem Solving' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.
5. 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
6. Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions
7. 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 ICA of 20 marks and End Semester Examination (ESE) of 30 marks (as prescribed by university, time to time) 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
8. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C128)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economical, 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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Credit System structure of S. Y. B. Tech. Civil Engineering, Semester- I, (W.E.F. 2019-2020)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme			
		L	T	P	D		ISE	ESE	ICA	Total
CV211	Concrete Technology, Material Testing & Evaluation	3	-	-	-	3	30	70	-	100
CV212	Surveying & Geomatics	3	-	-	-	3	30	70	-	100
CV213	Building Construction & Drawing	2	-	-	-	2	30	70	-	100
CV214	Introduction to Fluid mechanics	3	-	-	-	3	30	70	-	100
CV215	Engineering Geology	**2**	-	-	-	2	30	70	-	100
CV216	Introduction to Solid Mechanics	3	1*	-	-	4	30	70	-	100
CV217	Energy Science & Engineering	1	-	-	-	1	25	-	-	25
	Total	**17**	**1**	_	-	**18**	**205**	**420**	**-**	**625**
	Laboratory/Drawings							**POE** **OE**		
CV211	Concrete Technology, Material Testing & Evaluation	-	-	2	-	1	-	- -	25	25
CV212	Surveying & Geomatics	-	-	2	-	1	-	25 -	25	50
CV213	Building Construction & Drawing	-	-	-	2	1	-	- -	25	25
CV214	Introduction to Fluid mechanics	-	-	2	-	1	-	25 -	25	50
CV215	Engineering Geology	-	-	2	-	1	-	25 -	25	50
CV218	Lab practice	-	-	2	-	1	-	- -	25	25
	Total	**-**	**-**	**10**	**-**	**6**	**-**	**75**	**150**	**225**
	Grand Total	**17**	**1**	**10**	**2**	**24**	**205**	**495**	**150**	**850**
	Environmental Science	**1**	–	–	-	–	–	–	–	–

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

Note:

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

(2) Internal Continuous Assessment (ICA) shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable.

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

(4) *Laboratory tests and experiments included in syllabus of 'Introduction to Solid Mechanics' shall be conducted in laboratory. Just essential number of tutorial hours, be used for this purpose. The remaining tutorial turns shall be used for problem solving in the subject.

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Faculty of Science & Technology

Credit System structure of S. Y. B. Tech. Civil Engineering, Semester – II, (W. E.F. 2019-2020)

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

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

Note:

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

(2) Internal Continuous Assessment (ICA) shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable.

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

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of SCIENCE & TECHNOLOGY

Credit System structure of T. Y. B. Tech. Civil Engineering, Semester- I, (W.E.F. 2020-2021)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CV311	Design of Steel Structures	3	1	-	-	4	30	70		25	125
CV312	Geotechnical Engineering	4	-	-	-	4	30	70		-	100
CV313	Waste water Engineering & Air Pollution	3	-	-	-	3	30	70		-	100
CV314	Highway & Tunnel Engineering	4	-	-	-	4	30	70		-	100
CV315	Hydrology and Water Resources Engineering	3	1	-	-	4	30	70		25	**125**
SL31	Self Learning Module-I (H. S. S.)	-	-	-	-	2	-	50		-	50
	Total	**17**	**2**			**21**	**150**	**400**		**50**	**600**
	Laboratory/Drawings							**POE**	**OE**		
CV312	Geotechnical Engineering	-	-	2	-	1	-	25	-	25	50
CV313	Waste water Engg. & Air Pollution	-	-	2	-	1	-	-	25	25	50
CV314	Highway & Tunnel Engineering	-	-	2	-	1	-		-	25	25
CV317	Planning & Design of Public Buildings	**1**	-	-	2	2	-	50	**-**	25	75
CV318	Mini Project *	-	-	2	-	1	-	-	-	50	50
	Total	**1**	**-**	**8**	**2**	**6**	**-**	**100**		**150**	**250**
	Grand Total	**18**	**2**	**8**	**2**	**27**	**150**	**500**		**200**	**850**

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

*The students shall carry out 'Mini Project' using suitable application software /Carry out suitable Experimental work/ Carry out variety of Civil Engineering Surveys and present a report. The Mini project shall be assessed by the respective guide for ICA.

Note:

1) The batch size for the practical/tutorial is of 15 students. On forming the batches, if the number of remaining students exceeds 7 students, then a new batch be formed.
2) Internal Continuous Assessment (ICA) shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, syllabus, report presentation etc., as applicable.
3) Students shall undergo a field training of 15 days in the winter vacation after T.Y. B. Tech. Civil - Semester- I and submit the field training report, which shall be assessed by faculty associated with 'Principles of Management and Quantitative Techniques' , in T.Y.B. Tech Civil Semester-II.

4) Self-Learning Module- I at T.Y. B. Tech. Civil Engineering, Semester – I:

Curriculum for Humanities and Social Sciences, 'Self Learning Module – I' is common for all under graduate engineering programs.

(A) Student can select & enroll a 'Self Learning Module- I' (HSS) Course from P.A.H Solapur University, Solapur HSS Course List **SL31-(A)** and appear for University examination.

SL31-(A): Self Learning Module – I (HSS)

P. A. H. Solapur University, Solapur: HSS Course List

No	Course title
1	Economics
2	Intellectual Property Rights for Technology Development and Management
3	Introduction to Sociology
4	Stress and Coping
5	Professional Ethics & Human Value

OR

(B) Student can select and enroll for University approved minimum eight weeks NPTEL HSS course **SL31-(B)**, complete its assignments, and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-(B) will be updated from time to time by University authorities. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.

More details about NPTEL are available at http://nptel.ac.in

SL31-(B): Self Learning Module-I (HSS)

University approved NPTEL- HSS course List (SL31-B)

No	Course title	No	Course title
1	Soft skills	15	Management of Inventory Systems
2	Introduction to Modern India Political Thought	16	Economic Growth and Development
3	Intellectual Property	17	Ethic in Engineering Practice
4	Technical English for Engineers	18	Corporate Social Responsibility
5	Developing Soft Skills and Personality	19	Marketing Management –I
6	Educational Leadership	20	Marketing Research and Analysis
7	Microeconomics: Theory & Applications	21	Selected Topics in Decision Modeling
8	Engineering Economics	22	Innovation, Business Models and Entrepreneurship
9	Human Resource Development	23	Simulation of Business Systems: An Applied Approach
10	Project Management for managers	24	Sustainability through Green Manufacturing Systems: An Applied Approach
11	Data Analysis and Decision Making - I	25	Total Quality Management - I
12	E-Business	26	Introduction to Operations Research
13	Working Capital Management	27	Knowledge Management
14	Industrial Safety Engineering		

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Faculty of SCIENCE & TECHNOLOGY

Credit System structure of T. Y. B. Tech. Civil Engineering, Semester – II, (W. E.F. 2020-2021)

Course Code	Theory Course Name	Hrs./week				Credits	Examination Scheme				
		L	T	P	D		ISE	ESE		ICA	Total
CV321	Foundation Engineering	4	-	-	-	4	30	70		-	100
CV322	Hydraulic Structures & Water Power Engg.	3	-	-	-	3	30	70		-	100
CV323	Professional Elective-I	3	-	-	-	3	30	70		-	100
CV324	Design of Concrete Structures-I	4	-	-	-	4	30	70		-	100
CV325	Principles of Management and Quantitative Techniques	3	1	-	-	4	30	70		25	125
CV326 (SL32)	Self Learning Module-II (Technical)	-	-	-	-	2	-	50		-	50
	Total	**17**	**1**	**-**	**-**	**20**	**150**	**400**		**25**	**575**
	Laboratory/Drawings:						-	**POE**	**OE**		
CV321	Foundation Engineering	-	-	2	-	1	-	-	-	25	**25**
CV322	Hydraulic Structures & Water Power Engg.	-	-	2	-	1	-	-	25	25	50
CV323	Professional Elective Course-I	-	-	2	-	1	-	-	-	25	**25**
CV324	Design of Concrete Structures-I	-	-	2		1	-	-	-	25	**25**
CV327	Project on Steel Structures	-	-	-	4	2	-	-	50	50	**100**
CV328	Assessment of field training report	-	-	-	-	1	-	-	-	25	**25**
	Total	**-**	**-**	**8**	**4**	**7**		**75**		**150**	**225**
	Grand Total	**17**	**1**	**8**	**4**	**27**	**150**	**475**		**200**	**825**

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

.**Note:**

1) The batch size for the practical/tutorial is of 15 students. On forming the batches, if the number of remaining students exceeds 7 students, then a new batch be formed.
2) Internal Continuous Assessment (ICA) shall be a continuous process based on the performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, syllabus, report presentation etc., as applicable.
3) Students shall undergo a field training of 15 days in the summer vacation after T.Y.B. Tech Civil Semester-II. The training report shall be assessed in Final Tear B. Tech Civil Semester-I by the concerned project guides.

4) Self-Learning Module II at T.Y. B. Tech. Civil Engineering, Semester- II

(A) Student can select a 'Self Learning Module II' (Technical Course) from Course List **SL32-(A)** and appear for university examination.

P. A. H. Solapur University, Solapur: Technical Course List Course List

SL32- (A): Self Learning Module – II (Technical Courses)

No	Course title
1	Geosynthetics and Reinforced Soil Structures
2	Rural Roads
3	Planning for Sustainable Development
4	TQM and MIS in Civil Engineering
5	Earthquake Resistant Non Engineered Construction

OR

(B) Student can select & enroll for university approved minimum eight week technical course from various NPTEL technical courses, complete its assignments and appear for certificate examination conducted by NPTEL.

BOS Chairman / Coordinator will announce the list of approved NPTEL online courses of minimum eight weeks duration for ‘Self Learning Module-II (Technical)’ on commencement of the Semester-II of respective academic year from the available NPTEL courses through university system and will make available to student through University / institute website.

Professional Elective Courses: Student shall choose any one course of the following

Elective No	Semester	(I) Structural Engineering	(II) Geotechnical Engineering & Transportation Engg	(III) Construction Engineering & Management	(IV) Environmental Engineering &Hydraulics, Hydrology & Water Resources Engineering
Professional Elective-I	**T.Y.B.Tech Civil Semester-II**	(A) Masonry Structures	(D) Structural Geology	(H) Construction Engineering Materials	(K) Ecological Engineering
		(B) Structural Analysis by Matrix Methods	(E) Urban Transportation Planning.	(I) Systems Engineering & Economics	(L) Solid and Hazardous Waste Management
		(C)Structural Dynamics	(F) Pavement Design	(J) Infrastructure Planning and Management	(M) Physico-Chemical Processes for Water and Wastewater Treatment
			(G) Metro Systems and Engineering		(N)Hydraulic modelling
					(O)Urban Hydrology and Hydraulics
					(P) Instrumentation & Sensor Technologies for Civil Engg. Applications
					(Q) Open Channel flow & River Hydraulics

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T.Y. B. Tech Civil – Part I

CV- 311 DESIGN OF STEEL STRUCTURES

.

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

Course Outcomes:

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

1. Select appropriate load combinations for 'Limit State' design of various elements of steel structures for strength and serviceability
2. Analyze and design Tension members, Compression members, flexural members and their connections.
3. Analyze beams and portal frames by plastic analysis approach
4. Analyze and design a Roof truss for given loading conditions.
5. Design Column, Column base for given loading conditions.

SECTION I

Unit 1: Introduction to Design of Steel Structures (4)

Steel as a structural member, Philosophy of limit state design for strength and serviceability, partial safety factor for load and resistance, various design load combinations, various types of standard rolled sections, Types of connections (Flexible, rigid, semi-rigid connection), grades of structural steel available as per relevant IS codes specifications, Classification of cross section such as plastic, compact, semi-compact and slender.

Unit 2: Design of Connections (5)

Bolted Connections, Types of bolts and bolted joints, Failure of bolted joints, Specifications of bolted connections (Pitch, gauge, Edge distance, End distance, Tacking bolts etc), Bearing

type connection, Shear strength of bolts, bearing strength of bolts, Tensile strength of bolts, Tensile strength of plate, Efficiency of bolted connections, design of eccentric bolted subjected to in plane and out of plane loading.

Welded connections, types of welded joints, Design strength of fillet weld, Design strength of butt weld, design of eccentric welded connections subjected to in plane and out of plane loading.

Unit 3: Tension Members **(4)**

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.

Unit 4: Compression Members-Struts **(4)**

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.

Unit 5: Columns **(5)**

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, column splices, design of eccentrically loaded column subjected to uniaxial bending (check for section strength only), design of beam to column connections using bolt / weld.

SECTION II

Unit 6: Introduction to Plastic Analysis for Beams and Portal Frames **(6)**

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 and portal frames.

Unit 7: Beams **(5)**

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 8: Industrial Roof Trusses **(6)**

Various component of an industrial shed, Types of trusses, load calculation and combination, design of purlins, design of members of a truss.

Unit 9: Column Bases **(5)**

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, IS 85, IS: Handbook No. 1 for steel section and steel table is permitted for theory examinations.

Assignments as homework

At least one assignment 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.
3. 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
5. Design of Steel structures by K. S. Sai Ram
6. Design of Steel structures by L. S. Jayagopal and D. Tensing

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, IS800-2007, IS875-1987.
8. Steel Tables SP: 6(1) and SP: 6(6)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

CV- 312 GEOTECHNICAL ENGNEERING

.

Teaching Scheme	**Examination Scheme**
Lectures :- 4Hrs/Week, 4 Credits	**ISE:** 30 Marks
Practical :- 2 Hrs/Week, 1 Credit	**ICA**:-25 Marks
	ESE: 70 Marks
	POE:-25 Marks

Course Outcomes:

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

1. Determine various index properties and strength 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. Assess compaction and consolidation settlement of soil for given loading conditions.
6. Determine earth pressure for earth retaining structure.

