MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

D no 214

05/05/2023

DEPARTMENT OF CIVIL ENGINEERING

MINUTES OF BOARD OF STUDIES MEETING, JUNE 2023 ALONG WITH ITS ANNEXURES

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF CIVIL ENGINEERING

Summary of Board of Studies Meeting held on 02nd June, 2023

COURSES WHERE SYLLABUS REVISION WAS CARRIED OUT

(Session: July - Dec 2023)

(Course / Subject name)	Course Code	Year/Date of introduction	Year/Date of revision	Percentage of content added or replaced	Item No.	Page No.
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Civil Engineering Department, MITS Gwalior

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DEPARTMENT OF CIVIL ENGINEERING

Summary of Board of Studies Meeting held on 02nd June 2023

COURSES FOCUSING ON EMPLOYABILITY/ENTREPRENEURSHIP/ SKILL DEVELOPMENT
(Session: July – Dec 2023)

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Item No.	Page No.
Availability & Management of Ground Water Resources	110762 / H110512	Well Hydraulics, Groundwater resources planning & management	4,7	3,4,9
Earthquake Geotechnical Engineering	H110706	Dynamic soil properties, ground response analysis	7	4
Admixtures & Special Concretes	H110707 / H110508 / 8003XX	Special concrete – self compacting concrete, ultra high performance concrete	7,21	4,6, 105
Dynamics of Structures	H110708	Seismic analysis, seismic isolation	7	4
Sustainable Engineering Concepts & Life Cycle Analysis	8003XX	Life Cycle Assessment, ISO Framework	21	6,106
Bridge Engineering	H110704	Design of Various Types of Bridges like Prestressed Bridges, Composite Bridges	7	4
Advanced Structural Design (RCC)	110732	Design of Water Tanks, Prestressed Concrete	3	2,9,13
Integrated Waste Management for Smart City	900211	Waste Management, E waste management, biomedical waste management	4	3,9,18
Software Application for Solving Civil Engineering Problems	110716	Study on Prima Vera, STADD Pro & MATLAB	6	3,9,23
Creative Problem Solving	110717	Providing engineering solutions of critical problems	6	3,9,24
Principles of Construction Management	110763	Network techniques in Construction management, resource planning, cost control	4	3,9
Geometric Design of Highways	M110704	Design on highway curves, traffic signals	7	3
Introduction to Multimodal Urban Transportation Systems	110764	Planning of urban Transportation systems	4	3,9
Building Materials & Composites	M110501	Building Materials, Admixture uses	7	4
Ground Improvement	H110705	Use of Geosynthetics in Ground Improvement	7	4

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DEPARTMENT OF CIVIL ENGINEERING

Summary of Board of Studies Meeting held on 02nd June 2023

NEW COURSES ADDED
(Session: July – Dec 2023)

(Course/subject name)	Course Code	Activities/contents which have a bearing on increasing skill and employability	Item No.	Page No.
Availability & Management of Ground Water Resources	110762 / H110512	Well Hydraulics, Groundwater resources planning & management	4,7	3,4,9
Earthquake Geotechnical Engineering	H110706	Dynamic soil properties, ground response analysis	7	4
Admixtures & Special Concretes	H1107077 / H110508 / 8003XX	Special concrete – self compacting concrete, ultra high performance concrete	7,21	4,6, 105
Dynamics of Structures	H110708 / H110507	Seismic analysis, seismic isolation	7	4,
Sustainable Engineering Concepts & Life Cycle Analysis	8003XX	Life Cycle Assessment, ISO Framework	21	6,106

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DEPARTMENT OF CIVIL ENGINEERING

Summary of Board of Studies Meeting held on 02nd June, 2023

Feedback on curriculum received from stakeholders: Analysis & ATR

Stakeholder	Student	Faculty	Alumni
No of Responses	124	10	14
Link of Analysis	https://web.mitsgwalior.in/images/Department s/Civil/currciulum%20feedback/ANNEXURE%20-13%20a%20Curriculum%20Feedback%20Analy sis.pdf	https://web.mitsgwalior.in/images/De partments/Civil/currciulum%20feedbck /ANNEXURE%20-13%20a%20Curriculumn%20Feedback %20Analysis.pdf	https://web.mitsgwalior.in/images/ Departments/Civil/currciulum%20fe edbck/ANNEXURE%20-13%20a%20Curriculumn%20Feedbac k%20Analysis.pdf
ATR Link	https://web.mitsgwalior.in/images/Department s/Civil/currciulum%20feedbck/ANNEXURE%20-13%20b%20ATR%20on%20Curriculumn%20Fee dback%20Analysis.pdf	https://web.mitsgwalior.in/images/De partments/Civil/currciulum%20feedbck /ANNEXURE%20-13%20b%20ATR%20on%20Curriculumn %20Feedback%20Analysis.pdf	https://web.mitsgwalior.in/images/ Departments/Civil/currciulum%20fe edbck/ANNEXURE%20-13%20b%20ATR%20on%20Curriculu mn%20Feedback%20Analysis.pdf

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Minutes of Board of Studies Meeting held on 02nd June 2023

The meeting of Board of Studies of the Civil Engineering department was held on Friday, 02nd June 2023 in online mode. Following were present:

1. Dr. A. K. Nema   (Expert nominated by V.C.)
   Professor, Civil Engg., IIT Delhi
2. Prof. Brind Kumar   (Subject Expert nominated by Academic Council)
   Professor, Civil Engg., IIT BHU, Varanasi
3. Er. Alok Tiwari   (Representative from Alumni)
   Principal Chief Safety Officer, SW Railway, Hubli
4. Dr. M. K. Trivedi   (Chairman BoS & Head of the department)
5. Prof. (Mrs.) Archana Tiwari   (Member, BOS)
6. Dr. S. K. Jain   (Member, BOS)
7. Dr. R. Kansal   (Member, BOS)
8. Dr. S. Tiwari   (Member, BOS)
9. Prof. A. K. Dwivedi   (Member, BOS)
10. Prof. A. K. Saxena   (Member, BOS)
11. Prof. G. Bhadoriya   (Member, BOS)
12. Prof. Aditya K. Agarwal   (Member, BOS)
13. Dr. Hemant Shrivastava   (Member, BOS)
14. Dr. Prachi Singh   (Member, BOS)
15. Dr. Abhilash Shukla   (Member, BOS)

Leave of absence was granted to the members who could not attend the meeting.

Following agendas were discussed & deliberated upon

Item No. /	
CE - 1	To confirm the minutes of previous BoS meeting held in the month of December 2022
	Previous Board of Studies meeting minutes dated 14th December 2022 are confirmed.
Item No. / CE - 2	To prepare and finalize the scheme structure of B.Tech. VII Semester with the provision of *Three Departmental Electives (DEs)* (in which two Departmental Elective is to be offered in online mode with credit transfer) *and one Open Category (OC) Course for the batch admitted in 2020-21.*
	The finalized scheme of B.Tech VII Semester for 2020-21 admitted batch is attached in Annexure – I.
Item No. / CE – 3	To prepare and finalize the syllabus of courses to be offered *(for the batch admitted in 2020-21)* under *Departmental Elective (DE) Course* (in traditional mode) for B. Tech. *VII Semester* along with their COs

	The following courses will be offered as Departmental Elective (DE) courses in traditional mode for VII semester students for 2020 admitted batch.
	      1. Hydraulic Structure (110731)
	      2. Advanced Structural Design (RCC) (110732)
	      3. Railway, Airport & Tunnel Engineering (110733)
	The syllabus along with COs for these courses were discussed & finalized. The finalized syllabus is attached in Annexure – II and the same has been incorporated in the syllabus file for 2020 batch.

Item No. / CE – 4	To propose the list of courses which the students can opt from SWAYAM/NPTEL/MOOC based Platforms, to be offered in *online mode under* Departmental Elective (DE) Courses, with credit transfer in the B. Tech. *VII Semester under* the flexible curriculum *(for the batch admitted in 2020-21)*
	Following SWAYAM/NPTEL courses are offered as Departmental Elective (DE) Courses in VII Semester for batch admitted in 2020-21 with credit transfer. 1. Municipal Solid Waste Management (110761) 2. Availability and Management of Groundwater Resources (110762) 3. Principles of Construction Management (110763) 4. Introduction to Multimodal Urban Transportation Systems (110764) 5. Foundation Engineering (110765) 6. Remote Sensing & GIS (110766)
Item No. / CE - 5	To prepare and finalize the syllabus of courses to be offered *(for the batch admitted in 2020-21)* under the *Open Category (OC) Courses* (in traditional mode) for B. Tech. *VII semester* students of other departments along with their COs
	The following courses will be offered as Open Category (OC) courses in traditional mode for VII semester students for 2020 admitted batch. 1. Integrated Waste Management for Smart City (910211) 2. Safety & Quality Management (910212) The syllabus along with COs for these courses were discussed & finalized. The finalized syllabus is attached in Annexure – III and the same has been incorporated in the syllabus file for 2020 batch.
Item No. / CE - 6	To prepare and finalize the Experiment list/ Lab manual for Departmental Laboratory Course (DLC) to be offered in B. Tech. VII semester *(for the batch admitted in 2020-21)*
	The list of experiments for laboratory course to be offered in VII semester for 2020-21 admitted batch were finalized and are attached in Annexure – IV and the same has been incorporated in the syllabus file for 2020 batch.
Item No. / CE - 7	To propose the list of "Additional Courses" which can be opted for getting an (i) *Honours (for students of the host department)* (ii) *Minor Specialization (for students of other departments)* *[These will be offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. VII semester students (for the batch admitted in 2020-21)] and for B.Tech. V semester (for the batch admitted in 2021-22)]*
	Following SWAYAM/NPTEL courses are proposed as additional courses which can be opted for getting Minor Specialization during VII semester for 2020-21 admitted batch 1. Soil Mechanics / Geotechnical Engineering I (M110703) 2. Geometric Design of Highways (M110704) Following SWAYAM/NPTEL courses *were offered as additional courses for getting Minors during V semester for 2020-21 admitted batch and are running on SWAYAM/NPTEL platform in upcoming semester. Hence these courses are also offered as additive courses for getting Minors during VII Semester provided students can opt only those courses which they have not taken for any credit transfer facility earlier* 1. Building Materials & Composites (M110501)

	2. Strength of Materials (M110503) 3. Fluid Mechanics (M110504)
	Following SWAYAM/NPTEL courses are proposed as additional courses which can be opted for getting Honours during VII semester for 2020-21 admitted batch 1. Bridge Engineering (H110704) 2. Ground Improvement (H110705) 3. Earthquake Geotechnical Engineering (H110706) 4. Admixtures & Special Concretes (H110707) 5. Dynamics of Structures (H110708)
	Following SWAYAM/NPTEL courses *were offered as additional courses for getting Honours during V semester for 2020-21 admitted batch and are running on SWAYAM/NPTEL platform in upcoming semester, Hence these courses are also offered as additive courses for getting Honours during VII Semester provided students can opt only those courses which they have not taken for any credit transfer facility earlier* 1. Integrated Waste Management for Smart City (H110501) 2. Matrix Method of Structural Analysis (H110502)
	Following SWAYAM/NPTEL courses are proposed as additional courses which can be opted for getting Minor Specialization during V semester for 2021-22 admitted batch 1. Building Materials & Composites (M110501) 2. Strength of Materials (M110503) 3. Fluid Mechanics (M110504)
	Following SWAYAM/NPTEL courses are proposed as additional courses which can be opted for getting Honours during V semester for 2021-22 admitted batch **TRACK 1: STRUCTURE ENGINEERING** 1. Dynamics of Structures (H110507) 2. Admixtures & Special Concretes (H110508) 3. Introduction to Engineering Seismology (H110509) **TRACK 2: ENVIRONMENTAL ENGINEERING** 1. Municipal Solid Waste Management (H110510) 2. Environmental Chemistry (H110511) 3. Availability and Management of Groundwater Resources (H110512)
Item No. / CE - 8	To prepare and recommend the *scheme structure of B.Tech. V Semester under* the flexible curriculum (for the *Batch admitted in 2021-22)*
	The finalized scheme of B.Tech V Semester for 2021-22 admitted batch is attached in Annexure – V
Item No. / CE - 9	To prepare and recommend the syllabi for all *Departmental Core (DC) Courses* of B. Tech. *V Semester (for the batch* admitted in 2021-22) under the flexible curriculum along with their COs.
	The syllabus along with COs for Departmental Core (DC) courses which are being offered in V Semester were discussed & finalized. The syllabus is attached in Annexure – VI and the same has been incorporated in the syllabus file for 2021 batch.
Item No. / CE - 10	To prepare and recommend the suggestive Experiment list/ Lab manual and list of projects which can be assigned under the 'Skill based mini-project' category in various laboratory component based courses to be offered in B. Tech. V Semester

	(for the batch admitted in 2021-22). The list of experiments for laboratory course to be offered in V semester for 2021-22 admitted batch were finalized along with the syllabi of courses offered in B.Tech V Semester as mentioned in agenda **Item No. / CE – 9.** The list of Skill based mini project for the lab courses is being attached in Annexure – VII.