SECTION –I

Unit 1: **(09)**

Introduction: - Definition of soil and soil engineering, 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, soil structure and fabric.

Unit 2 : **(10)**

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 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, concept of total, neutral & inter granular stress.

Stress Distribution in Soil: 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.

Unit 3: **(10)**

Shear strength :- Concept of shear, Coulmob'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, Peak and Residual shear strength, 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: **(09)**

Compaction:- Theory of compaction, factors influencing compaction, compacted density. Laboratory Standard and Modified compaction test, Method and measurement of field compaction, field compaction control.

Unit 5: **(10)**

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, consolidation test, determination of coefficient of consolidation, degree of consolidation, relevance of one dimensional consolidation to field condition, time factor

Unit 6: **(10)**

Earth pressure theory:- Concepts, area of application, Earth pressure at rest, active and passive conditions. Rankine'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.

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. Particle size distribution- Mechanical sieve analysis, wet sieve analysis
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 Mcgraw hill company Ltd, New Delhi]
3. Basic and applied Soil Mechanics (Revised Edition) – Gopal Rajan and Rao A.S.R. (New Age, New Delhi. 1998)
4. Soil Mechanics and Foundation Engineering - Dr. K. R. Arora, [Standard Publication]
5. 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, New Delhi]
8. 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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

CV- 313 WASTE WATER ENGINEERING & AIR POLLUTION

.

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

Course Outcomes:

Upon successful completion of course the student will be able to:

1. Plan the layout of sewage collection system, matching with topography of the region and characterization of sewage.
2. Select aerobic or anaerobic wastewater treatment processes and decide their sequence.
3. Design of aerobic and anaerobic wastewater treatment units and disposal of treated wastewater into the streams.
4. Elaborate the novel decentralized wastewater treatment systems.
5. Select appropriate methods of Solid waste Disposal and Management of hazardous waste based on their characteristics.
6. Analyze air pollution and adopt various measures to control air pollution.

SECTION-I

Unit -1: Collection and conveyance of Sewage (08)

Components of wastewater flows, waste water sources and flow rate. Variation in flow rates, Waste water constituents, Characteristics of various types of waste waters, Sewerage system, layout, types of sewers, collection system. Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems, Sewage and sludge pumping, location, capacity and pumping station design.

Unit-2: Unit Operations **(10)**

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

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

Unit -3: Anaerobic treatment and Low cost treatment **(06)**

Fundamentals of anaerobic treatment, sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors.

Low cost waste water treatment methods- Principle of waste stabilization pond, Design and operation of oxidation pond, aerobic and anaerobic lagoons, Oxidation ditch, septic tank, Selection of alternative treatment process flow sheets.

SECTION-II

Unit-4: Disposal of waste water **(08)**

Disposal of waste water stream pollution, Self-purification, DO sag curve, Streeter Phelp's Equation

Emerging Technology for wastewater Treatment- Centralized Sewage Treatment System, objectives of small & decentralized wastewater Treatment system

i. Root zone Technology,
ii. Constructed Wetlands,
iii. Duckweed Ponds,
iv. Fluidized aerobic bed Technology,
v. UASB

Unit -5: Solid Waste Disposal **(06)**

Solid waste management - Solid waste definition, Types, sources, characteristics. Functional outlines- storage, collection, processing techniques, Treatments of solid waste-Composting, Incineration, Pyrolysis and sanitary land filling.

Unit -6: Air Pollution **(07)**

Air Pollution- Definition, Sources and classification of pollutants, Effects. Introduction to meteorological aspects of control of industrial air pollution- Settling Chamber, Bag filter, Cyclone separator, Scrubbers, Electrostatic precipitators. Control of vehicular air pollution. Air quality standards

LABORATORY WORK

INTERNAL CONTINUOUS ASSESSMENT (ICA)

The Internal Continuous Assessment (ICA) work includes practical work to find the characteristics of wastewater and demonstration of Air monitoring equipments and design of sewage treatment plant

Internal Continuous Assessment (ICA) work shall consist of the following:-

(A) List of Experiments (Any Eight)

Analysis of Waste Water,

1. pH Value
2. Total Solids
3. Dissolved Oxygen
4. Biochemical Oxygen Demand
5. Chemical Oxygen Demand
6. Chlorides
7. Oil & Grease
8. Sulphate Content
9. Total Nitrogen
10. Demonstration of High Volume Sampler
11. Demonstration of Auto Exhaust Analyzer.

(B) Design of sewerage system & Treatment system for a small urban area.

(C) Visit to sewage treatment plant

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

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

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

END SEMESTER EXAMINATION (Oral)

Oral examination will be based on the above syllabus.

TEXT BOOKS

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

REFERENCE BOOKS

1. 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
2. Water and waste water Technology - Hammer M.J, Prentice-Hall of India Private ltd.
3. Masters. G.M. Introduction to Environmental Engineering and Science
4. Manual on Municipal Solid Waste Management- Ministry of Urban Development, Govt. of India.

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T.Y. B. Tech Civil – Part I

CV- 314 HIGHWAY & TUNNEL ENGINEERING

.

Teaching Scheme	**Examination Scheme**
Lectures :- 4 Hrs/Week, 4 Credits	**ISE:** 30 Marks
Practical :- 2 Hrs/Week, 1 Credit	**ESE:** 70 Marks
	ICA: 25 Marks

Course Outcomes:

After completion of the course, students will be able to

1. Choose the ideal alignment for highways after thorough understanding of planning and different surveys.
2. Design various geometric elements of highway as per IRC standards.
2. Evaluate the pavement materials through various tests in the laboratory and design the crust thickness of pavements as per IRC standards.
4. Describe the different steps in highway construction and select appropriate drainage system.
5. Determine the highway economic cost by different methods of highway projects and explain highway financing.
6. Select appropriate method of tunnel construction in different types of soils.

SECTION- I

Unit 1: **(10)**

Introduction to Transportation engineering: Modes of transportations, their importance and limitations, the importance of highway transportation.

Highway Development and Planning: Principles of Highway planning, Road development in India, Classification of roads, road network patterns, Planning Surveys. Salient features of road development plan 2021 and present scenario of road development in India

Highway Alignment and Surveys: Requirements, Engineering Surveys.

Unit 2 : **(10)**

Highway Geometric Design: Cross Section elements, carriageways, camber, stopping and overtaking sight distances, Sight distance at uncontrolled intersection Horizontal alignment-

Curves, design of super elevation, extra widening, transition curves, Set back distance and design of vertical curves.

Unit 3: **(9)**

Highway Materials: Properties of sub grade and pavement component materials, Tests on subgrade soils (CBR and Plate load tests), properties and requirements of road aggregates and bituminous materials, bituminous mix design by Marshall Method. Applications of Geosynthetics and Modified Binders in road construction.

SECTION- II

Unit 4: **(8)**

Pavement Design: Types of pavements, Design parameters, Axle and Wheel load, tyre pressure, ESWL concept, EWL factors, 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, Design of Rigid Pavement as per IRC-58-2015.

Unit 5: **(6)**

Highway Construction and Maintenance: Specifications, construction steps and quality control tests for Granular sub base course, Water Bound Macadam, Wet Mix macadam, bituminous concrete pavement, Cement Concrete pavement.

Unit 6: **(5)**

Highway Maintenance: Pavement failures (flexible and rigid), causes and remedies, Pavement evaluation, Functional and Structural evaluation.

Highway drainage: Surface and sub-surface drainage.

Unit 7: **(5)**

Highway Economics and Financing: Highway user benefits – VOC using charts only – Highway costs – Economic analysis by annual cost method and benefit cost ratio methods. Highway financing – BOT, DBFOT, BOOT and Hybrid Annuity concepts.

Unit 8: **(5)**

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)

Name of Tests:-

Test on Aggregates

1. Impact test on aggregate
2. Abrasion Test on aggregate
3. Crushing strength test on aggregate
4. Soundness test on aggregate
5. Shape test on aggregate

Test on Soil

1. CBR test on soil
2. Compaction test on soil

Test on Bitumen

1. Penetration test on bitumen
2. Ductility test on bitumen
3. Softening Point test on bitumen
4. Specific gravity test on bitumen 8.
5. Flash and Fire point test on bitumen
6. Viscosity Test on Bitumen.

Functional Evaluation of Pavement

1. Demonstration of Benkelman Beam Deflection Survey
2. Demonstration of road roughness survey by MERLIN and Bump Integrator

From the above tests, Minimum 10 Tests have to be performed and assignments on each unit based on syllabus.

Field visits to highway construction site, Hot Mix Plants, Pug Mill plants, RMC plants and quarry and crusher units

TEXT BOOKS

1. Highway Engineering By C.E.G.Justo, A. Veeraragavan& S.K.Khanna., *Nemchand Bros.*
2. Harbour, Dock and Tunnel engineering By R. Shrinivasan, *Charotar Publishing House.*
3. Transportation Engineering By Subramanian. K.P Scitech Publications, Chennai.
4. Principles of Transportation and Highway Engineering By Rao, G.V., McGraw – Hill Publishing Company Limited, New Delhi.
5. Highway Engineering, Kadiyali L.R, Khanna Publishers, New Delhi

REFERENCE BOOKS

1. Principles of Transportation Engineering, Partha Chakroborty and Animesh Das, PHI Publication.
2. Transportation Engineering – An Introduction, Khistry, C.J., PHI Publication.
3. Specifications of Road and Bridge Works (MoRTH) Publication – 5th Revision. New Delhi.
4. IRC: 37-2018, IRC: 58-2015 and other relevant IRC codes

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

CV- 315 HYDROLOGY AND WATER RESOURCES ENGINEERING

.

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

Course Outcomes:

At the end of this course, the 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 (7)

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

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

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

Unit 2: Rainfall – runoff Relationship (6)

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

Unit 3: Stream gauging (5)

Selection of a site, various methods of discharge measurements, Area velocity method, Slope Area method, S.W.F. and other modern methods.

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

Unit 4: Ground-water Hydrology (5)

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 5:Water Resources Development in India and Maharashtra (6)

Water Resources Development in India & Maharashtra: National water policy of India, Water Policy of Maharashtra State, Development of irrigation potential through five year plans, Water resources potential of India, Water Resources development in India, Problems in water resources developments in country and Maharashtra state.

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

Unit 6: Irrigation **(6)**

a. Irrigation: Definition and necessity of Irrigation, Different systems of irrigation-Flow, Lift, Inundation, Storage.
b. 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.
c. Lift Irrigation: Necessity, General Layout, Main Components of a lift irrigation scheme, Elementary design of Lift Irrigation Scheme.
d. Minor Irrigation System: Necessity and general layout of percolation tanks, Bandhara irrigation, Kolhapur type weirs.

Unit 7: Soil and Crop Water requirements **(5)**

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 water required.

Unit 8: Water Management **(5)**

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

INTERNAL CONTINUOUS ASSESSMENT (ICA)

Internal Continuous Assessment (ICA) shall consist of minimum six assignments based on 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.
6. Water Management, Conservation, Harvesting and Artificial Recharge- Dr. A. S. Patel, Dr. D. L. Shah, New Age International Publishers.
7. Hydrology and Water Resources-R. K. Sharma, Dhanpat Rai & Sons.
8. Fundamentals of Irrigation Engineering-Bharat Sing, Nem Chand & Bros, Roorkee.
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. Irrigation Structures- Milos Holy-CBIP
3. Water Management-Jaspal Singh, M. S. Acharya , Arun Sharma .Pub- Himanshu Publication
4. Design of Minor Irrigation and Canal Structure- Satyanarayan and R. Murthy

WEBSITES

1. Ministry of Jal Shakti, Department of Water Resources, River Development and Ganga Rejuvenation: http://mowr.gov.in/policies-guideline/policies/national-water-policy
2. Maharashtra water resources regulatory authority: https://mwrra.org/
3. National Remote Sensing Center: https://www.nrsc.gov.in/
4. National Water Development Agency: http://nwda.gov.in

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech. Civil – Part I

SL- 31 SELF LEARNING - H.S.S. COURSE

. (Self Learning- H.S.S. course, common for all the branches of Engineering and Technology)

Teaching Scheme | **Examination Scheme**

Credits :- 2 Credits | **ESE:** 50 Marks

‘Self-Learning Module- I’ at T.Y. B. Tech. Civil Engineering, Semester – I

- Curriculum for Humanities and Social Sciences, ‘Self Learning Module – I’ is common for all under graduate engineering programs.

- Student can select & enroll a ‘Self Learning Module- I’ Course from P.A.H Solapur University, Solapur HSS Course List (SL31-A) and appear for university examination.

SL31-(A): Self Learning Module – I (HSS)

P. A. H. Solapur University, Solapur: HSS Course List

No	Course title
1	Economics
2	Intellectual Property Rights for Technology Development and Management
3	Introduction to Sociology
4	Stress and Coping
5	Professional Ethics & Human Value

OR

Student can select and enroll for university approved minimum eight weeks NPTEL HSS course SL31-(B), complete its assignments and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-(B) will be updated from time to time by University authorities. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.

SL31-(B): Self Learning Module-I (HSS)

University approved NPTEL- HSS course List (SL31-B)

No	Course title	No	Course title
1	Soft skills	15	Management of Inventory Systems
2	Introduction to Modern India Political Thought	16	Economic Growth and Development
3	Intellectual Property	17	Ethic in Engineering Practice
4	Technical English for Engineers	18	Corporate Social Responsibility
5	Developing Soft Skills and Personality	19	Marketing Management –I
6	Educational Leadership	20	Marketing Research and Analysis
7	Microeconomics: Theory & Applications	21	Selected Topics in Decision Modeling
8	Engineering Economics	22	Innovation, Business Models and Entrepreneurship
9	Human Resource Development	23	Simulation of Business Systems: An Applied Approach
10	Project Management for managers	24	Sustainability through Green Manufacturing Systems: An Applied Approach
11	Data Analysis and Decision Making-II	25	Total Quality Management - I
12	E-Business	26	Introduction to Operations Research
13	Working Capital Management	27	Knowledge Management
14	Industrial Safety Engineering		

More details about NPTEL are available at http://nptel.ac.in

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech. Civil – Part I

SL- 31 SELF LEARNING - H.S.S. COURSE

SL-31-A(1) ECONOMICS

.