Item No. /
CE - 11
	To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered *(for the batch admitted in 2021-22)* **in online mode under** *Self-Learning/ Presentation,* **in the B. Tech.** *V Semester*
	
	Following courses are offered Self-learning / Presentation courses for V semester through SWAYAM/NPTEL platform.
	    1. Principles and Application of Building Science
	    2. Geotechnical Engineering Laboratory.
	    3. Global Navigation Satellite Systems & Applications.

Item No. / **CE - 12**	**To review, prepare, finalize and recommend the** *Scheme & Syllabi (along with the Course Outcomes) of III semester* **B. Tech. programmes (for the batch admitted 2022-23 Session)** The Scheme & Syllabi for III Semester for B.Tech Civil Engineering for batch admitted in 2022-2023 was finalized. The scheme as well as syllabus is being attached in Annexure – VIII.
Item No. / **CE - 13**	**To review, prepare, finalize and recommend the list of experiments/ Lab manual and skill based mini projects for various laboratory courses to be offered in III Semester** *(for the batch admitted in 2022-23).* The list of experiments for laboratory course to be offered in III semester for 2022-23 admitted batch were finalized along with the syllabi of courses offered in B.Tech III Semester as mentioned in agenda **Item No. / CE – 12.** The list of Skill based mini project for the lab courses is being attached in Annexure – IX.

Item No. /
CE - 14
	To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered *(for the batch admitted in 2022-23)* **in online mode under** *Self-Learning/ Presentation,* **in the III Semester**
	Following courses are finalized as Self Learning/Presentation courses for III Semester through NPTEL platform
	    1. Water Society & Sustainability
	    2. GPS Surveying
	    3. C Programming & Assembly Language

Item No. / **CE - 15**	**To Review, prepare and recommend the scheme structure, Syllabi (along with the Course Outcomes), list of experiments/ Lab manual and skill based mini projects for various laboratory courses of** *I semester* **B. Tech. programmes (for the batch admitted in 2023-24 Session)** The Scheme & Syllabi for I Semester for B.Tech Civil Engineering for batch admitted in 2023-2024 was finalized. The list of experiments and skill based mini projects for lab courses offered in I Semester were also discussed and finalized along with the syllabus of courses. The scheme as well as syllabus is being attached in Annexure – X.

Item No. / CE – 16	To review the CO attainments, to identify gaps and to suggest corrective measures for the improvement in the CO attainment levels for July-Dec 2022.

CO attainment calculations & gap analysis has been done for July-Dec 22. On the basis of this analysis it is observed that the CO attainment level is found to be below the set target, for those COs corrective actions to be taken have been suggested. The compiled report is attached in Annexure – XI. The summary of the same is presented below:

Total No of Courses	Total Number of COs	No. of COs Not attained	Percentage of COs not attained
30	142	75	52.41%

Item No. / CE – 17	To review PO attainment of 2018-2022 batch, CO-PO mapping matrix with attainments and gap analysis

PO attainment calculations of 2018-2022 batch has been done and the gap analysis in PO attainment level has been carried on the basis of the set targets. The compiled report is attached in Annexure – XII.

Item No. / CE – 18	To prepare and recommend the syllabi of Mandatory Audit Course: Universal Human Values & Professional Ethics (UHVPE). (at institute level)

This agenda item is applicable at Institute level.

Item No. / CE – 19	To review curricula feedback from various stakeholders, its analysis and impact

The curricula feedback has been taken from various stakeholders. The compiled report along with its analysis & ATR is attached in Annexure – XIII (a) & (b).

Item No. / CE – 20	To review the Course Outcomes (COs) feedback of various courses, its analysis, and ATR (for July –Dec. 2022 semester)

The course outcomes (COs) feedback of various courses running in the July – Dec 22 semester has been taken. The compiled analysis report is attached in Annexure – XIV.

Item No. / CE – 21	To discuss and recommend the scheme structure & syllabi of PG Programme (M.E./M.Tech./MCA/MBA) along with their Course Outcomes (COs)

There are no changes in existing scheme and syllabus of PG Programmes (M.E. CTM & M.Tech Environmental Engineering) for I Semester (Batch admitted 2023-24). Following is the list of courses which will be offered as MOOC Course (Through SWAYAM/NPTEL) in the upcoming 3rd Semester of PG programme (Batch admitted in 2022-23).
M.E. C.T.M. 3rd Semester – Admixtures & Special Concretes
M.Tech Environmental Engineering 3rd Semester – Sustainable Engineering Concepts & Life Cycle Analysis.
In view of the above, the existing schemes of 3rd Semester M.E. C.T.M. & M.Tech Environmental Engineering is modified to include these courses. the modified schemes for III Semester and existing schemes and syllabus for I Semester are attached in Annexure - XV.

Item No. / CE – 22	To recommend the scheme structure and Syllabus of Ph.D. Course Work (specific to Doctoral Research Scholars, if any)

The Scheme & Syllabus of Ph.D. Course work for students admitted in 2022-2023 is being attached in Annexure – XVI.

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ANNEXURE – I

(Scheme 7th Sem B.Tech Civil Engineering (2020 Admitted Batch))

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Scheme of Evaluation

B. Tech. VII Semester (Civil Engineering)

For batches admitted in academic session 2020 – 21 onwards

S. No.	Subject Code	Category Code	Subject Name	End Term Evaluation	Proficiency in subject /course	Mid Sem	Quiz/ Assignment	End Sem	Lab Work & Sessional	Skill Based Mini Project	Assignment	Exam	Total Marks	L	T	P	Total Credits	Mode of Teaching (Offline/Online)	Mode of Exam
1.	1107XX	DE	Departmental Elective – II (DE – 2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
2.	1107XX	DE	Departmental Elective – III (DE – 3)*	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
3.	1107XX	DE	Departmental Elective – IV (DE – 4)*	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online (0/3)	MCQ
4.	910XXX	OC	Open Category Course – II (OC – 2)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended (2/1)	PP
5.	110716	DLC	Software Application for Solving Civil Engineering Problem (DLC – 5)	-	-	-	-	60	20	20	-	-	100	-	-	2	1	Offline (2/0)	SO
6.	110717	DLC	Creative Problem Solving (DLC – 6)	-	-	-	-	25	25	-	-	-	50	-	-	2	1	Offline (2/0)	SO
7.	110718	DLC	Summer Internship project – III (Evaluation)	-	-	-	-	60	-	-	-	-	60	-	-	4	2	Interactive	SO
			Total	100	20	40	40	145	45	20	50	150	610	12	-	8	16	-	-
8.	1000008	MAC	Universal Human Values & Professional Ethics	50	10	20	20	-	-	-	-	-	100	2	-	-	Grade	Online	MCQ

Additional Courses for obtaining Honours or Minor Specialization

*Proficiency in course/subject – includes the weightage towards ability/ skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject

MCQ – Multiple Choice Questions, PP – Pen paper Mode, A+O – Assignment + Oral, SO – Submission + Oral

*Course will run through SWAYAM/ANU/NPTEL/MOOC with credit transfer

Permitted to opt for maximum 02 additional courses for the award of Honours or Minor Specialization

Mode of Teaching

	Theory			Lab		MOOC	SIP			
	Online	Blended Offline	Online	Offline	Online	Online Mentoring	Interactive			
	-	4	2	2	-	6	2			
	-	25%	13%	13%		36%	13%			

Mode of Examination

	Theory			Lab	SIP		Total Credits	
	PP	MCQ	A+O	SO	SO		SIP/SLP/NEC SO	Total Credits
	6	6	-	2	2		2	16
Credits %	36%	36%	-	13%	13%		13%	16

DE – 2

110731. Hydraulic Structure

110732. Advanced Structural Design (RCC)

110733. Railway, Airport & Tunnel Engineering

DE – 3 (Through SWAYAM/NPTEL)

110761. Municipal Solid Waste Management

110762. Availability and Management of Groundwater Resources

110763. Principles of Construction Management

DE – 4 (Through SWAYAM/ NPTEL)

110764. Introduction to Multimodal Urban Transportation Systems

110765. Foundation Engineering

110766. Remote Sensing & GIS

OC – 2

910211 Integrated Waste Management for Smart City

910212 Safety & Quality Management

Civil Engineering Department, MITS Gwalior

ANNEXURE – II

(Syllabus 7th Sem B.Tech Civil Engineering DE Courses (2020-2021 Admitted Batch))

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ANNEXURE – II

SYLLABUS FOR DEPARTMENTAL ELECTIVE COURSES (DEs) TO BE OFFERRED IN VII SEMESTER

Course Code: 110731
Course Name: Hydraulic Structure

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To study the different aspects of design of hydraulic structures.

2) To build the necessary theoretical background for the selection of a suitable site for a dam and a suitable dam for a given site location.

3) To emphasize on the basic design principle of the gravity dam & earthen dam

4) To carry out the stability & seepage analysis of various types of dams.

5) To provide knowledge on various hydraulic structures such as energy dissipaters, spillways & gates & understand their designs.

6) To understand the design of cross drainage structures for uninterrupted water supply in natural channels and manmade canals.

7) To provide a basic knowledge on various types of hydropower plants and their components.

Syllabus:

Unit-I Gravity dams:

Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, foundation treatment, construction joints, galleries in gravity dams.

Unit-II Earth and Rock fill dams:

Earth Dams: Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method, pore pressures, sudden draw down, steady seepage and construction pore pressure condition.

Rock fill dams: Types, merits and demerits, conditions favourable for their adoption

Unit-III Cross drainage works:

Types, selection of suitable type, design criteria, fluming of canal- Mitra & Chaturvedi methods. Design of Different types of CD works.

Unit-IV Spillways, Energy dissipators and gates:

Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways. Principles of energy dissipation, Energy dissipators based on tail water rating curve and jump height curves, Spillway crest gates – vertical lift and radial gates, their design principles and details.

Unit-V Hydropower Plants:

Hydropower development, assessment of power potential, types of hydropower plants, general features of hydro-electric schemes, selection of turbines, draft tubes, surge tanks, penstocks, power house dimensions, development of micro hydel stations, tidal plants, pumped storage plants and their details.

Course Outcomes:

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

CO1: Identify different components of hydro project.

CO2: Explain basic principles of designing hydropower plant & cross drainage works.

CO3: Solve problems of dam analysis, energy dissipators & cross drainage works.

CO4: Evaluate suitability of types of hydraulic structures.

CO5: Design various elements of hydraulic structures.

Reference Books:

1. Engineering for Dams (Volumes I, II & III) by Creager, Justin & Hinds
2. Hydroelectric Hand Book by Creager
3. Hydraulic Structures by Varshney
4. Irrigation & Water Power Engg. By Punmia& Pandey
5. Water Power Engineering by Dandekar
6. Irrigation Engineering & Hydraulic Structure by S.K. Garg.

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Course Code: 110732
Course Name: Advanced Structural Design (R.C.C.)

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To understand the behavior of RC structures like Retaining wall, Water tanks, Highway Bridges and prestressed concrete beams.
2) To apply the codal provision for estimation of loads on Retaining wall, Water tanks, Highway Bridges and prestressed concrete beams sections
3) To know analysis of Retaining walls, Water tanks, Highway Bridges and prestressed concrete beam sections subjected to realistic loads.
4) To learn design of Retaining walls, Water tanks, Highway Bridges and prestressed concrete beam sections using Codal provisions.

Syllabus:

Unit-I
Design of Water Tanks:
General design requirements; Design of circular tanks resting on ground; Design of rectangular tanks resting on ground; Design of under ground tanks.

Unit-II
Over Head Water tanks and Flat Slabs:
Overhead Tank: Intze type (Membrane analysis only), Design of Staging
Design of Flat slabs: (i) Direct design method and (ii) Equivalent frame method; Design Shear.

Unit-III
Earth Retaining Structures:
Types of retaining walls, Stability of retaining walls, Design of Cantilever type retaining wall; Design of Counterfort type retaining walls.

Unit-IV
Design of Bridges:
IRC loading for highway bridges, Design of Slab bridges for IRC Loads; Design of T-beams bridges for IRC Loads.

Unit-V
Prestressed Concrete:
Prestressing concepts, materials: systems of prestressing: prestress losses. Introduction to working & limit state design method for prestress beam sections.

Course Outcomes:

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

CO1: Explain the structural behaviour of water retaining structures; earth retaining structures; bridges and Prestressed concrete structures.

CO2: Determine design forces in water retaining structures; earth retaining structures; highway bridges; and Prestressed sections.

CO3: Analyse the water retaining structures; earth retaining structures; highway bridges and Prestressed sections for realistic loadings.

CO4: Design economic and safe water retaining structures; earth retaining structures; highway bridges

and Prestressed sections as per Codal provisions.

Reference Books:

1. Plain and Reinforced Concrete by O.P. Jain and Jai Krishna Vol. I & II, Nem Chand & Bros, Roorkee

2. Reinforced Concrete Limit State Design by Ashok K. Jain, Nem Chand & Bros. Roorkee.

3. Reinforced Concrete Design by S. U. Pillai and D. Menon, Tata McGraw-Hill Publishing Company Limited, New Delhi.

4. Essentials of Bridge Engineering by D.J. Victor, Oxford and IBH publishers.

5. Design of Bridges by N.K. Raju, CBS Publishers

6. Prestressed Concrete by N.K. Raju, CBS Publishers

7. Advanced Reinforced Concrete Design by P. C. Varghese, Prentice Hall of India publisher

8. Prestressed concrete by T.Y. Lin & N.H. Burns, Wiley publisher

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Course Code: 110733
Course Name: Railway, Airport & Tunnel Engineering

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To understand the requirements of airport, runway & taxi – way.
2) To understand the requirement of lighting & signal & traffic control at airports.
3) To understand the geometrical elements of railway track.
4) To understand the properties of good ballast.
5) To understand the track alignment, super elevation, turnout, yards.
6) To understand the principles of signalling & interlocking.
7) To understand the construction of tunnels.

Syllabus:

Unit-I Introduction to Railway Engineering

Tractive resistance & Permanent way, Principles of Transportation, Transportation by Road, Railways, Airways, Waterways, their importance and limitations. Route surveys and alignment, railway track, development and gauges. Hauling capacity and tractive effort.

(i) Rails- types, welding of rails, wear & tear of rails, rail creep ultrasonic Testing of Rails.
(ii) Rail fastenings- types – Fishplates, spikes bearing plates, chairs, keys, check and guard rails, Elastic Rail Clips (ERC), Vossloh fastening.
(iii) Sleepers, types & comparison, requirement of a good sleeper, sleeper density, Turnouts.
(iv) Ballast –Requirement of good ballast, various materials used as ballast, quantity of ballast, Ballast Cleaning.

Different methods of plate laying, material trains, calculation of materials required, relaying of track.

Unit-II

Track alignment, Geometrical Design. Gradient & gray compensation, Super Elevation, Equilibrium, Cant and Cant deficiency, relationship of super elevation, gauge, speed & radius of curves, speed on curves, Limits of super elevation, Cant deficiency, Negative super elevation, curves . transition curves, necessity of points and crossing. Turnouts, Points of switches, Types of switches, crossing, calculation of turnouts, sleepers at points &crossing, Types of Track junctions. Types, locations, general equipments, layouts, marshalling yards. Definition, layout details, designs of simple turnouts.

Stations and Yards: Site selection for a Railway stations, Requirements of railway stations, junction station &terminals, location, layout & details, Types of signals in stations and yards, principles of signaling and inter-locking. Modern development in railways, Modernization of track for high speed, Maintenance of track, Track drainage.

Unit – III Airport Planning, Runway & Taxiway

Airport site selection, air craft characteristic and their effects on runway alignments, wind rose diagrams, basic runway length and corrections, classification of airports. Geometrical elements: taxi ways and runways, pattern of runway capacity.

Unit – IV Airport, Obstructions, Lightning & Traffic control

Zoning regulations, approach area, approach surface-imaginary, conical, horizontal, Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc. instrumental landing system, precision approach radar.

Unit-V Tunnels

Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts . Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

Course Outcomes:

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

CO 1: **Explain** the elements of airport planning, bridges & tunnels.

CO 2: **Design** runway & taxiway system as per regulations.

CO 3: **Explain** various elements of railway tracks, signalling, yards, bridges & tunnels.

CO 4: **Illustrate** various gauge, signals, fasteners, turnouts, crossing etc.

CO 5: **Apply** construction methods of railway tunnels.

Text Books:

1. Airport Planning & Design, S. K. Khanna & M. G. Arora, Nem chand Publishers, 6th edition, 1999
2. Railway Engineering, Arora & Saxena, Dhanpat Rai & Sons, 2010

Reference Books:

1. Airport Planning, Froesch, Charles, Andesite Press, 2017
2. The Planning & Design of Airports, Horonjeff Robert, MHE, 5th edition, 2010
3. Railway Engineering, S.C. Rangwala, Charotar Publication House, Anand, 2012
4. Railway Tack, K.F. Antia, New Book Company, 5th edition, 1960

ANNEXURE – III

(Syllabus OC 7th Sem B.Tech Civil Engineering (2020 Admitted Batch))

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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ANNEXURE – III

SYLLABUS FOR OPEN CATEGORY COURSES (OCs) TO BE OFFERRED IN VII SEMESTER

Course Code: 910211
Course Name: Integrated Waste Management for Smart City

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To provide broad knowledge on various aspects of planning & implementation of waste management system in a smart city/town.

2) To understand the principles applied in waste management.

3) To understand various ways to collect, treat & disposal of waste.

4) To understand various methods of energy recovery from waste.

5) To understand various aspects of hazardous waste management, E-waste management, biomedical waste management etc.

Syllabus:

Unit I:

Introduction to waste management, classification of solid waste, objective of solid waste management, principles of integrated waste management, 3R policy, various laws & rules of waste management (MSW Rules, hazardous waste management rules, E-waste rules etc.), role of various agencies in planning of waste management system, swachh bharat mission and smart cities program – implementation, current status, challenges and future trend of waste management.

Unit II:

Municipal solid waste – generation, composition, characterization, handling of waste at source, collection of waste – collection system, collection routes, collection equipments, transportation of waste, transfer stations, segregation and recycling of waste, disposal of waste through landfills – types of landfills, planning & operation of landfills, leachate management & control of gases in landfills, environmental monitoring of landfills.

Unit III:

Energy recovery from municipal solid waste - thermal conversion technologies, incineration, pyrolysis, gasification, environmental control system, biological & chemical conversion technologies, aerobic composting, anaerobic digestion, refuse derived fuels, other biological and chemical transformation methods.

Unit IV:

Hazardous waste management – characteristics, source, health effects, physiochemical treatment methods of hazardous waste, disposal of hazardous waste, Biomedical waste management – sources, health effects, issues in India, challenges, handling of biomedical waste.

Unit V:

E-waste management – sources, health effects, issues in India, challenges, handling of E-waste. Plastic waste management – types of plastics, sources of plastic waste, impacts of plastic waste, plastic waste management practices. Management of construction & demolition wastes.

Course Outcomes:

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

CO 1: Explain the principles & concepts of waste management.

CO 2: Apply various techniques of handling the waste.

CO 3: Apply various techniques of energy recovery from waste.

CO 4: Plan an effective & efficient waste management system.

Text Books:

1. Text Book of Solid Wastes Management, Iqbal H. Khan and Naved Ahsan, CBS Publishers, 1st edition 2012

2. Integrated Solid Waste Management, Hilary Theisen and Samuel A. Vigil, George Tchobanoglous, McGraw Hill Yew York, 1993

Reference Books:

1. Environmental Engineering, Rowe, Peavy & Tchobanogolous, Tata McGraw Hill Publications, 2017

2. CPHEEO, Manual on Municipal Solid Waste management, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2016

3. Solid Waste Engineering, Vesilind P.A., Worrel H. W. and Reinhard, Thomson Learning Inc. 2003

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Course Code: 910212
Course Name: Safety & Quality Management

L	T	P	Credit
3	0	0	3

Course Objectives:

1. To study the basics of quality and safety management.

2. To learn the code of practice in design and construction for quality standards.

3. To understand and evaluate quality and safety management principles and best practices in construction.

4. To understand and evaluate safety management principles in construction;

5. To acquire good basic practices for quality system and progress for quality assurance and quality improvement for construction companies.

Syllabus:

Unit – I

Quality Management: Introduction – Definitions and objectives. Factors influencing construction quality; Responsibilities and authority; Quality plan; Quality Management Guidelines; Quality circles; cost of quality and safety; Quality transition - quality control and inspection; quality assurance; total quality management-principles, tools and techniques; Planning and control of quality during design of structures; Tools and techniques for quality management.

Unit – II

Quality Systems: Introduction - Quality system standard, ISO 9000 family of standards; Requirements-Preparing Quality System Documents; Quality related training; Implementing a Quality system; Third party Certification; Concepts of quality control- Objectives, definitions, and systems.

Unit – III

Quality Planning: Quality Policy, Objectives and methods in Construction industry; Consumers satisfaction, Ergonomics, Time of Completion, Statistical tolerance, Taguchi's concept of quality; Inspection procedures-Processes and products (materials and machinery); Total cost implication.

Quality Assurance and Quality Improvement Techniques:

Evolution of quality assurance, Objectives of quality assurance; Methods, Techniques and needs of quality assurance; Different aspects of quality Appraisals; Quality assurance in construction. Role of quality assurance in TQM process, Quality assurance standards. Developing and implementing quality assurance system, Quality Improvement Tools and Techniques, work study, method study and time study.

Unit – IV

Safety management : Planning for safety provisions, budgeting for safety, safety policy. Safety audit, safety management practices, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety; Construction hazards and safety guidelines; Overall accident investigation process; Risk management; Prevention techniques for construction accidents; Site management with regard to safety recommendations; Training for safety awareness and implementation; Construction safety and health manual.