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Objectives:

1. To explain various theories of economics such as Demand supply, production and cost
2. To acquaint students with microeconomics
3. To describe Inflation with their causes, consequence and remedies
4. To acquaint students with International Trade, foreign exchange

Course Outcomes:

Upon completion of this course, students will be able to

1. Identify the Basic Economic problems, Resource Constraints
2. Apply various theories of economics for economic growth
3. Identify causes of Inflation consequence and remedies
4. To assess the impact of International Trade, foreign exchange on Indian economy

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Unit 1: Introduction

History of Economic thought, Basic Economic problems, Resource Constraints and Welfare maximization,

Nature of Economics: Positive and Normative Economics, Micro and Macro Economics, Basic concepts in Economics, The role of State in economic activity, Market and Government failures, New economic Policy in India.

Unit 2: Theories of Economics

Theory of utility and consumer's choice, Theories of Demand, supply and market equilibrium, Theories of firm, production and costs, Market structures, Perfect and imperfect competitions, oligopoly, monopoly.

Unit 3: Macroeconomics

An overview of Macroeconomics, measurement and determination of national income, Consumption, saving and investment.

Unit 4: Banking & Inflation.

Commercial and Central Banking, Relationship between money, output and prices. Inflation causes, consequences and remedies.

Unit 5: International Influences on Economics

International Trade, foreign exchange and balance payments, stabilization policies, Monetary, Fiscal and exchange rate policies.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Economics: P.A. Samuelson & W.D Nordhaus (McGraw Hill, New York, 1995.)
2. Modern Microeconomics : A. Koutsoyiannis (Macmillan,1975)

REFERENCE BOOKS

1. Microeconomics: R. Pindyck and D.L. Rubinfield. (Macmillan New York, 1989
2. Microeconomics: Gordon, 4th edition, Little Brown & Co., Boston,1987.
3. The Organization of Industry: William F. Shughart II, Richard D. Irwin, Illinois, 1990.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech. Civil – Part I

SL-31 SELF LEARNING- H.S.S. COURSE

SL-31-A (2) INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY DEVELOPMENT AND MANAGEMENT

.

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

1. Appreciate the intellectual property rights coming out of research and intellectual works
2. Demonstrate their knowledge about the process of acquiring the patents and copyrights for the innovative works.
3. Elaborate the role of Indian IPR system and role of WTO in protecting Intellectual Property Rights
4. Avoid the plagiarism in their thesis, research papers etc. which can be questioned legally.

Unit 1:

Dynamics of Knowledge evolution, creation of ownership domains in the knowledge space using various instruments of IPR

Unit 2:

Outlines concepts of confidentiality and information security, explores their role in technology development and transfer integrating Intellectual Property in project planning, execution & commercialization,

Unit 3:

Discussion on the shifting paradigms of R&D and their linkage to IPR, Introduction to concepts of Valuation of IP & Value Realization,

Unit 4:

Comparison the Indian IPR system with international IPR frameworks especially in the context of WTO, followed by a few sessions on IPR litigations both for the enforcement of rights and business strategy.

Unit 5:

Discussion on contentious issues of current interest such as Biotechnology and Intellectual Property, Protection of Traditional Knowledge, IPR and Electronic Commerce, TRIPS and Access to Medicines, Copyright issues in creative works, etc.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Prabuddha Ganguli: Intellectual Property Rights Unleashing the Knowledge Economy. Tata McGraw Hill, New Delhi, 2001.
2. Prabuddha Ganguli: Gearing Up for Patents The Indian Scenario. Universities Press India Ltd., Hyderabad, 1998.
3. P. Narayan: Patent Law. Eastern Law Co., Calcutta.

REFERENCE BOOKS

1. Global Dimensions of Intellectual Property Rights in Science and Technology, Author: National Research Council , National Academies Press, 1993.
2. Technology Transfer: Intellectual Property Rights, C Sri Krishna, ICFAI University press (2008)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech. Civil – Part I

SL-31 SELF LEARNING- H.S.S. COURSE

SL-31-A(3) INTRODUCTION TO SOCIOLOGY

.

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

1. Interpret the effect of various social phenomena on sociology
2. Elaborate the role of urbanization on the society
3. Appreciate the need of social institutions for better society.
4. Assess the role of modernization, industrialization, environmental/ecological changes in the development of society.

Unit 1:

What is sociology, some sociological concepts: social structure, status, role, norms, values etc., Socialization, and culture and change.

Social stratification - various approaches and concept of social mobility.

Unit 2:

Population and society - Trends of demographic change in India and the world, Human Ecology, Trends of Urbanization in the developing countries and the world.

Unit 3:

Major social institutions - Family and marriage, caste and tribe and organizations:

i. Formal organization (bureaucracy)
ii. Informal Organization

Unit 4:

Processes of social change- Modernization (including Sanskritization), industrialization, environmental/ecological changes and development.

Unit 5:

Social movements - protest movements, reformist movement and radical movements in India.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Sociology, L. Broom, P. Selznick and D. Dorrock, 11th Edn. 1990 (Harper International).
2. Sociology: Themes and Perspectives, M. Haralambos, Oxford University Press, 1980.
3. General Introduction to Sociology, Guy Rocher, A. , MacMillan, 1982.

REFERENCE BOOKS

1. Social movements in India, vols. 1-2, 1984, M.S.A. Rao, Manohar Publications.
2. Society in India, David Mandelbaum, 1990, Popular Publications.
3. Social change in modern India, M.N. Srinivas, 1991, Orient Longman Publications.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech. Civil – Part I

SL-31 SELF LEARNING- H.S.S. COURSE

SL-31-A(4) STRESS AND COPING

.

Teaching Scheme	**Examination Scheme**
Credits :- 1 Credit	**ESE:** 50 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

1. Identify various sources and nature of a stress.
2. Elaborate the effects of medical, psychological and behavioral stress.
3. Provide social support to mitigate the stress.
4. Adopt various stress management techniques.

Unit 1:

Concept of stress-current and historical status. The nature of the stress response.

Unit 2:

Common sources of stress biological, personality and environmental.

Unit 3:

Coping styles defensive behaviors and problem-solving. Consequences of stress - medical, psychological and behavioral.

Unit 4:

The role of social support in mitigating stress.

Unit 5:

Stress management techniques-relaxation, meditation, cognitive restructuring, self-control, bio- feedback and time management, Preparing stress profile of a student.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Walt, S. "Stress Management for Wellness". Harcourt Brace & Jovanovich, N.York, 1994.
2. D. Girdano and G. Everly., "Controlling Stress and Tension", Prentice-Hall, 1986.
3. Monat and R. Lazarus, "Stress and Coping: An Anthology", Columbia Univ. Press, 1985.

REFERENCE BOOKS

1. Weisman, "The Coping Capacity", Human Services Press, 1984.
2. Stress and Coping: The Indian Experience, D.M. Pestonjee, SAGE India; Second edition (1998)

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T.Y. B. Tech. Civil – Part I

SL- 31 SELF LEARNING- H.S.S. COURSE

SL-31-A (5) PROFESSIONAL ETHICS & HUMAN VALUES

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

Upon completion of this course, students will be able to,

1. Inculcate the human values in their behavior.
2. Demonstrate the Engineering ethics in their professional practice.
3. Practice the safety and responsibility and professional rights in their professional practice.
4. Incorporate the code of ethics of Global organizations such as ASME, ASCE, and IEEE

Unit 1: Human Values

Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for others, Living Peacefully, Caring, sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character, spirituality

Unit 2: Engineering Ethics

Senses of engineering ethics, Variety of Moral Issues, Types of inquiry, Moral Dilemmas Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self Interest , Customs and Religion.

Unit 3: Safety, Responsibilities and Rights

Safety and Risk, Assessment of safety and Risk, Risk Benefit Analysis and Reducing Risk, The Three Mile Island and Chernobyl Case Studies.

Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Whistle Blowing, Professional Rights – Employee Rights, Intellectual Property Rights (IPR) – Discrimination

Unit 4: Global Issues

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
2. Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
3. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006

REFERENCE BOOKS

1. Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
2. Wuest, D.E.: Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

T.Y. B. Tech Civil – Part I

CV- 317 PLANNING & DESIGN OF PUBLIC BUILDING

.

Teaching Scheme	**Examination Scheme**
Lectures :- 1Hr/Week, 1 Credit	**POE:** 50 Marks
Drawing :- 2 Hrs/Week, 1 Credit	**ICA:** 25 Marks

Course Outcomes:

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

1. Plan and design a public building according to requirements adhering to appropriate norms and standards.
2. Prepare "Municipal drawing" for public buildings for obtaining building permission from competent authority.
3. Prepare the building drawings by using suitable 'Computer Aided Drawing and Design' application software.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A. Preparation of drawings for any one public building by using AutoCAD

1) Permission Drawing
2) Furniture layout
3) Water supply and Drainage layout along with electrification layout
4) Perspective drawing of the building.

B. Line plan of any two public buildings by using AUTOCAD

C. Report on building project under (A) above.

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

END SEMESTER EXAMINATION (Practical - oral)

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

TEXT BOOKS

1. Building Construction: Arora and Bindra, Dhanpat Rai Publications
2. Building Design and Drawing – Y. S. Sane, Allies Book Stall
3. Principles of Perspective drawing- Shah, Kale, Patki, Tata McGraw Hill Publication Ltd, Delhi
4. Building Construction by Sushil Kumar, Standard Publishers Distributors, Delhi
5. Interior Design- Principles and Practice- M. Pratap Rao, Standard Publishers and Dist.,Delhi
6. Building Planning and Design by Kumar Swami and Kameshwar Rao, Charotar Publishing House.
7. Civil Engg. Drawing- by M. Chakraborty, Published by M. Chakraborty – Kolkata
8. Civil Engineering Drawing – by R.S.Malik, G.S.Meo, Computech Publication Ltd New Asian.
9. AutoCad software

REFERENCE BOOKS:

1. Building Construction by Mckay, W. B. & Mckay, J. M. ,Vol.III and IV, Donhead Publishing Limited
2. Modern Building Construction by Warland D. E., Vol. I and II, Pitman Publishing
3. Building Drawing – Shah, Kale, Patki, Tata McGraw-Hill Education
4. Built Environment by Shah, Kale, Patki, Tata McGraw-Hill Education
5. Construction science – by Edwin Walker, Selwyn Morgan, Hutchinson Educational
6. Time savers standards for buildings – Calendar Pub. McGraw Hill
7. Alternative Building Materials & Technology-by Jagdish ,Reddy, Rao Published by New Age International, New Delhi
8. Nuclear Reactor Materials by C. Smith, Addison- Wesley Pub.

9. Art in everyday life by Goldstein, Oxford Pub.
10. Planning by E and OE – Pub. London Illiffe and Sons Ltd.
11. Inside Outside- Magazine issues.
12. Maintenance of Building- by A.C. Panchdhari, Published by New Age International, New Delhi.
13. Materials for Nuclear Power Reactors- by Hausner, Henry H. And Roboff, Stanley B., Reinhold Publishing Corp
14. Environment and services-by Peter Burberry, Mitchells Building Series
15. Development Control Rules- Building Byelaws of Local Authority.

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T.Y. B. Tech Civil – Part I

CV- 318 MINI PROJECT

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Teaching Scheme	**Examination Scheme**
Practical :- 2 Hrs/Week, 1 Credit	**ICA:** 50 Marks

Student/s shall carry out 'Mini Project' in any one of the following subjects: Structural Engineering, Geotechnical Engineering, Environmental Engineering, or Engineering Management, by preferably employing relevant application software.

The project shall consist of Civil Engineering Prototype design, Working models, Laboratory experiments, Process modification/development, Simulation, Software development, Data analysis, Survey etc.

The student is required to submit a 'Project Report' based on the work. The Mini project shall be assessed by the domain subject teachers for ICA.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech Civil – Part II

CV- 321 FOUNDATION ENGINEERING

.

Teaching Scheme	**Examination Scheme**
Lectures :- 4 Hrs/Week, 4 Credits	**ISE:** 30 Marks
Practical :- 2 Hrs/Week, 1 Credit	**ESE:** 70 Marks
	ICA: 25 Marks

Course Outcomes

By the end of this course, the student should be able to:

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

SECTION –I

Unit 1: **(08)**

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: **(12)**

Bearing Capacity Analysis: Bearing capacity – Ultimate, safe and allowable. Modes of failure, Terzaghi's bearing capacity equation with derivation, I S code method of bearing capacity (IS 6403 -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 limitations.

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

Unit 3: Foundation Construction in Difficult Soil (09)

Guide lines 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.

Geotextiles and its applications: - Geotextiles- Definition and Types, Functions of Geotextiles, Different applications in Civil Engineering (Roads, Railways, Embankments, Earth Retainment, Erosion control etc)

SECTION –II

Unit 4: (06)

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

Unit 5: Deep foundations:- (10)

Pile foundation: Classification, Single pile capacity for RCC cast in situ pile in Cohesive, Non cohesive and mixed soils by Static method, Dynamic formulae, 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

Unit 6:- (08)

Cofferdams: Various Types, Cell fill material, Stability of cellular cofferdam.