Unit-V

Recent trends and Case studies: Quality and safety issues in steel construction, concrete construction (including pre-cast, and pre-stressed); computer aided hazard analysis.

Course Outcomes:

After this course, students will be able to:

CO 1: Explain the quality management systems and utilize the ISO 9000 family of standards.

CO 2: Improve the quality of the project through tools and techniques.

CO 3: Perform the environmental impact assessment (EIA) for construction projects towards quality.

CO 4: Analyse the quality assurance and quality control, quality improvement tools andtechniques;

CO 5: Evaluate the contract and inspection procedures.

CO 6: Identify the safety management practices in construction industry.

Reference Books:

1. B. G. Dale, Managing quality, 4th ed., Blackwell Publishing, Oxford, 2003.

2. D. Reese and J. V. Eidson, Handbook of OSHA construction safety and health, 2 n d ed.,CRC Press, Bocaaton, 2006.

3. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6 t h ed., Blackwell Publishing, Oxford, 2006

4. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction management fundamentals, 2 nd ed., McGraw Hill, New York, 2008.

5. S. J. Holt, Principles of construction safety, Blackwell Publishing, Oxford, 2008.

6. The Management and Control of Quality: Sixth edition; James R.Evans, William M.Lindsay.

7. Safety management by John V.Grimaldi Rollin H.Simonds.

8. ISO 9000 family of standard

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ANNEXURE – IV

(Syllabus/ Experiment List for 7th Sem DLC Courses B.Tech Civil Engineering (2020-2021 Admitted Batch))

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ANNEXURE – IV

(Syllabus/ Experiment List for 7th Sem DLC Courses B.Tech Civil Engineering (2020-2021 Admitted Batch))

ANNEXURE – IV

SYLLABUS/ EXPERIMENT LIST FOR DEPARTMENTAL LABORATORY COURSES (DLC) TO BE OFFERRED IN VII SEMESTER

Course Code: 110716
Course Name: Software Application for Solving Civil Engineering Problems

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To practice various software's used in civil engineering design & analysis.
2) To practice MATLAB & QGIS.
3) To practice various other software's and its applications in civil engineering works.

List of Experiments:

1. Design and analysis of reinforced concrete beam using STADD software.
2. Design and analysis of reinforced concrete slab using STADD software.
3. Design MATLAB code to develop load-response curve for different load conditions for a beam designed of experiment 1.
4. Application of QGIS in preparation of vector map of major city and preparation of land use and land cover maps.
5. Determination of critical network for a construction project using PRIMEVERA/ MS-Project.
6. To prepare an estimation of Multi-storey building and Road using MS-Excel.
7. Design water supply networks through Hardy Cross method. (Loops, EPANET and other software's).
8. Design Sewer networks using Hidra software.
9. Development of Geo-contor map by total station.
10. Estimation of axel load (msa) through IRC 37: 2015 using MS Excel.
11. Design and analysis of multi-storey building using E-tabs software.

In addition to above, various available open source software's will be used.

Course Outcomes

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

CO 1: Design various beams, slabs & multistorey building's using various software's.
CO 2: Design water supply & sewer networks using various software's.
CO 3: Practice MS Excel in estimation works.
CO 4: Produce land use land cover maps and geo contour maps using various software's
CO 5: Practice Primavera and MS-Project softwares.

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Course Code: 110717
Course Name: Creative Problem Solving

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To create an interest in students to provide solutions to various on field problems of civil engineering.
2) To provide solutions to various on field problems of civil engineering.

List of Experiments

1. Traffic Survey of Major Road's in the city.
2. Design of Traffic Signal.
3. Performance evaluation of new building materials.
4. Determination of residual life of structure.
5. Identification of occupational diseases.
6. Identification of solid waste collection problems in a locality and subsequent proposal of the solutions to those problems.
7. Determination of surface roughness index of road.
8. Use of waste materials for construction of pavement layers.
9. Creation of data bank of water resources in the city.
10. Industrial visit and joint solution of problems in industry.

Course Outcomes

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

CO 1: Identify various on field problems.
CO 2: Practice various methods to solve problems.
CO 3: Produce solutions to various problems.
CO 4: Demonstrate various problems solving skills.

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Course Code: 110718
Course Name: Summer Internship Project - III

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To develop an appreciation and importance of civil Engineering in developing the infrastructure.

2) To develop an understanding regarding the various engineering principals to be used in the field Construction activities.

3) To emphasize on the use of the modern tools and plants used in the construction industry.

4) To build the necessary practical background and exposure to the field problems.

5) To develop a technical skill to prepare project documents.

Syllabus:

Each candidate shall go for 1 month (4 week) on field training at different organizations / sites of his / her choice after completion of their 6th Semester exams (in summer vacations) and shall submit a detailed report after completion of training.

Course Outcomes:

Upon completion of the course, the students will be able to:
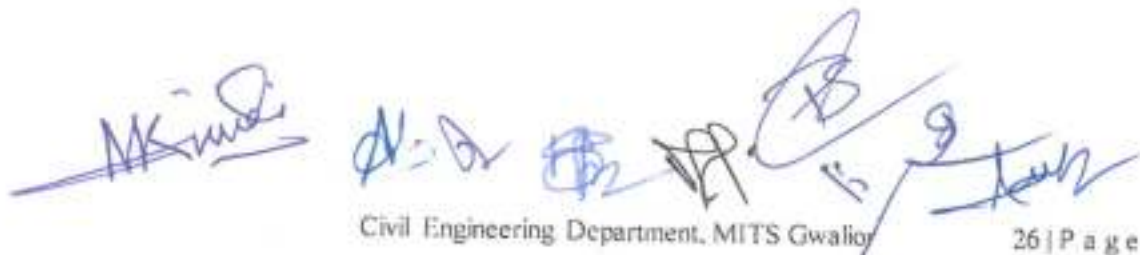
CO1: Observe various activities of civil construction works.

CO2: Examine the utility of general and specific equipments for construction.

CO3: Differentiate the construction projects individually and in team.

CO4: Develop the writing and communication skills for various engineering problems.

CO5: Adapt lifelong learning for benefit of society.

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ANNEXURE – V

(Scheme 5th Sem B.Tech Civil Engineering (2021 Admitted Batch))

Item No. / CE – 23	Any other matter None.
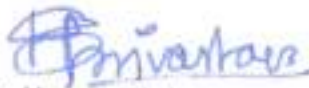
The meeting ended with vote of thanks to the chair.

(Dr. Abhilash Shukla)
Member, BoS

(Dr. Prachi Singh)
Member, BoS

(Dr. Hemant Shrivastava)
Member, BoS

(Prof. Aditya K. Agarwal)
Member BoS

(Prof. O. Bhadoriya)
Member BoS

(Prof. A. K. Saxena)
Member BoS

(Prof. A. K. Dwivedi)
Member BoS

(Dr. S. Tiwari)
Member, BoS

(Dr. R. Kansal)
Member, BoS

(Prof. (Mrs.) A. Tiwari)
Member, BoS

(Dr. S. K. Jain)
Member, BoS

(Prof. Brind Kumar)
Subject Experts Nominated by Academic Council

(Er Alok Tiwari)
Alumni Representative

(Dr. A. K. Nema)
Expert Nominated By V.C

(Dr. M. K. Trivedi)
Head of Department & Chairman, BoS

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DEPARTMENT OF CIVIL ENGINEERING
Scheme of Evaluation
B. Tech. V Semester (Civil Engineering)

For batches admitted in academic session 2021 – 22 onwards

S. No.	Subject Code	Category Code	Subject Name	Theory Slot — End Sem Exam	Theory Slot — *Proficiency in subject/course	Theory Slot — Mid Sem	Theory Slot — Quiz/Assignment	Practical Slot — End Sem Exam	Practical Slot — Lab Work & Sessional	Practical Slot — Skill Based/Mini Project	Total Marks	L	T	P	Total Credits	Mode of Teaching (Offline/Online)	Mode of Exam
1.	110520	MC	Data Science	50	10	20	20	60	20	20	200	3	0	2	4	Blended (2/1)	MCQ
2.	110511	DC	Water Supply Engineering (DC - 10)	50	10	20	20	60	20	20	200	2	1	2	4	Blended (2/1)	PP
3.	110512	DC	Theory of Structure – II (DC - 11)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
4.	110513	DC	Structural Design & Drawing (RCC) (DC - 12)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
5.	110514	DC	Fluid Mechanics – II (DC - 13)	50	10	20	20	-	-	-	100	2	1	-	3	Blended (2/1)	PP
6.	110515	DLC	Minor Project – 1 (DLC – 3)**	-	-	-	-	60	40	-	100	-	-	4	2	Offline (2/0)	SO
7.	110516	DLC	Self-learning /Presentation (SWAYAM /NPTEL/ MOOC)*	-	-	-	-	-	40	40	40	-	-	2	1	Online + Mentoring	SO
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO
9.	110517	DLC	Summer Internship Project-II (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline (2/0)	SO
			Total	250	50	100	100	290	120	40	950	11	4	16	23		
10.	1000006	MAC	Disaster Management	50	10	20	20	-	-	-	100	2	-	-	Grade	Online	MCQ

Additional Courses for obtaining Honours or Minor Specialization

compulsory registration for one online course using SWAYAM/NPTEL/MOOC, evaluation through attendance, assignments and presentation

*Proficiency in course/subject – includes the weightage towards ability/skill/ competence /knowledge level /expertise attained /attendance etc. in that particular course/subject

MCQ – Multiple Choice Question, PP – Pen paper Mode, A+O – Assignment + Oral, SO – Submission+ Oral

Note: Student of 2021-22 admitted batch with an upper and complete an additional NEC course of 50 Hrs. duration Project Management & Financing — after which credential to learners individual (Drones/ Robots etc.)

** The Minor Project-I may be evaluated by an internal committee for awarding sessional marks.

Permitted to opt for maximum 02 additional courses for the award of Honours or Minor Specialization

Mode of Teaching

Theory — Online	Theory — Offline	Blended — Offline	Blended — Online	Lab — Offline	Seminar — Online Mentoring	NEX — Interactive	Total Credits
-	-	10	5	6	1	1	23
-	-	43%	22%	27%	4%	4%	Credits %

Mode of Examination

Theory — PP	Theory — A+O	Theory — MCQ	Lab — SO	SP/ST/PNEX — SO	Total Credits
12	-	3	4	4	23
52%	-	14%	17%	17%	Credits %

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ANNEXURE – VI

(Syllabus 5th Sem B.Tech Civil Engineering (2021-2022 Admitted Batch))

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ANNEXURE – VI

SYLLABUS FOR COURSES TO BE OFFERRED IN V SEMESTER (2021-2022 ADMITTED BATCH)

Course Code: 110511
Course Name: Water Supply Engineering

L	T	P	Credit
2	1	2	4

Courses Objectives:
Students will be able to understand
1) The structure of drinking water supply systems, including water transport, treatment and distribution.
2) Water quantity and water quality criteria and standards, and their relation to public health.
3) Operation and maintenance of water supply system components.
4) How to estimate water requirement of a city
5) How to design water treatment plant for urban & rural areas
6) How to design water distribution network including pipe & appurtenances.

Syllabus:

Unit-I
Water demand (types variation, factors affecting it), Design period, population forecasting methods, estimation of water requirement of cities, Sources of Water, Source selection, underground water quality & quantity, characteristics of water (laboratory method & effects), water borne diseases, standards for drinking water.

Unit-II
Water treatment flow diagram, design, construction, working of (Aerators, screens, plain sedimentation tank, tube settlers), coagulants & coagulation, flocculation, feeding and mixing of coagulants, optimum dose of coagulants, design & working of clarrifloculator, filtration (Theory & types), Design, operation & construction of slow sands & Rapid sand gravity filters, pressure filters.

Unit-III
Disinfectants (types) & disinfection method of disinfection, chlorine & chlorine compounds, types of chlorination, Hardness (Causes & types), various methods of softening, Recarbonation, calculation of chemical requirements, Removal of colour, odor, Taste, Iron & manganese, algae removal, fluoridation / defluoridation, desalination, latest treatment techniques.

Unit-IV
Intake structures (location, types & design), conduits for transporting water, forces on conduits, types of pressure pipe, joints, corrosion of pipe (causes & control), pipe appurtenances (design), pumping of water (numerical problems), types of pumps, Economical diameter of rising main (numerical), pumping stations.

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Unit-V

Requirement of good distribution system, layout of distribution, methods of distribution, Distribution reservoir and calculation of its capacity, fixing size of pipe, Analysis of pipe networks (Hardy cross method, Equivalent pipe method), appurtenances used in distribution networks, water supply & plumping system in building. Rural water supply.

Courses Outcomes:

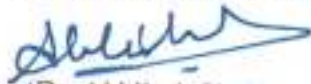Upon completion of the course, the students will be able to:

CO 1: **Explain** the concepts of water supply engineering.

CO 2: **Determine** the requirements for safe supply of water.

CO 3: **Apply** suitable water treatment technique based upon the available data.

CO 4: **Analyse** a given water supply scheme.

CO 5: **Design** a water supply system based upon the needs of society.

Text Books:

1. Water Supply Engg., B. C. Punmia, Laxmi Publication (P) Ltd. New Delhi, 2016
2. Water Supply Engg., S. K. Garg, Khanna Publishers New Delhi, 2017

Reference Books:

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhanpat Rai Publishing Company, 2014
2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6th edition, 2008
3. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill Publication, 2017
4. Manual of Water Supply and Treatment by CPHEEO, GOI, 2009

List of Experiments:

1. Determination of pH of a given water sample.
2. Determination of Total Solids, Dissolved Solids and Suspended Solids of water sample.
3. Determination of Chloride concentration in water sample.
4. Determination of turbidity of water sample using turbidity meter.
5. Determination of acidity of the water sample.
6. Determination of alkalinity of the water sample.
7. Determination of Hardness of the water sample.
8. Determination of D.O concentration of a given water sample.
9. Determination of optimum dose of coagulants required for the treatment of a given water sample.
10. Determination of MPN of the given water sample.
11. Determination of Sulphate of a given water sample.
12. Determination of Nitrate of a given water sample.

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

CO 1: **Follow** sampling procedure & other guidelines for sampling & analysis of water samples.

CO 2: **Check** various water quality parameters.

CO 3: **Improve** the water quality by suggesting suitable corrective measures.

CO 4: **Train** others on various ways of improving the quality of water.

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Course Code: 110512
Course Name: Theory of Structure - II

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To understand the analytical procedure related to the analysis of building frame by some classical methods viz. Kani's methods and approximate methods of analysis.

2) To study the multi storey frames subjected to gravity loads and lateral loads

3) To understand matrix method and its application for computer based analysis of structure.

4) To understand the influence line concepts for indeterminate structures

5) To develop the skill to deals with the problems of moving loads in the structures & their analysis techniques.

6) To understand the concepts of plastic analysis of structures.

Syllabus:

Unit – I

Moment distribution method in analysis of frames with sway, Analysis of box frames, analysis of beams and frames by Kani's methods.

Unit – II

Analysis of tall frames, Calculation of various loads including wind and earthquake loads, Introduction to Code provisions for lateral loads. Approximate analysis of multistorey frames for vertical and lateral loads.

Unit – III

Matrix Method of Structural Analysis: Force method and displacement method.

Unit-IV

Rolling Load and Influence Lines

Maximum SF & BM curves for various types of Rolling loads, EUDL, Influence Lines for determinate structural beams, Trusses, Three Hinged Arches.

Unit-V

Plastic analysis of beams & frames

Course Outcomes:

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

CO 1: Explain various methods for analysis of structures and frames.

CO 2: Analyse various loads on framed structures using codal provisions.

CO 3: Analyse different type of structures for various load conditions by different methods.

CO 4: Draw influence line diagrams for statically determinate & indeterminate structure.

CO 5: Analyse beams & frames using plastic analysis.

Text Books:

1. Intermediate structural analysis, Wang C.K., McGraw Hill, New York, 1984
2. Basic Structural Analysis, Reddy C. S., Tata McGraw Hill Publishing Company, 2017
3. Theory of Structures, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publications, 9th edition, 2014

Reference Books:

1. Elementary Structural Analysis, Norris C.H., Wilbur J.B. McGraw Hill Intenrational
2. Structural Analysis, Aslam Kassimali, C. L. Publisher, 2014
3. Structural Analysis, R. C. Hibbler, Pearson Publication, 2017
4. Indeterminate Structural Analysis, Kinney Sterling J., Addison Wesley
5. Matrix Methods of Framed Structures, Weaver W & Gere J. M., CBS Publishers, Delhi

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Course Code: 110513
Course Name: Structural Design & Drawing (RCC)

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To understand various design philosophies for RC components.
2) To study the desired properties of steel and concrete for use in Reinforced concrete.
3) To learn design of RC elements for flexure and deflection.
4) To learn design of RC elements for shear and bond as per relevant IS codes.
5) To learn design of RC elements subjected to compression.

Syllabus:

Unit-I

Design principles: Materials; Introduction to IS 456; Design philosophies: Working stress, Ultimate load and Limit state design

Singly reinforced beam sections: Analysis and design of singly reinforced rectangular beams: Lintel, Cantilever, Simply supported beams; Design for deflection.

Unit-II Design of Beams:

Design for Shear; Design for bond; Doubly-reinforced and Flanged sections; Design of Continuous beams

Unit-III Design of Slabs:

Slabs spanning in one direction: Cantilever, Simply supported and Continuous slabs; Slabs spanning in two directions; Circular slabs.

Unit-IV Columns & Footing:

Design of short columns subjected to axial loads, axial load and bending moments (section with no tension); Design of long columns; Introduction to IS 13920; Design of isolated and combined footings.

Unit-V Staircases:

Design of Staircases with waist slab: straight flight, dog legged, and open well staircase with different support conditions; Design of Tread-riser (without waist slab) staircase.

Course Outcomes:

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

CO1: Apply the concepts of different design philosophies for analysis and design of singly reinforced concrete beams using relevant IS Codes.

CO2: Analyze and design singly, doubly and flanged sections for flexure, shear and bond using relevant IS Codes

CO3: Design one way, two way and circular slabs using relevant IS Codes.

CO4: Analyze and design compression members and design footings using relevant IS codes.

CO5: Design different type of staircase using relevant IS codes

Text Books:

1. Reinforced Concerete Limit State Design, A.K. Jain, Nem Chand Pub.,7th edition, 2012
2. Reinforced Concrete, Pillai & Menon, Tata McGraw Hill, New Delhi, 3rd edition, 2017
3. Limit State Design, P.C. Varghese, Prentice Hall of India, New Delhi, 2nd edition, 2008
4. RCC Design, Neelam Sharma, Katson Publishers, 2014

Reference Books:

1. Reinforced Cement Concrete, P. Dayaratnam, Medtech Publishers, 5th edition, 2017.

2. Reinforced Concrete Design, S.N. Sinha, Tata McGraw Hill, 3rd edition, 2017

3. Plain and Reinforced Concrete, O.P. Jain and Jai Krishna, Nem Chand Pub.,8th edition,2008

4. Reinforced Cement Concrete, Winter & Nelson, McGraw Hill, 11th edition, 1991

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Course Code: 110514
Course Name: Fluid Mechanics – II

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To develop an understanding of fluid flows patterns and learnto use boundary layer theory and drag.
2) To apply theories of laminar & turbulent flow to solve typical pipe flow problems in the field.
3) To apply boundary layer theory to estimate drag &lift for various shapes of the objects.
4) To classify the types of flows in open channel and also to design open channel sections in a most economical fashion with minimum wetted perimeter and learn about critical flows.
5) To study about non uniform flows in open channel and longitudinal slopes in open channel and also to learn about the characteristics of hydraulic jump.
6) To understand design philosophy of various types of pumps & turbines.

Syllabus:

Unit-I

Turbulent Flow: Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically rough boundaries, velocity distribution in turbulent flow, Resistance of smooth and artificially roughened pipes, Commercial pipes, aging of pipes.

Pipe Flow Problems: Losses due to sudden expansion and contraction, losses in pipe fittings and valves, Concepts of equivalent length, Hydraulic and energy gradient lines, Siphon, Pipes in series, in parallel, Branching of pipes.(Hardy Cross method)

Pipe Network: Water hammer (only quick closure case) transmission of power.

Unit - II Forces on immersed bodies:

Introduction, Force Exerted by a flowing fluid on a stationary body, Expression for Drag & Lift, Drag on a sphere, Terminal velocity of a Body, Drag on a cylinder, Introduction to Development of Lift on a Circular Cylinder and an Airfoil

Unit – III Uniform Flow in open Channels:

Channel geometry and elements of channel section, Velocity distribution, Energy in open channel flow, Specific energy, Types of flow, Critical flow and its computations, Uniform flow and its computations, Chezy's and Manning's formulae, Determination of normal depth and velocity, Normal and critical slopes, Economical sections.

Unit - IV Gradually varied flow

Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow-hydraulic jump in rectangular channels and its basic characteristics, Surges in open channels.

Unit - V Introduction to Fluid Machinery: Turbines & Pumps

Turbines: Classifications, definitions, Similarity laws, Specific speed and unit quantities, Pelton turbine – their construction and settings, Speed regulation, Dimensions of various elements, Action of jet, Torque, Power and efficiency for ideal case, Characteristics curves, Reaction turbines construction & setting, Draft tube theory, Runaway speed, Simple theory of design and characteristic curves, Cavitation.

Pumps: Principle of working & criteria for selection of different types of pump, viz. Centrifugal, Reciprocating.

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

CO 1: Differentiate different types of fluid flow & fluid machinery.

CO 2: Describe principles of analysis of fluid flow problem.

CO 3: Explain basic principles for measurement of different forces acting on fluid body.

CO 4: Analyze pipe flow, open channel flow problems & various characteristics of hydraulic machines.

CO 5: Design open & closed conduit systems.

Text Books:
1. Fluid Mechanics, Modi & Seth, Standard Book house, Delhi, 21st edition, 2017
2. Open Chanel Flow, K. Subramanya, Tata McGraw Hill, New Delhi, 5th edition, 2019

Reference Books:
1. Open Channel Flow, Rangaraju, Tata Mc Graw Hill Publishing Comp. Ltd., New Delhi, 1st edition, 2001
2. Fluid Mechanics, A.K. Jain, Khanna Publishers, Delhi, 1988
3. Fluid Mechanics, Hydraulics & Hydraulic Mechanics, K.R. Arora, Standard Publishers, 2009
4. Open Channel Hydraulics, Chow V.T., McGraw Hill, New York, 57th edition, 2009

Course Code: 110515
Course Name: Minor Project – I

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To develop an appreciation of civil engineering problems & have a feel of real life situations in planning & execution of projects.
2) To impart training of handling various types of civil engineering problems by use of conventional methods as well as software's.
3) To utilize the expertise in engineering to solve industry's technological problems.
4) To become innovative and professional in technology development, and system implementation.
5) To be able to function in their profession with social awareness and responsibility.
6) To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.
7) Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

Syllabus:

Each candidate shall work on an approved project of a public building or any other civil engineering work and shall submit design and a set of drawings.

OR

Shall submit a detailed report of experimental work / software package on any specific problem of importance.