Sheet Piles: Classifications, Design of cantilever sheet pile in cohesion less (approximate method) and cohesive soils. Design of anchored sheet pile by free earth support method

Unit 7: **(06)**

Slope Stability:- 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 No and it's use.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

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

A) Field tests:-

1. Standard penetration test
2. Plate Load test

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

C) Laboratory work:-

1. Swelling pressure test
2. Vane shear test

D) Assignments consisting design problems on:-

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

TEXT BOOKS

1. 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)
3. Principals of Foundation Engineering – Braja M. Das (Cengage Learning India Pvt. Ltd, New Delhi)
4. Geotechnical Engineering - C. Venkatachalam (New Age International (I) Ltd, New Delhi)
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. SP36-1 Compendium of Indian Standards on Soil Engineering Part 1
9. SP36-2 Compendium of Indian Standards on Soil Engineering Part 2
10. Design of sub structure- Swami Saran (Oxford and IBH Publications)

REFERENCE BOOKS

1. Foundation analysis and design- Bowles J. E. (Tata McGraw hill 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 – Part II

CV- 322 HYDRAULIC STRUCTURES AND WATER POWER ENGINEERING

.

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

Course Outcomes:

After studying this subject the students will be able to

1. Plan and design the reservoirs depending upon the water resources potential.
2. Analyze and design Gravity dams and Earth dams (Simple Designs).
3. Elaborate the design principles of Arch dams.
4. Carry out Hydraulic Design of spillways
5. Select appropriate method of river training depending upon river characteristics
6. Estimate water power potential at a site.

SECTION – I

Unit 1: Dams and Reservoir Planning **(5)**

Dams – Necessity, types of dams, selection of site for dams, selection of type of dam, Introduction to dam instrumentation

Planning of Reservoirs: Storage calculations, Control levels, silting of reservoirs, reservoir sedimentation surveys, reservoir losses. Use of remote sensing for reservoir sedimentation surveys.

Unit 2: Gravity and Arch Dams **(8)**

Gravity Dams - Forces acting on dam, design criteria, theoretical and practical profile, high and low dam, stability calculations, materials and methods of Construction, Galleries, joints, Dam Instrumentation, Computer Application for Design of Dam. Decommissioning of dams

Arch Dams – Types, Layout of Constant angle and Constant radius arch dam, Forces acting on arch dams.

Unit 3:Earth Dams **(5)**

Earth Dams: Components and their functions, Design Criterions; Seepage through and below earth dam, Application of Slip circle method, Inverted Filters, Downstream Drainage, relief wells, Construction of earth dam.

Unit 4: Spillways and Outlets through Dams **(5)**

Spillways: Necessity and different types , factors affecting choice and type of spillway, elementary hydraulic design, jump height and tail water rating curve, energy dissipation below spillway, gates for spillway. Spillway operations for different discharge values.

Outlets through Dams: types and energy dissipation in outlets transition

SECTION – II

Unit 5: Weirs on Permeable Foundations: **(6)**

Weirs on Permeable Foundations: Theories of seepage, Bligh's creep theory, Khosla's theory exit gradient, Piping and undercutting, Concept of flow net etc. Kolhapur type weirs- working principles, suitability and construction.

Unit 6: Canals and Canal Structures **(6)**

Canals: Types, Alignment, Design – Kennedy's and Lacey's Silt theories, Canal losses, Typical canal sections, canal lining – Necessity and types, Economics of canal lining.

Canal Structures (Introduction): Cross drainage works and canal regulatory works - Aqueduct, Culvert, Super passage, Level Crossing, Cross and Head regulator, Canal Siphon, Canal Escape, canal fall, canal outlets.

Unit 7: River Training Works ad Water logging **(5)**

River and River Training Works: Types of rivers, Meandering phenomenon, Types of river training works, river navigation.

Water Logging and Drainage: Causes, effects, preventive and curative measures, alkaline soils, soil efflorescence, drainage arrangements.

Unit 8: Hydropower Engineering **(5)**

Elements of Hydropower Engineering: Power crisis and competing uses of water, need of harnessing solar energy. Types of water power plants, small hydropower plants, layout and components of each type, Intakes, Conveyance system, Surge tanks, Power house types, components and layout, tail race. Managing power demand using various sources of power.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

A) Minimum seven assignments from the following:

1. Determination of height of dam: Reservoir capacity calculations based on demand and Supply, fixing control levels of dam for completed project or ongoing project.
2. Design of gravity dam: Elementary and practical profile with stability calculations
3. Earth dam
    a. Design- Determination of section – slip circle calculations.
    b. Filters and Drainage arrangements.
4. Spillway: Geometrical section, Design of spillway; Energy dissipation arrangements and gates.
5. Arch dam layout of constant angle and constant radius
6. Drawing sheet: Outlets through earth dam. Masonry dam, layout.
7. Drawing sheet: Typical plan and section of Kolhapur type barrage.
8. A typical layout of Hydropower plant and its functioning. Calculating reservoir capacity for hydropower plant
9. Design of any one Canal Structure / Cross Drainage Works

B) Report based on Field visits to Irrigation and Water Power Engineering Projects

END SEMESTER EXAMINATION - ORAL EXAMINATION

Oral Examination will be based on the ICA.

TEXT BOOKS:

1. Irrigation Engineering – S. K. Garg , Khanna Pub. Delhi
2. Irrigation and Water Power Engineering - Priyani , Charoter pub. House, Anand
3. Irrigation and Water Power Engineering – Punmia, B. C.
4. Irrigation – Bharat Singh, NEW CHAND & bros. Roorkee
5. Irrigation Engineering Vol. I – Varshhey and Gupta
6. Engineering Hydrology - K. Subramanya
7. Design of Canals – Circular of Government of Maharashtra, 18 February 1995
8. Irrigation Water Power & Water Resource Engineering, Arora, Standard Publishers

REFERENCE BOOKS:

1. Design of Small Dam – U. S. B. R., OXFORD & IBH pub.co.
2. Engineering for Dam Vol. I, II, III – Justinn, Creager and Hinds
3. Design of Hydraulic Structures Vol. I & II – Leliavsky
4. River Behaviour, Management and Training - CBIP Publication

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech Civil – Part II

CV- 323 PROFESSIONAL ELECTIVE-I
323 (A) MASONRY STRUCTURES

.

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

Course Outcomes:

After studying this course, students will be able to:

1. Select various types of masonry units based on their properties.
2. Classify defects and crack in masonry and suggest remedial measures.
3. Apply various formulae for finding compressive strength of masonry units.
4. Determine permissible stresses and design criteria as per IS: 1905 and SP-20.
5. Design different types of masonry walls for different load considerations.

SECTION I

Unit 1: Masonry Units, Materials, types and masonry construction (10)

a) Bricks, Stone and Block masonry units- strength, modulus of elasticity and water absorption of masonry materials – classification and properties o f mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks.

b) Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

Unit 2: Permissible stresses (5)

Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses.

Unit 3: Design Considerations **(7)**

Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars. Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.

SECTION – II

Unit 4: Design of walls subjected to concentrated axial loads **(8)**

Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings.

Unit 5: Design of walls subjected to eccentric loads **(7)**

Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.

Unit 6: Design of laterally and transversely loaded walls **(7)**

Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls. Introduction to reinforced brick masonry, lintels and slabs. In-filled frames: Types – modes of failures – design criteria of masonry retaining walls.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. Henry, A.W., “Structural Masonry”, Macmillan Education Ltd., 1990.
2. Dayaratnam P, “Brick and Reinforced Brick Structures”, Oxford & IBH, 1987.
3. M. L. Gambhir, “Building and Construction Materials”, Mc Graw Hill education Pvt. Ltd.

REFERENCE BOOKS

1. IS 1905–1987 “Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi.
2. SP 20 (S&T) – 1991, “Hand book on masonry design and construction (1st revision) BIS, New Delhi.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech Civil – Part II

CV- 323 PROFESSIONAL ELECTIVE-I
323(B) STRUCTURAL ANALYSIS BY MATRIX METHODS

.

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

Course Outcomes:

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

1. Describe the concepts of flexibility and stiffness method of analysis for simple problems.
2. Analyze continuous beams, rigid frames and trusses by using element flexibility method.
3. Analyze continuous beams, rigid frames and trusses by using element stiffness method.
4. Analyze continuous beams, trusses by direct stiffness method.
5. Evaluate secondary stresses.

SECTION –I

Unit 1: **(08)**

Introduction: Structural systems, geometric and material non-linearity, principle of superposition, equilibrium and compatibility conditions, static and kinematic indeterminacy, principle of minimum potential energy and minimum complementary energy, concepts of stiffness and flexibility, flexibility and stiffness matrices of beam and truss elements.

Unit 2: **(08)**

Element Flexibility Method: Force transformation matrix, global flexibility matrix, analysis of continuous beams, rigid frames and trusses.

Unit 3: **(07)**

Element Stiffness Method: Displacement transformation matrix, global stiffness matrix, analysis of continuous beams, rigid frames and trusses.

SECTION –II

Unit 4: **(06)**

Effects of Temperature Changes and Lack of Fit: Related numerical problems by flexibility and stiffness method as in Unit 2 and Unit 3.

Unit 5: **(09)**

Direct Stiffness Method Beams: Local and global coordinates systems, global stiffness matrices of beam, analysis of continuous beams

Unit 6: **(08)**

Direct Stiffness Method Trusses: Local and global coordinates systems, global stiffness matrices of truss element. Analysis of trusses

INTERNAL CONTINUOUS ASSESSMENT (ICA)

ICA shall consist of

1. At least one assignment on each unit.
2. Answers of few of the assignment problem shall be checked with the application software.

TEXT BOOKS

1. Weaver W. and Gere J. H., "Matrix Analysis of Framed Structures", CBS publications, New Delhi.
2. Rajasekaran S., "Computational Structural Mechanics", PHI, New Delhi.
3. Madhujit Mukhopadhay and Abdul Hamid Sheikh, "Matrix and Finite Element Analysis of Structures", Ane Books Pvt. Ltd.

REFERENCE BOOKS

1. Godbole P. N. et.al, “Matrix Method of Structural Analysis”, PHI ltd, New Delhi.
2. Pundit and Gupta, “Theory of Structures Vol II”, TMH publications, New Delhi
3. A K Jain, “Advanced Structural Analysis”, Nemchand Publications, Roorkee.
4. Manikaselvam, “Elements of Matrix Analysis and Stability of Structures”, Khanna Publishers, New Delhi.
5. H. C. Martin, “Introduction to Matrix Methods in Structural Analysis”, International textbook company, McGraw Hill.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
T.Y. B. Tech Civil – Part II

CV- 323 PROFESSIONAL ELECTIVE-I
323(C) STRUCTURAL DYNAMICS

.

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

Course Outcomes:

At the conclusion of this course, the students will be able to:

1. Develop mathematical models for engineering structures using knowledge of structural Dynamics
2. Apply different theories for vibration study of structures.
3. Interpret dynamic analysis results for design, analysis and research purposes
4. Apply structural dynamics theory to earthquake analysis and design of structures.

SECTION – I

Unit 1: SDOF Systems Subjected to General Dynamic Loading (8)

Duhamel's integral, Application to simple loading cases, numerical evaluation of response integral, Piece wise exact method.

Unit 2: Free Vibration Analysis of MDOF systems - I (8)

MDOF systems , selection of DOFs , formulation of equations of motion , Stiffness matrices, Static condensation, Free Vibration as Eigen Value problem, Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes. Orthogonality conditions.

Unit 3: Free Vibration Analysis of MDOF systems – II (7)

Modal analysis method for free vibration analysis, modal combination rules, systems with and without damping, proportional damping.

SECTION – II

Unit 4: Forced Vibration Analysis of MDOF systems **(6)**

Governing equations, modal analysis, numerical evaluation of modal equations by mode combinations.

Unit 5: Distributed- Parameter Systems **(10)**

Partial differential equations of motion, Free and forced Vibration, Application to beams in flexure

Unit 6: Energy Methods **(6)**

Rayleigh method for Discrete and continuous systems, Fundamental mode analysis.

Internal Continuous Assessment (ICA)

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

REFERENCES BOOK:

1. Dynamics of Structures –A.K. Chopra, Dhanapat Rai & sons, New Delhi
2. Structural Dynamics - Mario Paz, CBS Publication
3. Dynamics of Structures – R. M. Clough and Penzian, McGraw Hill Co., New Delhi

TEXT BOOKS:

1. Mechanical Vibrations – G. R. Grover, Roorkee University, Roorkee.
2. Dynamics of Structures- Patrick Paultre, Wiley India Pvt. Ltd, New Delhi

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (D) STRUCTURAL GEOLOGY

.

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

Course Outcomes:

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

1. Explain the geometry and type of geological structures present in earth.
2. Describe the features formed in rocks when subjected to stress.
3. Elaborate the impact of structural geology to active tectonic settings
4. Depict the micro and macro scale deformation mechanisms (viz., brittle, ductile).
5. Interpret models used in structural geology to demonstrate poly-phase deformations

SECTION –I

Unit 1: **(8)**

Concept of rock deformation & tectonics, Elementary ideas of types of deformation (Tension, compression and shear stresses). Micro and macro scale deformation

Unit 2: **(8)**

Introduction to structural Geology; Elementary ideas of bed, Dip and strike, Contours and Outcrops. Width of outcrop, In-lier and outlier, Lineation and foliation

Unit 3: **(5)**

Introduction to Topographic and Geological maps; Use of Clinometer and Brunton Compass

SECTION –II

Unit 4: **(6)**

Folds: Definition, Nomenclature and types of Folds: anticline, syncline, symmetrical, asymmetrical, isoclinal, Open, Close, Box, overturned and recumbent. Criteria for their recognition in the field

Unit 5: **(6)**

Faults: Definition, nomenclature, Types of faults: Normal, reverse, horst, graben and strike slip. Recognition of fault in the field, effects on outcrops

Unit 6: **(5)**

Joints: Definition, classification (Geometric and genetic); Significance of Joints.

Unit 7: **(5)**

Unconformity: Definition and types; Significance of unconformities, recognition in the field

INTERNAL CONTINIUOS ASSESSMENT (ICA)

The ICA shall consists minimum seven assignment based on above topics along with following practicals.

PRACTICALS

I. Identification of strike and dip, folds, faults, unconformity and joints from block models, Preparation of cross-section profile and description from geological maps – Horizontal Exercises on basic structural problems

II.