Course Outcomes:

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

CO 1: Recognize various engineering problems and techniques to solve them.
CO 2: Reproduce the solution of the problems upon the need of society.
CO 3: Cooperate to work within group.
CO 4: Develop the writing and communication skills for various engineering problems.
CO 5: Display lifelong learning.

Course Code: 110516
Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To encourage students to read, study & understand different topics of civil engineering published in articles, literatures.
2) To help in presenting different topics of civil engineering and related subjects to supplement theoretical knowledge gained in class.
3) To make student acquire good oral & written communication skills.
4) To promote the habit of lifelong learning.
5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

Syllabus:

1. Any relevant topic related to civil engineering from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

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

CO 1: Analyze contemporary issues in civil engineering & its allied areas through literature survey.

CO 2: Distinguish state of art & relevance of the topic in national & international arena.

CO 3: Demonstrate good oral & written communication skills.

CO 4: Develop poster and power point presentations for effective communication.

CO 5: Display lifelong learning.

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Course Code: 110517
Course Name: Summer Internship Project – II

L	T	P	Credit
0	0	4	2

Course Objectives:
1) To make student acquire good oral & written communication skills.
2) To promote the habit of lifelong learning.
3) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.
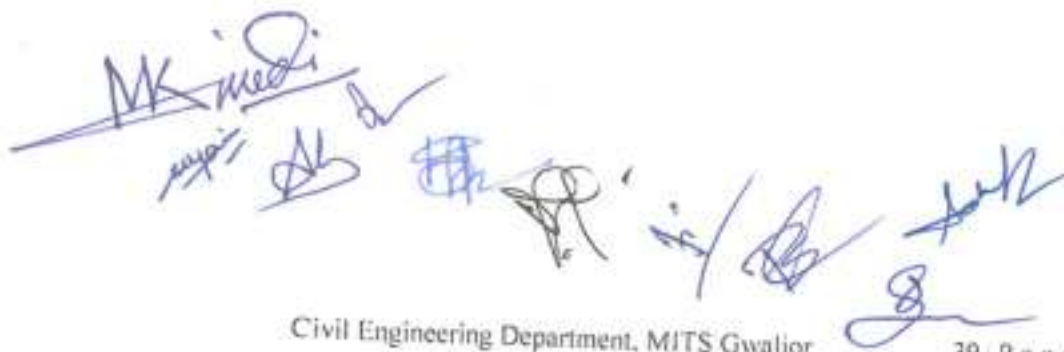
Syllabus:
Each candidate shall have to undergo 15 days in house summer internship related to soft skills at the institute after the completion of their 4th Semester exams (in summer vacations) and after successful completion of internship they have to submit detailed report.

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

CO 1: **Develop** the writing and communication skills for various engineering problems.

CO 2: **Adapt** lifelong learning for benefit of society.

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DATA SCIENCE (COURSE CODE 110520)

COURSE OBJECTIVES:

- To provide the fundamental knowledge of Data Science.
- To present the basic representation and exploratory data analysis used in DataScience.
- To understand the working of techniques used in Data Science.

Unit 1

Need for data science, benefits and uses, facets of data, data science process, Introduction of basics python tool, Setting working Directory, Creating and saving a script file, File execution, removing variables from environment, clearing environment, Commenting script files, Variable creation, Data types and associated operations, Arithmetic and logical operators.

Unit 2

Control structures, loop, Functions, data structures: Lists, Arrays, Tuples, Dictionary, Sets, NumPy library, Data Collection: Getting to know your data, Types of Data, Data collection strategies, Data Pre-processing, Feature engineering, Exploratory Data Analytics.

Unit 3

Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, inferential statistics: hypothesis testing, probability: probability theory, conditional probability, Pandas library, dataframe and dataframe related operations, Reading files.

Unit 4

Data Cleaning and Preparation, Handling Missing Data, Data Transformations using pandas and sklearn library, Removing Duplicates, Replacing Values, Detecting Outliers. Data visualization on different dataset using matplotlib and seaborn libraries. Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.

Unit 5

Supervised learning: Regression, classification, Linear regression, logistic regression, decision tree, tree creation with entropy and information gain, ID3 algorithm, random forest, naïve bayes theorem, K-nearest neighbor and ensemble methods for solving real world problems, Unsupervised learning: Clustering, Reinforcement learning.

BOOKS AND REFERENCES

1. Mastering python for data science, Samir Madhavan
2. Introduction to linear algebra - by Gilbert Strang
3. Applied statistics and probability for engineers – by Douglas Montgomery
4. Pattern Recognition and Machine Learning, Christopher M. Bishop

COURSE OUTCOMES:

After completing the course, the student will be able to:

CO1: define different Data Science techniques.
CO2: illustrate various tools used for Data Science technique.
CO3: apply data visualization techniques to solve real world problems.
CO4: build exploratory data analysis for Data Science methods.
CO5: apply Data Science techniques for solving real world problems.
CO6. evaluate the performance of algorithms in data science.

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List of Programs

1. Perform creation, indexing, slicing, concatenation and repetition operations on Python built – in data types: Strings, List, tuples, dictionary, set

2. Solve problems using decision and looping statements.

3. Apply python built-in data types: Strings, List, tuples, dictionary, set and their methods to solve any given problem.

4. Handle numerical operations using math and random number functions

5. Maniulation of NumPy arrays – Indexing, Slicing, Reshaping, Joining and Splitting.

6. Computation on NumPy arrays using universal functions and mathematical methods.

7. Import a CSV file and perform various statistical and comparison operations on rows/columns.

8. Create Pandas series and data-frame from various inputs.

9. Import any CSV file to Pandas data-frame and perform the following –
   - Visualize the first and last 10 records
   - Get the shape, index and column details
   - Select / Delete the rows / columns based on conditions
   - Perform ranking and sorting operations
   - Do required statistical operations on given columns
   - Find the count and uniqueness of the given categorical values
   - Rename single / multiple files

10. Import any CSV file to Pandas data-frame and perform the following –
    - Handle missing data by detecting and dropping / filling missing values.
    - Transform data using different methods
    - Detect and filter outliers
    - Perform vectorized string operations on Pandas series
    - Visualize data using line plots, bar pots, histograms, density plots and scatter plots

11. Use the scikit-learn package in python to implement the regression model and its related methods

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Course Code: 1000006

Course Name: Disaster Management

L	T	P
2	-	-

Course Objectives:

i) To understand basic concepts in Disaster Management
ii) To understand Definitions and Terminologies used in Disaster Management
iii) To understand Types and Categories of Disasters
iv) To understand the Challenges posed by Disaster
v) To understand Impact of Disasters key skills

Syllabus:

Unit 1: Introduction to disaster management, concepts and definitions: disaster, vulnerability, risk severity, frequency and details, capacity impact, prevention, mitigation.

Unit 2: Disasters – Disasters classification, demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends, hazard and vulnerability profile of India.

Unit 3: Disaster Impacts – Disaster impact (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues, impact of natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides etc.), impact of manmade disasters (industrial pollution, artificial flooding in urban areas, urban disasters, transportation accidents etc.).

Unit 4: Disaster Risk Reduction (DRR)- Disaster management cycle- its phases; prevention, mitigation, preparedness, relief and recovery; structural and non- structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response, Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster management, DRR programmes in India and the activities of National Disaster Management Authority.

Unit 5: Disasters, Environment and Development – Factors affecting vulnerability such as impact of development projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Course Outcomes:

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

CO1: Identify disaster prevention and mitigation approaches.
CO2: Classify global and national disasters, their trends and profiles.
CO3: Determine the impacts of various disasters.
CO4: Apply Disaster Risk Reduction in management.
CO5: Infer the linkage between disasters, environment and development.

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Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
3. Srivastava H.H. & Gupta G.D., Management of Natural Disasters in developing countries, DayaPublishers Delhi, 2006.

Reference Books:

1. http://ndma.gov.in (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in / (National Disaster Management in India)
3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
4. National Disaster Management Policy, 2009, GOI.
5. Inter Agency Standing Committee (IASC) (Feb. 2007), IASC Guidelines on Mental Health andPsychosocial Support in Emergency Setting. Geneva: IASC

ANNEXURE – VII

(Suggestive List of Skill Based Mini Projects for B.Tech Vth Semester Civil)

ANNEXURE – VII

Suggestive List of Skill Based Mini Projects for B.Tech Vth Semester

110511, Water Supply Engineering:

1. Estimation of drinking water requirement for various locations including new upcoming localities in and around Gwalior city.
2. Design of water supply & distribution layout system for various new upcoming localities in and around Gwalior city.
3. Study of existing water supply & distribution scheme available for Gwalior city and suggest improvement in it.
4. Study of existing water supply sources and determination of water quality of those sources.
5. Determination of water quality characteristics of various localities in and around Gwalior city.
6. Draw a water quality map for various localities in and around Gwalior city.
7. Comparative analysis of water quality between Municipal Corporation supplied water in city & R.O. treated water.
8. Study of new water treatment plant in the city.
9. Design of water treatment system for new upcoming localities in and around Gwalior city.
10. Performance evaluation of existing water treatment plants in city.

ANNEXURE – VIII

(Scheme & Syllabus 3rd Sem B.Tech Civil Engineering (2022 Admitted Batch)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Department of Civil Engineering

Scheme of Evaluation

B. Tech. III Semester CIVIL ENGINEERING

(for batch admitted in academic session 2022-23)

No.	Subject Code	Category Code	Subject Name	Theory Slot — End Term Evaluation: End Sem Exam	$Proficiency in subject /course	Continuous Evaluation: Mid Sem. Exam.	Quiz/ Assign ment	End Sem. Exam	Practical Slot — Continuous Evaluation: Lab Work & Sessional	Skill Based Mini Project	Total Marks	L	T	P	Total Credits	Mode of Teaching	Mode of Exam	Duration of Exam
1.	2100025	BSC	Engineering Mathematics – II (BSC – 2)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
2.	2110321	DC	Fluid Mechanics – I (DC – 5)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	PP	2 Hrs
3.	2110322	DC	Theory of Structure – I (DC – 6)	50	10	20	20	-	-	-	100	2	1	-	3	Blended	PP	2 Hrs
4.	2110323	DC	Geotechnical Engineering (DC – 7)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	MCQ	1.5 Hrs
5.	2110324	DC	Transportation Engineering (DC – 8)	50	10	20	20	60	20	20	200	2	1	2	4	Blended	MCQ	1.5 Hrs
6.	2110325	DLC	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)*	-	-	-	-	-	40	-	40	-	-	2	1	Online + Mentoring	SO	-
7.	2110326	DLC	Summer Internship Project–I (Institute Level) (Evaluation)	-	-	-	-	60	-	-	60	-	-	4	2	Offline	SO	-
8.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	50	-	-	2	1	Interactive	SO	-
			Total	250	50	100	100	290	100	60	950	10	5	14	22	-	-	-
9.	3000001	Natural Sciences & Skills	Engineering Physics	50	10	20	20	30	10	10	150	1	-	2	GRADE	Blended	MCQ	1.5 Hrs
10.	1000005	NAC	Project Management & Financing	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs

*compulsory registration for any online course using SWAYAM/NPTEL/MOOC, evaluation through attendance, assignments and presentation

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject Natural Sciences & Skills: Engineering Physics / Engineering Chemistry /Environmental Engineering /Language, Credits of natural Sciences & Skills will be added in VI Semester; MCQ: Multiple Choice Question AO: Assignment + Oral   OB: Open Book   PP: Pen Paper   SO: Submission + Oral

Mode of Teaching

	Theory			LabSIP			Seminar		NEC
	Online	Offline	Blended	Online	Offline	Blended	Online	Mentoring	Interactive
			15		5		1		1
			68%		22%		5%		5%

Mode of Examination

	Theory			Lab	SIP/SLPWEX	Total Credits
	PP	AO	MCQ	SO	SO	
	9		6	3	4	22
	41%		27%	13%	19%	Credits %

Civil Engineering Department, MITS Gwalior

DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS B.Tech Civil Engineering

2022 ADMITTED BATCH

SEMESTER-III

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Course Code: 2110321
Course Name: Fluid Mechanics - I

L	T	P	Credit
2	1	2	4

Course Objectives:

1) To understand fluid properties and concept of fluid continuum.
2) To understand the concepts of kinematics & dynamics of fluid flow.
3) To apply fluid flow principles to various fluid flow problems.
4) To understand the mechanism of fluid measurement.
5) To understand the method of simulation & dimensional analysis.
6) To understand the concepts of laminar flow.