1. Study of geological maps and drawing of geological sections of following types
    - A) Horizontal Series
    - B) Inclined series
        - 1) With intrusions - sill, vertical dyke, two intersecting vertical dykes
        - 2) With vertical fault
    - C) An unconformity separating inclined series with horizontal series.

2. Study of structural problems - Involving strike, true and apparent dips, and width of outcrop by graphical method.

TEXT BOOKS:

1. Billings, M.P., 1972. Structural Geology. Prentice Hall.
2. Davis, G.R., 1984. Structural Geology of Rocks and Region. John Wiley
3. Hills, E.S., 1963. Elements of Structural Geology. Farrold and Sons, London.
4. Singh, R. P., 1995. Structural Geology. A Practical Approach. Ganga Kaveri Publ., Varanasi

REFERENCE BOOKS:

1. Fundamentals of Structural Geology- N. W. Gokhale.
2. Structural Geology: Fundamentals and Modern Developments, Ghosh, S.K., Elsevier; First edition

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (E) URBAN TRANSPORTATION PLANNING

.

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

Course Outcomes:

After 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 demand distribution models and modal split models for mode choice analysis.
4. Develop and calibrate 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: **(6)**

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: **(8)**

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: **(8)**

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. -

Section-II

Unit 4: **(6)**

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. Problems

Unit 5: **(6)**

Modal Split and Assignment: Factors affecting modal split; Modal split in transport planning; Principles of traffic assignment; assignment techniques. Problems

Unit 6: **(6)**

Land Use Models – Lowry Model-Hansen's Accessibility Model-Density -Saturation Gradient Model-Problems (Except on Lowry Model).

Unit 7:

Mass Transit Systems: Types- Capacity, Fleet planning and Scheduling **(4)**

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

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., McGraw Hill Book Co., London, UK, 1982.

REFERENCE BOOK

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

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CV- 323 PROFESSIONAL ELECTIVE-I
323(F)-PAVEMENT DESIGN

.

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

Course Outcomes:

After completion of the course the student will be able to

1) List and explain the various factors affecting design and performance of pavements.
2) Calculate the stresses and deflection in flexible and rigid pavements.
3) Design flexible and rigid pavements.
4) Design the overlay thickness for existing pavement as per IRC standards

SECTION I

Unit 1: **(8)**

Factors Affecting Pavement Design: Variables considered in pavement design, types of pavements, functions of individual layers, classification of axle types of rigid chassis and articulated commercial vehicles, legal axle and gross weights on single and multiple units, tire pressure, contact pressure, EAL and ESWL concepts, traffic analysis: ADT, AADT, truck factor, growth factor, lane distributions & vehicle damage factors, effect of transient & moving loads.

Unit 2: **(8)**

Stresses In flexible Pavement: Vehicle-pavement interaction: transient, random & damping vibrations, steady state of vibration, experiments on vibration, stress inducing factors in flexible and rigid pavements; stress in flexible pavements: Visco-elastic theory and assumptions, layered systems concepts, stress solutions for one, two and three layered systems, fundamental design concepts.

Unit 3: **(8)**

Stresses in Rigid Pavements: Westergaard's theory and assumptions, Stresses due to curling, stresses and deflections due to loading, frictional stresses, and stresses in dowel bars & tie bars.

SECTION II

Unit 4: **(10)**

Design of Flexible Pavements: Factors effecting design. deflection studies in flexible pavements. present serviceability index. IRC guidelines for flexible pavements. pavement performance and methods- AASHTO and Asphalt Institute method. need for overlays, overlays design methods for flexible and rigid pavements.

Unit 5: **(10)**

Design of Rigid Pavements: Factors effecting Design - Wheel load & its repetition, subgrade strength & proportion, strength of concrete - modulus of elasticity. reinforcement in slab. design of joints. design of dowel bars. design of tie bars. IRC and AASHTO methods of Rigid Pavement design.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. `Principles of Pavement Design', Yoder, E.J., and Witczak, 2nd ed. John Wiley and Sons, 1975.
2. `Design of Functional Pavements', Yang, , McGraw Hill Book Co.
3. 'Test Book of Highway Engineering', Khanna and Justo, 'Nemchand brothers, Roorke-2004. Huang, 'Pavement Analysis', Elsevier Publications

REFERENCE BOOKS

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
2. Pavement and Surfacing for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
3. Haas and Hudson `Pavement Management System', McGraw Hill Book Co., New York.
4. HRB/TRB/IRC/International Conference on Structural Design of Asphalt Pavements.
5. Relevant IRC Publications
6. CMA Hand Book

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CV- 323 PROFESSIONAL ELECTIVE-I

323(G)- METRO SYSTEMS AND ENGINEERING

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

Course Outcomes:

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

1. Demonstrate the knowledge of basic planning and financials of metro network systems.
2. Illustrate the surveys and investigations required for construction of elevated and underground stations with safety measures.
3. Present track standards and geometrical features of metro rail tracks.
4. Suggest signaling, fire control and ventilation system for stations and buildings.

SECTION I

Unit 1: **(10)**

Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials

Unit 2: **(12)**

Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management

SECTION II

Unit 3: **(10)**

Track standards for metro rail system – General, Operating requirements, Track gauge, Track spacing, Track geometry (Horizontal curves, Super-elevation, Transition curves, Vertical alignment, Vertical curves, Clearance – All introduction only.

Structure of track, Permissible tolerances.

Unit 4: **(12)**

Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors. Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators Metro rails in India – Delhi, Bangalore, Mumbai etc.

Internal Continuous Assessment (ICA)

The work for Internal Continuous Assessment (ICA) will consist of:

1) Field visit to nearest Metro Station or Railway Station and submit the field visit report.

2) Total four assignments, based on syllabus. (One assignment for every unit of the syllabus)

3) Quiz, Presentation, Videos, Course seminar etc. for ensuring continuous assessment of the students.

Note: Term will be granted only on satisfactory completion of assignments during stipulated period. The student will be detained in case of non-completion/non-submission of the work designated for Internal Continuous Assessment (ICA).

TEXT BOOKS

1. "A textbook of Railway Engineering", S.C. Saxena, S.P.Arora, Dhanpat Rai Publications, 8th edition, 2018.
2. "Railway Track Engineering", J. S. Mundrey, McGraw Hill Education (India) Pvt Ltd, 5th edition, 2017.
3. "Railway Engineering",S.C. Rangwala, Ketki Dalal, Charotar Publishing House Pvt. Ltd, 27th edition, 2017.

REFERENCES

1. Construction and maintenance of high speed railway, Published by Indian railway institute of Civil Engineering Pune, 2nd edition, October 2015.
2. Standardization of Signaling and Train Control Systems For Metro Railways, Published by Government Of India Ministry Of Urban Development, November 2013.
3. Rolling Stock for Metro Railways, Published by Government Of India Ministry Of Urban Development, November 2013.

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CV- 323 PROFESSIONAL ELECTIVE-I
323(H) CONSTRUCTION ENGINEERING MATERIALS

.

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

Course Outcomes:

On completion of the course students will be able to:

1. Examine the properties of common construction materials along with their behaviors under different environments, short- or long-term.
2. Assess material properties, mechanical tests and quality control tests for, concrete, masonry, glass, plastics, iron and steel, paints and protective coatings, bituminous products, gypsum products, resilient flooring, and carpeting.
3. Appraise appropriateness and sustainability of materials for construction projects.
4. Select the sustainable materials based on the international standard practices and certification.
5. Explain about innovative sustainable construction materials and their uses in construction.

SECTION I

Unit 1: Stone, Bricks and Other materials **(7)**

- Stone as building material, Criteria for selection, Tests on stones, Deterioration and Preservation of stone work.
- Bricks, Classification, Properties, Types:- Fly ash bricks, Cement blocks, Calcium silicate bricks, Refractory bricks, Concrete blocks, Lightweight concrete blocks, Tests on bricks.
- Glass, Ceramics, Sealants for joints, Fibre glass reinforced plastic.
- Clay products, Refractories, Composite materials, Types.
- Applications of laminar composites – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

Unit 2: Timber and Metals **(7)**

- Timber and its types:- Industrial timber, Plywood, Veneer, Thermocol, Panels of laminates
- Ferrous Alloys: Steel and Properties of Steels, Cast Irons, Stainless Steels and its advantages of new alloy steels,.
- Non-Ferrous Metals and Alloys: Copper, Aluminum, and Magnesium, Properties and its uses.

Unit 3: Special Concretes **(8)**

- Ingredients of Concrete and their Properties, and Concrete Mix Design.
- Various construction chemicals/admixtures , Fly ash and its use in concrete, Silica fume concrete, Self compacting concrete, Fiber Reinforced plastics and concrete , Light weight concrete.
- Special Concretes:- Ferro cement and fibre reinforced concrete, different types of fibres, high density concrete, Nuclear concrete, heat resisting and refractory concretes, pre fabricated systems

SECTION II

Unit 4: Geosynthetics **(7)**

- Introduction, types of Geosynthetics and Polymers used in Geosyntheics like Geotextiles, Geogrids, Geonets, Geomembranes, Geocells Geomats and others.
- Function and Engineering application like reinforcement, separation, filtration, Drainage, Containment and Erosion Controls.

Unit 5: Asphalt Cement and Hot Mix Asphalt Cement **(7)**

- Introduction and Types of Asphalt Cements or Bituminous Materials, Typical uses of Asphatic Materials

Unit 6: Modern Finishing Materials **(8)**

- Glass Ceramics, Sealants for joints, Fibre glass reinforced plastic, Clay products, Refractories Composite materials. Types Applications of laminar composites, Fibre textiles, Geomembranes and Geotextiles for earth reinforcement.
- Tiles, Paints, Varnishes, and Distempers

TEXT BOOKS

1. Varghese P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Rajput R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
3. Gambhir M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004
4. Duggal S.K., "Building Materials", 4th Edition, New Age International, 2008.
5. William P Spence," Construction Materials, Methods & Techniques", Yesdee Publication 2012, Pvt. Ltd,, Chennai, India
6. Mehta P.K & Mantreio," Concrete Structure properties & Materials", P.J.M, Prentice hall.
7. Nagaratnam Sivakugan, Carthigesu T. G, Rabin Tuladhar and M. Bobby Kannan," Civil Engineering Materials", MindTap from Cengage.

REFERENCE BOOKS

1. Jagadish K.S, "Alternative Building Materials Technology", New Age International, 2007.
2. Gambhir. M.L., & Neha Jamwal., "Building Materials, products, properties and systems",
3. Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
4. IS456 - 2000: Indian Standard specification for plain and reinforced concrete, 2011
5. IS4926 - 2003: Indian Standard specification for ready–mixed concrete, 2012
6. IS383 - 1970: Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, 2011
7. IS1542-1992: Indian standard specification for sand for plaster, 2009.
8. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, 2009.
9. New Building Materials and Construction World magazine

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (I) SYSTEM ENGINEERING AND ECONOMICS

.

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

Course Outcomes:

Upon completion of this course, students should be able to

1. Analyze the Systems in Engineering planning, design and management
2. Build the model of system in Planning and Engineering
3. Carry out 'Economic Evaluation' of Engineering system
4. Explain Microeconomics for Engineers and Planners

SECTION - I

Unit 1: **(12)**

Mapping the Terrain of the Systems Approach- Introduction, The Nature of Science, Engineering Planning, Design, and Management, The Systems Approach, Steps in Systems Analysis, Classification of Systems, Systems Characteristics, Systems Analysis and Decision Making Models and Model-Building

Unit 2: **(10)**

Problem Solving and Designing in Engineering and Planning, Introduction, Problem Solving and Designing Hierarchy: Problem-space, Trees, and Semi-lattices, Measurement and Scaling Sources of Data Measurement Scales of Measurement, System Model Types and Model-building Model Types, Models Used in Planning and Engineering.

SECTION - II

Unit 3: **(8)**

Basic Engineering Economics and Evaluation, Introduction, Notations, Simple Interest Compound Interest, Uniform Series of Payments, Compound Amount Factor (CAF), Sinking Fund Factor (SFF), Present Worth Factor (PWF), Capital Recovery Factor (CRF), Uniform

Gradient Series, Discrete Compound Interest Factors, Uniform Continuous Cash Flow and Capitalized Cost Evaluation, Feasibility Issues, Evaluation Issues, The Evaluation Process Values, Goals, Objectives, Criteria, and Standards, Estimation of Costs, Impacts, and Performance Levels, Capital, Operating, and Maintenance Costs, User Costs, Impacts Performance Levels.

Unit 4: **(6)**

Evaluation of Alternatives Economic and Financial Concepts, Analysis Techniques Economic Evaluation Methods (Efficiency Analysis), Cost-effectiveness Analysis, Multi-criteria Evaluation, Method Benefit-Cost Analysis, The Willingness-to-pay Concept, Depreciation and Taxes, Reporting Results.

Unit 5: **(8)**

Basic Microeconomics for Engineers and Planners, The Scope of Economics and Microeconomics, Some Basic Issues of Economics, Demand for Goods and Services, Contents, Demand, Supply, and Equilibrium Sensitivity of Demand; Factors Affecting Elasticities Income, Elasticities Price, Elasticities Elasticity and Total Revenue Price Elasticity of Supply, Kraft Demand Model, Direct and Cross Elasticities, Consumer Surplus Costs, Laws Related to Costs, Average Cost, Marginal Cost, Consumer Choice.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS:

1. Systems Engineering With Economics, Probability, And Statistics, Second Edition, C. Jotin Khisty Jamshid Mohammadi Adjo A. Amekudzi J. Ross Publishing
2. Principles of Engineering Economy- E. L. Grant, W. G. Ireson, R. S. Leavenworth,Wiley International Education, 7th Ed.

REFERENCE BOOKS

1. Systems Engineering and Analysis, 4th edition. Prentice-Hall, Upper Saddle River, NJ. Bowman, M. (2003)
2. NASA Systems E*ngineering Handbook, NASA/SP-2007–6105 Rev 1*. Military Bookshop, 2007. ISBN: 9781780391380.
3. Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities. 4th ed. Wiley, 2015. p. 304. ISBN: 9781118999400.
4. Engineering Economics - L.P. DeGarmo, W. G. Sullivan, J. A. Bantadelli, McMillan India Co. New Delhi, 8th Ed. 1984.

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (J) INFRATRUCTURAL PLANNING & MANAGEMENT

.

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

Course Outcomes:

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

1) Apply Infrastructure Engineering concepts and explain Public Private Partnership in Civil Engineering.
2) Explain policies, economics, operation research, and technologies prevailing in infrastructural engineering and the social aspects of infrastructure development.
3) Apply the advanced infrastructure tools for successful infrastructure Management.

SECTION –I

Unit 1:An Overview of Basic Concepts Related to Infrastructure (6)

Introduction to Infrastructure, Overview of the Power Sector, Transportation Sectors, Water Supply and Sanitation Sector, Road, Rail, Air, and Port Telecommunications Sector Urban Infrastructure, Rural Infrastructure in India.

An introduction to Special Economic Zones, Organizations and players in the field of infrastructure, The Stages of an Infrastructure Project Lifecycle, Infrastructure Project Finance.

Unit 2: Public private partnership in Infrastructure (8)

Historical Overview: - Infrastructure privatization the benefits of Infrastructure privatization Problems with infrastructure privatization.

Challenges in privatization of Water Supply, Privatization of Power, Privatization of Infrastructure in India: Water Supply project- Privatization of road transportation infrastructure in India.

Unit 3:Challenges to Successful Infrastructure Planning and Implementation (8)

Economic and demand risks, Political risks, Socio-Environmental risks, Cultural risks in international infrastructure projects, Legal and contractual issues in Infrastructure. Challenges in construction and maintenance of infrastructure.

SECTION –II

Unit 4: Strategies for Successful Infrastructure Project Implementation (9)

Risk management framework for Infrastructure Projects, Shaping the planning phase of infrastructure projects to mitigate risks, Designing Sustainable Contracts, Introduction to fair process and negotiation, Negotiating with multiple stakeholders on infrastructure projects, Sustainable development of infrastructure

Unit 5: Advanced Infrastructure (9)

Information Technology and Systems for successful infrastructure Management, Innovative design and maintenance of infrastructure facilities, Performance Modelling and Life Cycle Analysis techniques, Capacity Building, Improving the Government's role in infrastructure implementation ,An integrated framework for successful Infrastructure

Unit 6:Planning, and Management (4)

Infrastructure Management Systems and Future directions

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1) Infrastructure Engineering and Management, Grigg, Neil, Wiley Publication, (1988).
2) Infrastructure management: Integrating design, Construction, Maintenance, Rehabilitation, and Renovation, Hudson, Haas, and Uddin, Tata McGraw Hill Publication, (1997).

REFERENCES BOOKS & JOURNALS

1) World Development Report 1994: Infrastructure for Development (1994).
2) Indian Road Congress Journal.
3) Indian Railways Journal.
4) Indian Water Works Association Journal.

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CV- 323 PROFESSIONAL ELECTIVE-I
323(K) ECOLOGICAL ENGINEERING

.

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

Course Outcomes:

Upon successful completion of course the student will be able to:

1. Classify the structure and functioning of ecosystems.
2. Analyze impacts of watershed, design of ecology and energy and mass flow through ecosystem.
3. Evaluate the ecosystem services and analyze its control and feedback systems.
4. Design ecosystem services by landform and stream restoration and also carry out the green infrastructure design.

SECTION-I

Unit 1: **(07)**

Introduction, Sustainable Design Principles, Global Population Dynamics, Increasing Demands for Ecosystem Services, Human Impacts and land use change, Water Resource Demands, Ecosystem Services and its classification, Ecosystem Assessment, design and assessment of ecosystem services, Analysis, deliberation and mapping of Ecosystem Services Processes.

Unit 2: **(07)**

Bio-geographical Realms, Introduction to Biomes and Eco-regions, types of Eco-regions, other Land Classification Systems, Climate Change and land use effect on Eco-regions, Introduction to Watershed, various characteristics and its Services, Watershed Human Impacts.

Unit 3: **(08)**

Fundamental principles of ecology, Organisms and Place, Adaptation Processes, Responses to Environmental Variation, Landforms and Ecosystem Function, Patches, Corridors, and Connectivity, Ecotones and Edge Effects, Landform Metrics, Energy Flow through Ecosystems, Energy Balance in the Biosphere, Energy as a Unit of Analysis, Trophic Levels, Energy Density, Mass Flow through Ecosystems, various cycles

SECTION-II

Unit 4: **(08)**

Introduction to community structure, Hierarchical Processes, Types of Restoration Design, Biotic and community Interactions, Competition, Consumption and Commensalism, Meta-populations, Species-Area Relationship, Regional Processes, Colonization Sequence, Environmental and Habitat Impacts.

Unit 5: **(06)**

Introduction to ecosystem control and feedback systems, Population Control Processes, Reproductive Strategies, Community Control Processes, Resource Competition, Feedback Processes, various Feedback Loops, Designing Ecosystem Complexity and Self-Organization, Introduction to stream restoration and assessment, Hydrology, Sedimentology, Geomorphology, Habitat, Connectivity, Riparian Corridor.

Unit 6: **(08)**

Introduction to designing ecosystem services by landform, Ecosystem Services Design Process, Agricultural Lands, Forests, Grasslands, Wetlands, Urban Areas, green infrastructure design, The Green Infrastructure Network, Green Infrastructure Planning, Tools of Green Infrastructure, Sustainable Cities Initiative.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. Ecological Engineering: Principles and Practice by Parik C. Kanga [CRC Press; 1 edition, 2003]
2. Ecological Engineering Design: Restoring and Conserving Ecosystem Services - M. D. Matlock and R. A. Morgan[John Wiley & Sons, Inc.2001]

REFERENCE BOOKS

1. Ecology, Engineering, and Management: Reconciling Ecosystem Rehabilitation and Service Reliability - Michel J. G. van Eeten, Emery Roe [Oxford University Press; 1 edition, 2002]
2. Energy Technology, O.P. Gupta, Khanna Book Publishing House

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (L) SOLID AND HAZARDOUS WASTE MANAGEMENT

.

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

Course Outcomes:

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

1. Develop solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies.
2. Select and adopt the appropriate methods for solid waste collection, transportation, redistribution and disposal.
3. Identify the types of hazards and describe methods of disposal of hazardous solid waste.
4. Implement legal, political and administrative considerations in design and operation of solid and hazardous waste management.

SECTION-I

Solid Waste Management

Unit 1: **(06)**

Solid Waste management: Functional outlines of refuse, storage, transportation of refuse, analysis, composition and quantity of refuse, Economic aspects of refuse collection and transport, Solid waste in industries, common types of solid waste, classification, collection and transportation. Concept of biomedical & Hazardous waste management, Introduction to integrated solid waste management.

Unit 2: **(05)**

Solid waste handling and Processing methods, Segregation and salvage recovery of bye-products, Use of solid waste as raw material in industries, Recycling of solid waste.

Unit 3: **(04)**

Composting: Theory of composting, types of composting, factors governing composting, processing before composting, mechanical composting plant, and recovery of biogas energy from organic solid waste.

Unit 4: **(06)**

Incineration: Theory and types of incinerators, location, planning aspects, effects of feed, composition, rate and temperature, air supply, design of incineration plant, pyrolysis and its by-products, energy recovery. Solid waste management rules, status of solid waste management in India.

SECTION-II

Hazardous Waste Management

Unit 5: **(06)**

Definition of Hazardous waste, Characteristics and nature of hazards, natural and man- made hazards, classification of hazards.

Unit 6: **(04)**

Qualitative estimation of damages, risk assessment and management.

Unit 7: **(06)**

Types of hazardous waste, characteristics, Site assessment waste minimization resource recovery. Strategy for minimization of damage due to natural and manmade hazards.

Unit 8: **(06)**

Storage and handling of hazardous waste, Site Selection, Transportation of hazardous wastes. Case Studies of hazards, episodes. Sanitary landfill site selection, types of land filling, maintenance and precaution, leachate and its control, control of contamination of ground water.

INTERNAL CONTINUOUS ASSESSMENT (ICA)

The ICA shall consist of:

1. Analysis of solid waste
2. Project on Design of Refuse collection & Disposal System for medium size town or a part of city.
3. Case study of Hazards and Episodes (Any Two).
4. Assignments (One Assignment on each unit)

TEXT BOOKS

1. Solid Waste Management – Dr. A.D. Bhide
2. Hazardous Waste Management – C. A., Wentz McGraw Hill International Edition
3. Management of Municipal Solid Waste- T. V. Ramchandra, Capital Publishing company, New Delhi
4. Solid and Hazardous Waste Management- M. N. Rao and Razia Sultana, B. S. Publication
5. Elements of Land/Soil Pollution, O.P. Gupta, Khanna Publishing House
6. Air Pollution Control Engineering, Keshav Kant, Khanna Publishing House

REFERENCE BOOKS

1. Solid Waste Management – George Tchobanoglous, McGraw Publication
2. Manual on Municipal Solid Waste management by ministry of Urban Development of Govt. of India.
3. Solid Waste Management- I. H. Khan, and Naved Ahsan, CBS Publishers and Distributors, New Delhi.

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T.Y. B. Tech Civil – Part II

CV- 323 PROFESSIONAL ELECTIVE-I
323 (M) PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTEWATER TREATMENT

.

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

Course Outcomes:

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

1. Implement the concepts of emerging/advanced physical, chemical and biological processes for the treatment of water and wastewater.
2. Evaluate the emerging/advanced hybrid physical, chemical and biological systems for the treatment of water and wastewater.
3. Design the emerging/advanced physical, chemical and biological water and wastewater treatment facilities.
4. Evaluate environmental and public health hazards and recommend sustainable wastewater treatment technologies and approaches

SECTION-I

Unit 1: **(05)**

Solids separation: High rate clarification, Enhanced particle flocculation, Analysis of ballasted flocculation and settling, Dense-sludge process, Swirl and vortex separation, Enhanced coagulation, Applications in water and wastewater treatment.

Unit 2: **(06)**

Organic matter removal: Chemical oxidation for BOD, COD, ammonia and non-biodegradable organic compounds, advanced oxidation processes, Inorganic removal: Biological removal of phosphorous, heavy metals, toxic and recalcitrant organic compounds, Biological-Chemical Phosphorus and Nitrogen Removal (BCFS) Process, Gas Stripping for ammonia and VOC removal, Analysis and design of stripping towers

Unit 3: **(10)**

Hybrid treatment: Biological treatment with membrane separation, Combined aerobic treatment processes, Integrated Fixed-film Activated Sludge (IFAS) Systems, Aerobic granular biomass wastewater treatment, Submerged attached growth processes, Denitrification with attached growth systems, Moving bed bioreactor, Combination natural and mechanized treatment systems, Vertical flow constructed wetland, Aerated constructed wetland.

SECTION-II

Unit 4: **(08)**

Sustainable wastewater treatment: Limitations of conventional centralized wastewater systems, Concept of sustainability in wastewater treatment, Decentralized treatment: Concept, significance, applications and elements of decentralized wastewater treatment, Technologies for Decentralized wastewater treatment, On-site treatment systems, Grey-water treatment

Unit 5: **(06)**

Vermi technology: Concept, worm species, worm action Applications of vermi technology, Vermifilter and Vegetated vermifilter in biological treatment of wastewater, Vermi-stabilization of sludge, Vermi composting

Unit 6: **(06)**

Introduction to automatic process control, Energy efficiency in wastewater treatment, Upgrading wastewater treatment plant performance Nano technology in treatment: Introduction to nano technology in water and wastewater treatment, Drinking water decontamination using nano technology, Application of Nano TiO_2 catalyst in wastewater treatment, Disinfection by nano particles.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. Peavy H, S, Rowe D, R, and Tchobanoglous G, “Environmental Engineering”, McGraw-Hill Book Company.
2. Hammer M, J and Hammer M, J, “Water and Wastewater Technology”, PHI learning private limited.
3. Metcalf and Eddy “Wastewater Engineering Treatment and Reuse”, Tata McGraw Hill Publication.
4. Sincero A, P and Sincero G, A, “Physical-Chemical Treatment of Water and Wastewater Environmental Engineering a Design approach”, WA publication, 2002.
5. O. P. Gupta, Elements of Water Pollution Control Engineering, Khanna Publishing House

REFERENCE BOOKS

1. Sincero A, P and Sincero G, A, “Environmental Engineering A Design approach”, PHI learning private limited, 2004.
2. Nazaroff W, W, and Alvarwz-Cohen, “Environmental Engineering Science”, John Wiley & Sons Publication, 2011.
3. Ram M, K, Andreescu, S, and Ding H, “Nanotechnology for Environmental decontamination”, McGraw Hill, 2011.

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CV- 323 PROFESSIONAL ELECTIVE-I
323(N) HYDRAULIC MODELLING

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

Course Outcomes:

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

1. Perform numerical analysis of problems in water resources engineering.
2. Develop physical models.
3. Model the open channel flow.
4. Model the coastal processes and near shore structures.

Unit 1: **(10)**

Review of theoretical background required for hydraulic modelling, basic mathematics, hydraulics, and numerical techniques.

Unit 2: **(12)**

Development of physical models – dimensional analysis and principles of similitude, non-dimensional numbers employed in hydraulic modelling, tools and procedures.

Unit 3: **(10)**

Modelling of open channel systems, closed conduit systems and urban drainage systems. Environmental modelling of open channel systems.

Unit 4: **(12)**

Modelling of estuaries, coastal processes, and hydraulics structures.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. Pavel Novak, Vincent Guinot, Alan Jeffrey, and Dominic. E. Reeve, Hydraulic Modelling – An Introduction, Spon Press.2010
2. James. J. Sharp, Hydraulic Modelling, Butterworths, 1981
3. Helmut Kobus and Gerrit Abraham, Hydraulic Modelling, Parey,1980.