Syllabus:

Unit I

Review of Fluid Properties: Engineering units of measurement, density, specific weight, specific volume, specific gravity, surface tension, capillary, viscosity, bulk modulus of elasticity, pressure and vapour pressure.

Fluid Statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems – gravity dams and Tainter gates), buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit II

Kinematics of Flow: Types of flow-ideal & real, steady and unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streamlines, streamlines and stream tubes, continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flownets-their utility & method of drawing flownets.

Unit III

Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum equation, forces of fixed and moving vanes, velocity triangles.

Fluid Measurements: Velocity measurement, flow measurement (Orifices, nozzles, mouth pieces, orifice meter, Nozzle meter, venturimeter, weirs and notches).

Unit IV

Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, dimensional homogeneity, use of Buckingham-pie theorem, calculation of dimensionless numbers, similarity laws, specific model investigations (submerged bodies, partially submerged bodies, weirs, spillways, etc.)

Unit V

Laminar Flow: Introduction to laminar, transition & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, laminar flow through porous media, stokes law, Bach wash processing, Instability of laminar flow to turbulent flow.

Course Outcomes:

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

CO 1: Define various fluid properties & states of fluid.

CO 2: Apply principles of fluid flow & dimensional analysis.

CO 3: Solve fluid flow problems.

CO 4: Analyze characteristics of fluid at rest, fluid at motion & dimensionless numbers.

CO 5: Discriminate different types of fluid flow, measurement techniques & principles.

CO 6: Apply the concepts of laminar flow in solving various fluid flow problems.

Text Books:

1. Fluid Mechanics, Modi & Seth, Standard Book House, Delhi, 21st edition, 2018.
2. Fluid mechanics, Girde & Mirazgaonkar, SCI Tech Publishers, 2019
3. Fluid Mechanics, R.K. Bansal, Laxmi Publishers, 2015

Reference Books:

1. Fluid Mechanics, A.K. Jain, Khanna Publishers, Delhi, 2014
2. Fluid Mechanics, Streeter, McGraw Hill Publishers, 9th edition, 2017

List of Experiments:

1. Determination of viscosity of fluid by redwood viscometer
2. Determination of metacentric height of floating body
3. Calibration of Venturimeter
4. Determination of Cc, Cd, Cv of Circular Orifice
5. Calibration of Mouthpiece
6. Calibration of Orifice Meter
7. Reynolds experiment for demonstration of stream lined & turbulent flow
8. Determination of Friction Factor for a pipe
9. Verification of Stoke's law.

Course Outcomes:

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

CO 1: Differentiate between different flow measurements devices.

CO 2: Notice flow through pipes & fall velocity of particle.

CO 3: Correct the instrumental errors.

CO 4: Apply Stoke's law to calculate terminal velocity.

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Course Code: 2110322

Course Name: Theory of Structure - I

L	T	P	Credit
2	1	0	3

Course Objectives:

1) To develop an understanding of the behavior of structure under serviceability load.

2) To understand the mechanics of the material behavior of different type of structures.

3) To understand the concepts of analysis of indeterminate structures by various classical methods.

4) To make student aware of different methods of structural analysis.

Syllabus:

Unit-I

Deflection of beams: Energy Methods, Castigliano's theorem, method of real work, Principle of virtual work, method of virtual work for beam displacements.

Unit-II

Deflection of determinate trusses, Analysis of indeterminate trusses, Principle of least work.

Unit – III

Indeterminate Structures –I: Static and Kinematics indeterminacy, Analysis of Fixed and continuous beams by Theorem of three moments. Effect of sinking and rotation of supports.

Unit-IV

Indeterminate Structures – II: Analysis of beams and analysis of frames (with and without sway) by slope Deflection method.

Unit-V

Moment Distribution Method: Moment distribution method for analysis of beams and analysis of frames (without sway) Three hinged arches of different shapes. Eddy's Theorem. Two Hinged and Fixed Arches.

Course Outcomes:

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

CO 1: Classify different type of structures based on support conditions.

CO 2: Explain various methods & principles for analysis of structures.

CO 3: Apply various methods & principles for structural analysis.

CO 4: Analyse various structures using various methods, principles & theorems.

CO 5: Evaluate different methods of structural analysis.

Text Books:

1. Basic Structural Analysis, Reddy C. S., Tata McGraw Hill Publishing Company, 2017
2. Theory of Structures, S. Ramamrutham, R. Narayanan, Dhanpat Rai Publications, 9th edition, 2014
3. Theory of Structures, B.C. Punmia, Laxmi Publications, 2017

Reference Books:

1. Structural Analysis – A Unified classical and matrix Approach, Ghali A. & Neville M. Chapman and Hall, New York, 6th edition, 2009

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2. Intermediate structural analysis, Wang C.K., McGraw Hill, New York, 1984
3. Structural Analysis, Aslam Kassimali, C. L. Publisher, 2014
4. Structural Analysis, R. C. Hibbler, Pearson Publication, 2017

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Course Code: 2110323
Course Name: Geotechnical Engineering

L	T	P	Credit
2	1	2	4

Course Objectives:

1) The students will get the basic knowledge about natural material like rocks and get acquainted with natural dynamic processes and their actions.

2) The students will know the significance of geological investigations for civil engineering projects and site selection.

3) To inculcate the basic knowledge of soil such as its identification and classification, determination of various engineering properties and its suitability as a foundation/subgrade material.

4) To develop an understanding of the relationships between physical characteristics and mechanical properties of soils by experimentally measuring them.

5) To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated.

6) To determine shear parameters and stress changes in soil due to foundation loads & estimate the magnitude and time-rate of settlement due to consolidation.

7) To apply the principles of soil mechanics in stability analysis of slopes and settlement calculations.

Syllabus:

Unit-I Engineering geology & soil properties

Introduction to geology, mineralogy, petrology – Three-fold classification of rocks and their characteristic features. Structural geology - Types and classification of structures (Joints, Unconformities, Folds and faults) and their effect on civil engineering projects.

Introduction – Types of soils, their formation & deposition, basic definitions and relationships - Three phase system, Index properties of soil and their determination. Relationship between volume weight, void ratio-moisture content, moisture content-specific gravity, and unit weight- air voids etc.

Plasticity Characteristics of soil & indices and their determination, use of consistency limits, Classification of soil based on particle size and consistency limits, unified soil classification systems, Indian standard soil classification system, general characteristics of soil in different groups.

Unit-II Soil Water and Consolidation:

Permeability of soil: Darcy law and its validity, Determination of permeability in laboratory and in field using various methods like constant head method, pumping tests etc, factors affecting permeability of soil, Seepage analysis – introduction, stream & potential functions, flow nets, uses of a flow net, Introduction to effective, neutral and total stresses, effect of water table, fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

Consolidation – Introduction, Compressibility and consolidation, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's Theory of consolidation, final settlement of soil deposits, Determination of consolidation settlement and secondary consolidation.

Unit-III Stress Distribution in Soils:

Stresses in soil – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area, influence factors, isobars, Boussinesq's equation, westergaard's analysis, Newmark's influence chart, Contract pressure under rigid & flexible area, computation of displacements from elastic theory.

Unit – IV Shear Strength of Soils:

Mohr Circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr–

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Coulomb's theory, types of shear tests, direct shear test, merits of direct shear test, Triaxial compression test, test behaviour of UU, CU and CD tests, pore-pressure measurements, computation of effective shear strength parameters, unconfined compression test, vane shear test, critical void ratio, Liquefaction.

Unit – V Stability of Slopes:

Introduction, Types of slopes and their failure mechanisms, factor of safety, analysis of Infinite and finite slopes, wedge failure, Swedish circle method, friction circle method, stability numbers and charts, Effect of ground water. Selection of shear strength parameters in slope stability analysis. Stability of Earth dams.

Course Outcomes:

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

CO1: **Evaluate** different properties of rocks & soil and its classification.

CO2: **Examine** the flow and shear parameters & their effects on various types of soil.

CO3: **Determine** the stress distribution & shear failure by various methods.

CO4: **Evaluate** the shear strength parameter of soil by various methods.

CO5: **Analyse** the stability of slopes using various methods.

Text Books:

1. Soil Mech. & Found. Engg., Dr. K.R. Arora, Std. Publishers Delhi, 7th Edition, 2014
2. Soil Mech. & Foundation, Dr. B.C. Punmia, Laxmi Publications, Delhi, 16th Edition, 2017
3. Basic & Applied Soil Mechanics, Gopal Ranjan, New Age International Publishers, 2016
4. Parbin Singh., "Engineering and General Geology", S. K. Kataria and Sons, 2009

Reference Books:

1. Modern Geotech Engg. Dr. Aram Singh, IBT Publishers, Delhi, 8th Edition, 2016
2. Geotech Engg., C. Venkatramaiah, New Age International Publishers, 16th Edition, 2018
3. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc. 1969
4. Bangar, K.M, Principles of Engineering Geology, Standard Publishers Distributors, 1995, New Delhi

List of Experiment's:

1. Moisture Content Determination. Oven Drying Method.
2. Grain Size Analysis – Mechanical Method.
3. Grain Size Analysis – Hydrometer Method.
4. Liquid Limit, Plastic Limit, Shrinkage Limit Tests.
5. In-Place Density tests – Core Cutter Method, Sand Replacement Method.
6. Specific Gravity Tests.
7. Permeability Tests. Variable Head Method.
8. Compaction Test.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Triaxial Shear Test (UU)
12. Vane Shear Test.
13. Plate Load Test (Demonstration)
14. Consolidation Test.
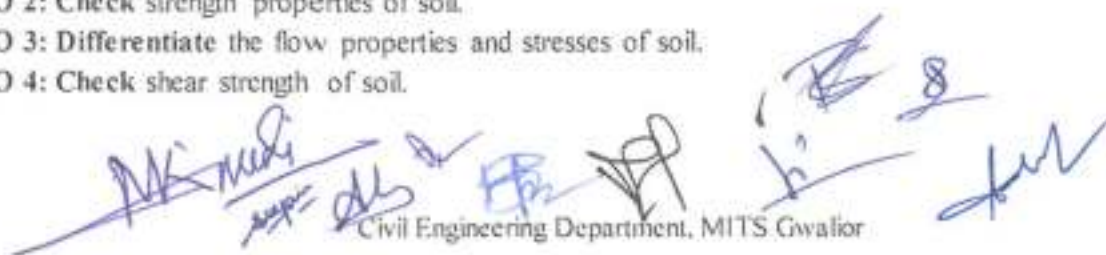
Upon completion of practical course, the students will be able to:

CO 1: Check physical properties of soil.

CO 2: Check strength properties of soil.

CO 3: Differentiate the flow properties and stresses of soil.

CO 4: Check shear strength of soil.

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Course Code: 2110324
Course Name: Transportation Engineering

L	T	P	Credit
2	1	2	4

Course Objectives:

1) To study the planning aspects of roads & highway.

2) To study the geometric design aspects of highway and road.

3) To know about pavement material and design.

4) To understand the construction process and methods of roads & highway.

5) To study about traffic characteristics and design of intersections.