REFERENCE BOOKS

1. S. N. Ghosh, Tidal Hydraulic Engineering, Oxford and IBH Pub. Co. Pvt. Ltd., 1998
2. Vedat Batu, Applied Flow and Solute Transport Modeling in Aquifers, Taylor and Franics.2006
3. James. L. Martin and Steven. C. McCutcheon, Hydrodynamics and Transport for Water Quality Modeling, Lewis Pub, 1999

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (O) URBAN HYDROLOGY AND HYDRAULICS

.

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

Course Outcomes:

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

1. Develop intensity duration frequency curves for urban drainage systems.
2. Develop design storms to size the various components of drainage systems.
3. Apply best management practices to manage urban flooding.
4. Prepare master drainage plan for an urbanized area.

SECTION - I

Unit 1: Introduction: (6)

Urbanization and its effect on water cycle, Urban hydrologic cycle, Trends in urbanization Effect of urbanization on hydrology.

Unit 2: Precipitation Analysis: (8)

Importance of short duration of rainfall and runoff data, Methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF) curves, Design storms for urban drainage systems.

Unit 3: Approaches to urban drainage (8)

Time of concentration, Peak flow estimation approaches, Rational method, NRCS curve number approach, Runoff quantity and quality, Waste- water and stormwater reuse, Major and minor systems.

SECTION - II

Unit 4: Elements of drainage systems: (6)

Open channel, underground drains, appurtenances, pumping, and source control.

Unit 5: Analysis and Management: (8)

Stormwater drainage structures, Design of stormwater network, Best Management Practices– Detention and retention facilities, swales, constructed wetlands, models available for stormwater management.

Unit 6: Master drainage plans: (8)

Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, use of models in planning.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. 'Manual on Drainage in Urbanized area' by Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 – 2 volumes), UNESCO,
2. 'Urban Hydrology' by Hall M J (1984), Elsevier Applied Science Publisher.
3. 'Hydrology – Quantity and Quality Analysis' by Wanielista M P and Eaglin (1997), Wiley and Sons.
4. 'Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling' by Akan A.O and R.L. Houghtalen (2006), Wiley International.

REFERENCE BOOKS

1. 'Stormwater Detention for Drainage' by Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. 'Urban water cycle processes and interactions' by Marsalek et al (2006), Publication No. 78, UNESCO, Paris (http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf)
3. 'Frontiers in Urban Water Management – Deadlock or Hope' by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing.

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (P) INSTRUMENTATION & SENSOR TECHNOLOGIES FOR CIVIL ENGG. APPLICATIONS

.

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

Course Outcomes:

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

1. Analyze the errors during measurements
2. Specify the requirements in the calibration of sensors and instruments
3. Explain the noise added during measurements and transmission, the measurement of electrical variables and the requirements during the transmission of measured signals.
4. Construct instrumentation and computer networks
5. Suggest proper sensor technologies for specific applications
6. Design and set up measurement systems and carry out the studies

SECTION I

Unit 1: Fundamentals of Measurement, Sensing and Instrumentation (11)

Definition of measurement and instrumentation, Physical variables, Common types of sensors; Functions of sensors; Appropriate terminology for sensor applications; Interpretation of signals from a known sensor type, Types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations

Unit 2: Sensor Installation and Operation (11)

Predicting the response of sensors to various inputs; Construction a conceptual instrumentation and monitoring program; Order and methodology for sensor installation; Types of sensors and their modes of operation and measurement, Approach to Planning & Monitoring Programs, Defining target, Sensor selection, Sensor sitting, Sensor Installation & Configuration, Sensor design, Measurement uncertainty

SECTION II

Unit 3: Data Analysis and Interpretation (11)

Fundamental statistical concepts, Data reduction and interpretation, Piezometer, Inclinometer, Strain gauge, etc. Time domain signal processing, Discrete signals, Signals and noise, Statistical properties of signals.

Unit 4: Frequency Domain Signal Processing and Analysis (11)

Need for frequency domain analysis and its principles; Physical processes based on analysis of sensor data; Combine signals for insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution

Internal Continuous Assessment (ICA)

PRACTICALS

1. Instrumentation of typical civil engineering members/structures/structural elements
2. Use of different sensors, strain gauges, inclinometers,
3. Performance characteristics
4. Errors during the measurement process
5. Calibration of measuring sensors and instruments
6. Measurement, noise and signal processing
7. Analog Signal processing
8. Digital Signal Processing
9. Demonstration & use of sensor technologies

Note:

For lab work, the course will allow students to prepare, deploy and analyze observations from standard instruments. Laboratory experiments shall be used on application of concepts introduced in the lectures providing principle knowledge, practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems.

TEXT & REFERENCE BOOKS

1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis
4. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer
5. J.G. Joshi, Electronics Measurements & Instrumentation , Khanna Publishing House
6. A.K. Sahwney, A Course in Electronics Measurements and Instrumentation, Dhanpat Rai

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CV- 323 PROFESSIONAL ELECTIVE-I
323 (Q) OPEN CHANNEL AND RIVER HYDRAULICS

.

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

Course Outcomes:

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

1. Demonstrate basic principles of the open channel flow.
2. Analyze the various types of flows viz. uniform and non uniform flow, gradually varied flow, rapidly varied flow etc.
3. Explain the mechanics of sediment transport
4. Apply the knowledge of open channel hydraulics to river engineering.
5. Apply the knowledge of dimensional analysis to develop different hydraulic models

SECTION-I

Unit 1: **(5)**

Basic fluid flow concepts, Classification of open channel flow, Velocity and pressure distribution. Energy and Momentum Equation applied to open channel flow, Energy and momentum coefficients, Channel Geometry and geometrical elements.

Unit 2: **(5)**

Uniform and critical flow computations: Energy depth relationships, Resistance formulae, Concepts of first and Second hydraulic exponent, Determination of critical and normal depth, hydraulically most efficient channel sections, Channel transitions.

Unit 3: **(6)**

Gradually varied flow: Different equation governing GVF, Classification analysis and control sections of profiles, Computation of GVF profiles by different methods.

Unit 4: **(6)**

Rapid varied flow: Type, Analysis and characteristics of Hydraulic jump in rectangular channels, Location of jump, Introduction to jump in non-rectangular channel and on sloping floor, Use of jump as Energy dissipater. Flow Measurement –Weir, spillways, critical depth flumes.

SECTION-II

Unit 5: **(5)**

River gauging: Dominant discharge, Methods of gauging, current meter rating curve, automatic water level recorder, stage discharge relationship of a river.

Unit 6: **(7)**

Fluvial Hydraulics- Sediment transport, Mode of sediment motion and formation, Threshold movement, Total sediment load, Suspended and bed load Theories, Reservoir Sedimentation.

Unit 7: **(6)**

River Management and Training: Type of river, river morphology, meandering and braiding of River training work- Classification Types-Guide banks, Groynes, Deflectors, Embankments, Cut-offs, Bank Protection Stable channel nature river training works, river morphology.

Unit 8: **(5)**

Similitude and model analysis: Basic principles, fixed bed and models, distorted models.

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. Open channel Hydraulics – Ven Te Chaw, McGraw Hill book Co. New York.
2. Flow through open channel – Ranga Raju
3. Flow in open channel –K. Subramanya, Tata McGraw Hill Publications
4. Mechanics of Sediment transport and alluvial river problems-R. J. Garde New Age Publications New Delhi.

REFERENCE BOOKS

1. Open Channel Flow-F. M. Henderson.
2. River Gauging –Chitale and Hiranandani
3. River Mechanics-Vol. I &II, Hsieh Wen Shen.

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CV- 324 DESIGN OF CONCRETE STRUCTURES-I

.

Teaching Scheme	**Examination Scheme**
Lectures :- 4 Hrs/Week, 4 Credits	**ISE:** 30 Marks
Practical :- 2 Hrs/Week, 1 Credit	**ESE:** 70 Marks
	ICA: 25 Marks

Course Outcomes:

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

1. Design appropriate type of slab for a given loading.
2. Analyze and Design suitable type of beam for a given condition.
3. Design beam subjected to combined bending, shear and torsion.
4. Analyze and design appropriate type of column.

SECTION I

Unit 1: Introduction **(6)**

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.

Unit 2: Design of Slabs (Limit state method) **(8)**

One Way, One way continuous, and Two Way slabs with different end conditions as per IS code, cantilever slab.

Unit 3: Limit state of Collapse (Flexure, Shear and Bond) **(8)**

Analysis and Design of singly and doubly reinforced rectangular sections.

Unit 4: Analysis and Design of Flanged Sections **(7)**

Analysis and Design of Singly and doubly Reinforced T & L Beams for flexure .

SECTION II

Unit 5: Design of Continuous beams **(10)**

Design of Continuous beams by Limit State Method.

Unit 6: Limit State of Collapse (Torsion) **(8)**

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 7: Design of columns **(10)**

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.

Internal Continuous Assessment (ICA)

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

NOTE:

1. Problems based on above syllabus shall be covered in tutorials.
2. Only IS: 456-2000 shall be allowed in University Exam.
3. Unless otherwise mentioned separately, all the design should be by Limit State method.
4. Assignments as homework - One assignment on each topic

TEXT BOOKS

1. Limit State Theory & design –Karve & Shah Structures Pub., Pune
2. Reinforced Concrete Design (Limit State) - A.K. Jain
3. Reinforced Cement Concrete - B.C. Punmia
4. Design of R.C.C. structural elements by S.S. Bhavikatti (Volume I & II).

REFERENCE BOOKS

1. IS: 456-2000
2. Fundamentals of Reinforced Concrete- Sinha & Roy
3. Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi.
4. Handbook of Reinforced Concrete: SP- 16

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CV- 325 PRINCIPLES OF MANAGEMENT AND QUANTITATIVE TECHNIQUES

.

Teaching Scheme	**Examination Scheme**
Lectures :- 3Hrs/Week, 3 Credits	**ISE:** 30 Marks
Tutorial- 1 hr/week, 1 credit	**ESE:** 70 Marks
	ICA: 25 Marks

Course Outcomes:

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

1. Demonstrate decision making and communication as a member of a team as well as Lead a team for effective management of construction projects.
2. Apply the Optimization techniques for decision making in construction industry.
3. Carry out ABC analysis, Break even analysis and calculate EOQ and Inventory costs for construction project.
4. Create and edit master libraries in the ERP system.
5. Use Statistical Methods and Control charts (X, R, p, c charts) for quality control of materials and workmanship in Civil Engineering projects.

SECTION – I

Unit 1: **(04)**

Definition and Functions of Management; 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: **(10)**

Importance of Decision Making, steps in decision making.

Decision under certainty: Linear Programming, Formulation of simple L-P model, Graphical method, Simplex 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'.

Unit 3: **(04)**

Decision under uncertainty: Wald's, Savage, Hurvitz and Laplace criterion of optimism and regret, expected monitory value, Theory of games (dominance pure and mixed strategy).

Decision under risk: Decision tree.

Unit 4: **(04)**

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.

Monte Carlo Simulation: Concept, procedure and advantages.

SECTION – II

Unit 5: **(06)**

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

Unit 6: **(08)**

Construction ERP

Benefits, best practices: ISO Documents, Responsibilities, Document Directory Structures, Safety Measures, Approval system for Purchase, Work Orders and Billing, User permissions, The master libraries in the ERP system – Resources Master Library, Construction Activity Specifications Master Library.

Unit 7: **(06)**

Quality control: Concept, Statistical Methods, Control charts (X, R, p, c charts)

Internal Continuous Assessment (ICA)

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

TEXT BOOKS

1. A Textbook of Organizational Behaviour, CB Gupta, S. Chand Publications
2. Construction Engineering & Management, S.C. Sharma & S.V. Deodhar, Khanna Book Publishing
3. Optimization Techniques, S.S. Rao, Wiley Eastern India
4. Operation Research, Hamdy A. Taha, Operation Research, Prentice Hall of India, New Delhi, 8th Ed.2011
5. Store Management, Menon K. S., Store Management, McMillan Co. New Delhi, 2nd Ed. 1998.
6. Statistical Quality Control, E. L. Grant, Statistical Quality Control, Wiley International Education, 6th Ed.
7. Udo Linden, Mrunalini Kulkarni, Hit-Office Construction ERP technical manual, Engineering Design Software and Services Pvt. Ltd., Pune, April 2018 Edition.

REFERENCE BOOKS

1. Total Quality Management, Ponia & Sharma, Khanna Publishing House, Delhi
2. Engineering Management: Industrial Engineering & Management, S.C. Sharma, Khanna Publishing House, Delhi
3. Principles and Practice of Management, Prasad, L.M, Sultan Chand
4. Organizational Behaviour, L.M. Prasad, Sutan Chand and Sons.
5. Handbook of Construction Management, Joy PK, Macmillan
6. Construction Project Management, Jha, Pearson
7. Total Quality Management, Gopal, PHI Publications
8. Industrial Engineering & Operations Management, S.K. Sharma. S.K. Kataria & Sons
9. Principles of Operation Research: Prentice Hall of India, 2nd Ed.1925,Wagner H. M.
10. Operation Research: Shaum's outline series, Richard Bronson Govindsami N., Tata McGraw Hill , 2nd Ed.2004
11. Material Management, Gopal Krishnan, Sudeshan,
12. Handbook of Quality Control, Juran J. M., A. B. Godfrey, Mc Graw- Hill International,5th Ed.

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CV- 326 (SL32)SELF LEARNING TECHNICAL COURSES

.

Teaching Scheme | **Examination Scheme**
Credits :- 2 Credits | **ESE:** 50 Marks

Self-Learning Module II at T.Y. B. Tech. Civil Engineering, Semester- II

(A) Student can select a 'Self Learning Module II' (Technical Course) from Course List SL32(A) and appear for university examination.

P. A. H. Solapur University, Solapur: Technical Course List Course List

SL32 (A): Self Learning Module – II (Technical Courses)

No	Course title
1	Geosynthetics and Reinforced Soil Structures
2	Rural Roads
3	Planning for Sustainable Development
4	TQM and MIS in Civil Engineering
5	Earthquake Resistant Non Engineered Construction

OR

(B) Student can select & enroll for university approved minimum eight week Technical Course from various NPTEL technical courses, complete its assignments and appear for the 'Certificate examination' conducted by NPTEL.

BOS Chairman / Coordinator will announce the list of approved NPTEL online courses of minimum eight weeks duration for 'Self Learning Module-II (Technical)' on commencement of the Sem-II of respective academic year from the available NPTEL courses through university system and will make available to student through University/ institute website.

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CV- 326 SELF LEARNING TECHNICAL COURSE
SL32-(A)(1) GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES

.

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

At the end of this course, the students should be able to

1. Identify the different types of geo textile and their suitability for the soil reinforcement structures;
2. Perform the laboratory testing of Geo synthetics
3. Design 'Reinforced Earth' retaining structures
4. Select appropriate soil reinforcement for erosion control, drainage and filtration
5. Design soil reinforcement using Geo synthetic for pavement application and landfills

Unit 1:

Introduction: Historical background of reinforced soil, Principles of reinforced soil through Mohr circle analysis.

Different types of geosynthetics: Types of geosynthetics like geotextiles, geogrids, geonets, geocells, geo-composites, their manufacturing methods.

Unit 2:

Testing methods for geosynthetics: Techniques for testing of different index properties, strength properties, Apparent Opening Size, In-plane and cross-plane permeability tests, assessment of construction induced damage, extrapolation of long term strength properties from short term tests.

Unit 3:

Reinforced Soil retaining walls: Different types of walls like wrap-around walls, full-height panel walls, discrete-facing panel walls, modular block walls Design methods as per BS-8006 and FHWA methods Construction methods for reinforced soil retaining walls.

Reinforced soil slopes: Basal reinforcement for construction on soft clay soils, construction of steep slopes with reinforcement layers on competent soils, Different slope stability analysis methods like planar wedge method, bi-linear wedge method, circular slip methods.

Unit 4:

Erosion control on slopes using geosynthetics. Applications in foundations: Binquet and Lee's approach for analysis of foundations with reinforcement layers.

Drainage and filtration applications of geosynthetics: Different filtration requirements, filtration in different types of soils and criteria for selection of geotextiles, estimation of flow of water in retaining walls, pavements, etc. and selection of geosynthetics.

Unit 5:

Pavement application: Geosynthetics for separation and reinforcement in flexible pavements, design by Giroud-Noiray approach, reflection cracking and control using geosynthetics. Use of geosynthetics for construction of heavy container yards and railway lines.

Construction of landfills using geosynthetics: Different components of modern landfills, collection techniques for leachate, application of different geosynthetics like geonets, geotextiles for drainage in landfills, use of geomembranes and Geosynthetic Clay Liner (GCL) as barriers

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
3. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.

REFERENCE BOOKS

1. Geosynthetics Asia 1997: Select papers by C.V.J. Varma, G. Venkatappa Rao and A.R.G. Rao ,1998.
2. Geosynthetics for Trails in Wet Areas: 2008, Edition by James Scott Groenier , Bibligov Publishers, 2012.
3. Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla and Jian-Hua Yin, Taylor & Francis, 2008.

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CV- 326 SELF LEARNING TECHNICAL COURSE
SLT-32 (A) (2) RURAL ROADS

.

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

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

1. Plan the rural roads and develop rural road network.
2. Design different elements of road geometrics of rural roads.
3. Apply the knowledge of using locally available materials for construction and aimat low cost rural roads.
4. Design the rural road pavement as per IRC standards.
5. Carry out construction and maintenance of rural roads.

Unit 1: Planning of Rural Roads:

Problems associated with planning of low volume rural roads in India. Rural road network planning- principles and methods. Recent developments on rural roads in India.

Unit 2: Location Surveys and Geometric Design:

Location surveys, geometric design standards for rural roads, special considerations for rural roads in hilly terrain.

Unit 3: Pavement Materials:

Soil Investigations, Properties and specifications of materials, Utilization of locally available and waste materials in village road projects like fly ash, iron and steel slag, recycled and other waste material etc, stabilized roads, road aggregates, materials for bituminous construction, cement and concrete, special pavements.

Unit 4: Pavement Design:

Design factors, pavement thickness design as per IRC SP:72, internal drainage measures, design of semi-rigid pavement, roller compacted cement concrete pavement, special pavements like inter-locking block paving, design of fly ash embankments.

Unit 5: Specifications and Construction:

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

Unit 6: Road Drainage and Maintenance of Rural Roads:

Types of drainage, surface and sub-surface drains for low volume roads.

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

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

REFERENCES:

1. Soil Mechanics for Road Engineers‖, Her Majesty‘s Stationary Office (HMSO), London.
2. IRC, Manual for Rural Roads, Indian Roads Congress, 2002.
3. Relevant IRC Publications
4. PIARC, International Road Maintenance Hand Book- Maintenance of Paved Roads, France
5. PIARC, International Road Maintenance Hand Book- Maintenance of Unpaved Roads, France

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CV- 326 SELF LEARNING TECHNICAL COURSE
SL-32 (A)(3) PLANNING FOR SUSTAINABLE DEVELOPMENT

.

Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

After completion of the course the student will be able to

1. Identify the performance criteria, resource commitment, and measurement of sustainability and integration of sustainability programs
2. Explain about innovative sustainable methods and their uses in civil Engineering.
3. Connect with others who can help in facilitating peace, justice, inclusion and strong institutions in their country
4. Support the development of policies promoting all the pillars of sustainability and related approaches

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Unit 1:

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:

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- Environmental management and innovation strategies.

Unit 4:

Societal transformations. Institutional theory.

Unit 5:

Governance for sustainable development. Policy responses to environmental degradation.

Unit 5:

Capacity development for innovation. Research methods.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. M.H. Fulekar, Bhawana Pathak, R.K. Kale (2013) Environment and Sustainable Development, Springer Nature.
2. T.G. Carpenter (2001) The Environment, construction and sustainable Development, Willey- Blackwell

REFERENCES

1. Mog, J.M. (2004) Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs“, World Development 32(12): 2139–2160. IISD commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68kb)

2. Arundel, A., R. Kemp, and S. Parto (2004) Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.

3. Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding and fostering innovation, London

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CV- 326 SELF LEARNING TECHNICAL COURSE
SL-32(A)(4) TQM AND MIS IN CIVIL ENGINEERING

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Teaching Scheme	**Examination Scheme**
Credits :- 2 Credits	**ESE:** 50 Marks

Course Outcomes:

After completion of the course the student will be able to

1. Compare quality control, quality assurance, total quality control and total quality management (TQM)
2. Apply the TQM tools such as Six Sigma, Kaizen, Supply Chain Management
3. Develop an MIS for a construction organization associated with building works
4. Prepare typical checklist for concreting activity, formwork activity, steel reinforcement activity.

Unit 1:

Quality – various definitions and interpretation. Importance of quality in construction. Factors affecting good quality of construction. Importance of quality on a project in the context of global challenges.

Unit 2:

a) Difference between, quality control, quality assurance, total quality control and total quality management (TQM)

b) Process based approach for achieving TQM. Study of ISO 9001 principles

c) Quality manual – Importance, contents, documentation. Importance of check-lists in achieving quality. Typical checklist for concreting activity, formwork activity, steel reinforcement activity.

Unit 3:

TQM – Necessity, advantages. Six sigma as a tool in TQM. Supply chain management as a tool in TQM. Benchmarking in TQM. Kaizen in TQM. Defects in construction and measures to prevent rectify defects.

Unit 4:

Introduction to Management Information systems (MIS)

Overview, Definition. MIS and decision support systems, Information resources, management subsystems of MIS.

Management information system structure based on management activity whether for operational control, management control or strategic planning.

Unit 5:

a) Survey of information systems technology w. r. t hardware, software, communications technology, data processing, Information processing.
b) Concepts of information, planning and control, Information based support systems. Development of an MIS for a construction organization associated with building works.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.
2. Quality Control and Total Quality Management by P. L. Jain- Tata McGraw Hill Publ. Company Ltd.
3. Total Project Management – The Indian Context - P. K. Joy Macmillan India Ltd.

REFERENCE BOOKS

1. Management –Principal, process and practices by Bhat – Oxford University Press.
2. Financial management by Shrivastava- Oxford University Press
3. Management Information Systems – Gordon B. Davis, Margrethe H. Olson – Tata McGraw Hill Publ. Co

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CV- 326 SELF LEARNING TECHNICAL COURSE
SL-32 (A)(5) EARTHQUAKE RESISTANT NON ENGINEERED CONSTRUCTION

Teaching Scheme
Credits :- 2 Credits

Examination Scheme
ESE: 50 Marks

Course Outcomes:

1. On completion of the course, the students will be able to:
2. Identify the type and extent of damage occurred in non-engineered construction.
3. Apply the earthquake resistant concepts for non-engineered (Stone and Brick masonry) constructions.
4. Incorporate the construction aspects for brick and other masonry units.
5. Incorporate the features of the strengthening of masonry buildings.

Unit 1:

Introduction: General effects of an earthquake, terminology, structure of earth, earthquake effects. Ground shaking effect on structures: Inertia forces, seismic load, factors affecting seismic load, nature of seismic stresses, important parameters in seismic design, Factors affecting damage, building configuration, opening size, rigidity distribution, ductility, foundation, construction quality.

Unit 2:

General concepts of earthquake resistant design: Categories of building, seismic zones, importance of building, bearing capacity of foundation soil, combination of parameters. Planning of building, choice of site, structural design, fire resistance, structural framing, requirements of structural safety.

Unit 3:

Buildings in bricks and other masonry units: Introduction, Typical damage and failure of masonry buildings: Non-structural damage, Damage and failure of bearing walls, Failure of ground, failure of roofs and floors, Causes of damage in masonry buildings.

Typical strengths of masonry, General construction aspects, Horizontal reinforcement in walls, Vertical reinforcement in walls.

Unit 4:

Stone buildings: Introduction, Typical damage and failure of stone buildings, Typical structural properties, General construction aspects: overall dimensions, mortar, openings in walls, masonry bond, horizontal reinforcing of walls, and vertical reinforcing of walls.

Unit 5:

Restoration and strengthening of buildings: Introduction, Techniques to restore original strength, Planner modifications and strengthening of walls: Inserting new walls, strengthening existing walls, external binding, and other points.

ASSIGNMENTS

Students shall complete five assignments, based on the syllabus (One assignment for every unit of the syllabus). In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

TEXT BOOKS

1. Elements of Earthquake Engineering- Jai Krishna, South Asian Pub. New Delhi.

2. Earthquake Resistant, Design of Masonry and Timber Structures – A.S. Arya.

REFERENCE BOOKS

1. Manual of Earthquake Resistant Non engineering Construction, University of Roorkee.
2. Earthquake Tips published by NICEE, IIT Roorkee.
3. Government of Maharashtra Earthquake resistant Design of house guiding lines and assessment of damages.
4. IS – 4326:1993 Earthquake resistant design and construction of buildings

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CV- 327 PROJECT ON STEEL STRUCTURES

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Teaching Scheme	**Examination Scheme**
Drawing :- 4Hrs/Week, 2 Credits	**OE:** 50 Marks
	ICA: 50 Marks

Course Outcomes:

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

1. Design and assemble the various components of Industrial shed with roof truss or portal frame or gable Frame and prepare their detailed computer aided drawing
2. Design the various components of Building frame/Foot bridge/Welded plate girder and prepare their detailed computer aided drawing
3. Analyze the steel structure using standard structural engineering application software
4. Create report for the structure as per Analysis and Design.

PROJECT ON STEEL STRUCTURES (Laboratory)

INTERNAL CONTINUOUS ASSESSMENT (ICA)

It shall consist of detailed structural design and drawing of the following steel structure along with necessary drawings.

1. INDUSTRIAL SHED

Design of industrial shed including roof truss, purlin, gantry girder, columns, bracing system, column bases along with their connections and concrete pedestal

2. ANY ONE of the following:

a. Welded Plate Girder:

Design of welded plate girder, design of cross section, curtailment of flange plates, stiffeners and their connections.

b. Foot Bridge

Influence lines, cross beam, main truss, Raker, joint Details, support details

c. Building Frames

Building with Secondary and main beams, column and column bases, beam-to beam connection, column-beam-connection, design of typical members.

d. Offshore Structures

Offshore structures containing elements like jackets, topside platforms, equipment foundations etc. Further, these components can be designed using circular and hollow square sections etc.

Note:

1. Sample verification of analysis results shall be made by using software for any one problem.
2. Maximum number of students in a group not more than three to five for design.

Site visits: Report should contain structural details with sketches.

TEXT BOOKS

1. Design of Steel Structures, N. Subramanian, Oxford, 2008
2. Limit State Design of Steel Structures, S.K. Duggal.
3. 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

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. Indian Standard Codes: IS 800-2007, IS 875-1987 Bureau of Indian Standards.
8. Steel Tables SP: 6(1) and SP: 6(6)
9. Dynamic Analysis and Design of Offshore Structures , Srinivasan Chandrasekaran
10. Offshore Structures : Design, Construction and Maintenance by Mohamed A. EI-Reedy

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CV- 328 ASSESSMENT OF FIELD TRAINING REPORT

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Teaching Scheme	**Examination Scheme**
Credits :- 1 Credit	**ICA:** 25 Marks

Students shall undergo a field training of at least 15 days in the winter vacation after T. Y. B. Tech. Civil Part I and submit the field training report, which shall be assessed by faculty associated with Principles of Management and Quantitative Techniques, in T. Y. B. Tech. Civil Part II