Syllabus:

Unit – I Highway Development and Planning

Highway Development in India — Necessity for Highway Planning – Different Road Development Plans; Classification of Roads. Road Network Patterns — Highway Alignment- Factors affecting Alignment- Engineering Surveys.

Unit – II Highway Geometric Design

Importance of Geometric Design – Design controls and Criteria – Highway Cross Section Elements – Sight Distance Elements – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance – Design of Horizontal Alignment – Design of Super elevation and Extra widening – Design of Transition Curves – Design of Vertical alignment - Gradients-Vertical curves.

Unit – III Traffic Studies

Spot Speed Studies and Volume Studies. Speed and Delay Studies purpose. causes of delay, methods of conducting speed and delay studies, Origin and destination Studies (O & D): Various methods, collection and interpretation of data, Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service, Parking Studies: Methods of parking studies, design of intersections at grade & grade separated.

Unit -IV

Highway Construction Materials: Aggregates and their types, physical and engineering properties, Fillers, Bitumen, Characteristics, Emulsions and cutbacks, Basic tests on all materials.

Design of Flexible & Rigid Pavements: Introduction, flexible pavement, factors affecting design and performance, stress in flexible pavement, design of flexible pavement as per IRC, rigid pavements – components & functions, factors affecting design & performance of CC pavements, stress in rigid pavement, type of joints, dowel bar, tie bar and its functionalities.

Unit – V Evaluation and Maintenance of Pavements

Pavement distress in flexible and rigid pavements, Pavement evaluation, structural evaluation, evaluation by deflection measurements, Strengthening of pavements, Types of maintenance, Importance of highway drainage, Surface and sub-surface drainage arrangements.

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Course Outcomes:

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

CO 1: Explain the principles of highway planning & their geometrical design.

CO 2: Evaluate physical properties of suitable highway engineering materials with drainage provisions.

CO 3: Apply the concepts of traffic engineering in transportation planning.

CO 4: Design pavements as per regulations.

CO 5: Formulate the layers of pavement along with provisions of its drainage & maintenance.

Text Books:

1. Highway Engineering, S.K. Khanna & C.E.G. Justo, Nemchand Pub., 10th edition, 2018
2. Highway Engineering, Gurucharan Singh, Standard Publishers, 5th edition, 2006
3. Principles & Practices of Highway Engineering, L R Kadiyali, N B Lal, Khanna Publishers, 2016

Reference Books:

1. Principles of Pavement Design, E.J. Yoder & M.W. Witzech, Wiley India, 2nd edition, 2011
2. Highway Engineering, O' Flaherty, Butterworth-Heinemann, 4th edition, 2002
3. Principles of Practice of Highway Engg., Sharma & Sharma, Asia Publishing House, 1965
4. Analysis and Design of Pavements, Haung, Pearson, 2nd edition, 2004

List of Experiments:

1. Aggregate Crushing Value Test
2. Determination of Aggregate Impact Value
3. Determination of Los Angeles Abrasion Value
4. Determination of flakiness index and elongation index of aggregates.
5. Determination of California Bearing Ratio Value
6. Determination of Penetration Value of Bitumen
7. Determination of Viscosity of Bituminous Material
8. Determination of Softening Point of Bituminous Material
9. Determination of Ductility of the Bitumen
10. Determination of Flash Point and Fire Point of Bituminous Material
11. Determination of Bitumen Content by Centrifuge Extractor
12. Determination of Stripping Value of Road Aggregate
13. Determination of Marshall Stability Value for Bitumen.

Course Outcomes:

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

CO 1: Select suitable aggregate material by testing the physical properties.

CO 2: Determine properties of bitumen and its grade.

CO 3: Determine CBR value of material for subgrade and subsequent layers of pavement.

CO 4: Design job mix formula for bituminous surface using Marshal Stability test

Course Code: 2110325
Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To encourage students to read, study & understand different topics of civil engineering published in articles, literatures.

2) To help in presenting different topics of civil engineering and related subjects to supplement theoretical knowledge gained in class.

3) To make student acquire good oral & written communication skills.

4) To promote the habit of lifelong learning.

5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

Syllabus:

1. Any relevant topic related to civil engineering from within or beyond the syllabus through Swayam / NPTEL /MOOC.

Course Outcomes:

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

CO1: **Analyze** contemporary issues in civil engineering & its allied areas through literature survey.

CO2: **Distinguish** state of art & relevance of the topic in national & international arena.

CO3: **Demonstrate** good oral & written communication skills.

CO4: **Develop** poster and power point presentations for effective communication.

CO5: **Display** lifelong learning.

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Course Code: 2110326
Course Name: Summer Internship Project - I

L	T	P	Credit
0	0	4	2

Course Objectives:

1) To encourage students to read, study & understand different topics of civil engineering
2) To make student acquire good oral & written communication skills.
3) To promote the habit of lifelong learning.

Syllabus:

Each candidate shall have to undergo 15 days in-house summer internship at the institute after the completion of their 2ⁿᵈ Semester exams (in summer vacations). Candidate can choose from various modules which are offered by the institute and after successful completion of internship they have to submit detailed report.

Course Outcomes:

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

CO1: **Observe** various activities in field.

CO2: **Examine** the utility of general and specific equipments for construction.

CO3: **Differentiate** the construction projects individually and in team.

CO4: **Develop** the writing and communication skills for various engineering problems.

CO5: **Adapt** lifelong learning for benefit of society.

Course Code: 1000005

Course Name: Project Management and Financing

L	T	P	Credit
2	0	0	GRADE

Course Objectives:

1) To know about project, its attributes and essentials of project planning

2) To develop the project network

3) To take rational decisions using project networks for successful completion of the projects

4) To decide about about rational utilization of resources in project.

5) To have an elementary idea of finances involved in a project and managing it

Unit I:

Project Planning:

Introduction to Project Management, Difference between Project and Production, Attributes of a Project: Time, Cost, Quality and Safety, Stakeholders of a Project, Project life cycle. Project Planning: Types of Project Plans and feasibility.

Unit-II:

Project Network logic: Project Networking and work flows, Activity duration and methods of estimating activity duration – One time estimate three time estimates, Duration estimation procedure. Use of Bar Charts, Mile stone charts and networks, Network representation schemes: Activity on Arrow and Activity on Node Networks (A-o-A & A-o-N), Logic behind developing project network and simple network calculations, Critical paths and floats.

Unit-III:

Decision making through networks: CPM, PERT & PDM:

Use of network in Decision Making: Importance of critical path, Monitoring the progress and updating the project plan. Use of floats in Resource smoothening, Introduction to Precedence Diagramming Method (PDM), Different lag and lead relations in terms of SS(Start to Start), SF(Start to Finish), Finish to Start(FS), and Finish to Finish(FF) and composite relations.

Unit-IV:

Project Cost Control: Breakeven analysis in planning stage, Direct and indirect cost, slope of direct cost curve, Total project cost and optimum duration, contracting the network for cost optimization, Escalation & Variation in prices.

Unit-V:

Projects Financing:

Introduction to project financing: Role of governments in financing projects. Funder and Concessionaire: Economic multiplier effects of Projects: Means of financing-public finance and private finance. Granting authority: World Bank Group, IMF,ADB, Micro and Small Enterprises Funding Scheme (MSME), Elementary understanding of Procurement of infrastructure projects through Public Private Partnership (PPP) route. Build Operate Transfer (BOT), Build Operate Own & Transfer (BOOT): Stakeholders' perspectives. Lifecycle of PPP projects. Micro & Macro economics concepts and its application in Project Financing.

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Course Outcomes

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

CO 1: Know the attributes of project and its different phases.

CO 2: Develop the project network based on work breakdown structure and esimation of activity durations

CO 3: Analyze the project network and make **decide** the various alternates.

CO 4: Evaluate the optimum cost of project for assigned deadlines.

CO 5: Understand the different options to arrange the finances to complete it within stipulated time

Recommended Text-Books:

1. Project Management Scheduling PERT and CPM by Dr. B.C. Punmia, K.K. Khandelawal
2. PERT & CPM Principles and Applications by L.S. Srinath, Affiliated EWP Pvt. Ltd.
3. Project Planning and Control by Albert Lester, Fourth Edition Elsevier Butterworth-Heinemann.

Recommended Reference Books:

1. A Management Guide to PERT/CPM With GERT/PDM/DCPM and Other networks by Jerome D. Wiest, Ferdinand K. Levy, Prentice Hall.
2. Project Management with CPM and PERT by Joseph J . Moder, Cecil R . Phillips. Van Nostrand Reinhold Company

ANNEXURE – IX

(List of Skill Based Mini Projects for B.Tech IIIrd Semester Civil)

ANNEXURE – IX

Suggestive List of Skill Based Mini Projects for B.Tech IIIrd Semester

2110321, Fluid Mechanics - I:

1. Determination of Metacentric height of different shapes
2. Comparison of velocity measurement by orifice & pitot tube
3. Verification of Bernoulli's theorem for pipe flow & tank
4. Verification of Stoke's law for different liquid
5. Determination of Reynold's Number for different fluid.

2110323, Geotechnical Engineering:

1. Use of locally available waste materials as a soil stabilizer.
2. Improvement of swelling properties of black cotton soil using agricultural waste.
3. Effectiveness of modern reinforcing materials such as coir fibers, jute fibers, rubber tyre chips etc. in California Bearing Ratio based Flexible pavement design.
4. Study the Stress-strain behavior of soil mixed with poly propylene fibers using direct shear test.
5. Examine the variation in A-line curve of stabilized cohesive soil along with all the Atterberg's limits.
6. Identify the Swelling pressure of Black cotton soil and observed its usefulness as a foundation material of any single-storey building.

2110324, Transportation Engineering:

6. Identification of black spots.
7. Safety audit & rectification of black spots.
8. Use of local materials in rigid pavement
9. Effect of long term ageing on the performance of bituminous mix.
10. Identification of pavement distress and its remediation.
11. Traffic census of urban roads.
12. Analysing the effect of salinity of water on compressive strength of cement concrete.
13. Analyzing the effect of particle size of aggregates in compressive strength or pervious paver block.
14. Analyzing the effect of sugar as retarder on properties of OPC
15. Potential utilization of recycled aggregate waste on mechanical properties of cement concrete.

ANNEXURE – X

(Scheme & Syllabus 1st Sem B.Tech Civil Engineering (2023 Admitted Batch)

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Department of Civil Engineering
Scheme of Evaluation
B. Tech. I Semester CIVIL ENGINEERING
(for batch admitted in academic session 2023-24)

No.	Subject Code	Category Code	Subject Name	End Sem. Exam	*Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assign- ment	End Sem. Exam	Lab Work Based Sessional	Skill Based Mini Project	Total Marks	L	T	P	Total Credits	Mode of Teaching	Mode of Exam	Duration of Exam
1.	3100011	BSC	Engineering Mathematics–I (BSC - 1)	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
2.	3110121	ESC	Computer Programming (ESC - 1)	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	3100014	ESC	Engineering Graphics (ESC - 2)	50	10	20	20	-	-	-	100	1	2	-	3	Offline	AO	3 Hrs
4.	3110122	DC	Building Materials & Construction (DC - 1)	50	10	20	40	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
5.	3110123	DC	Engineering Mechanics (DC - 2)	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
6.	3100018	ESC	Engineering Graphics Lab (ESC – 3)	-	-	-	-	40	30	30	100	-	-	2	1	Offline	SO	-
		Total		250	50	100	100	120	90	90	800	12	4	6	19			
7.	3000003	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	-	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs

*Proficiency in course/subject – Includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

$Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language, Credits of natural Sciences & Skills will be added in VI Semester.

MCQ: Multiple Choice Question   AO: Assignment + Oral   OB: Open Book   PP: Pen Paper   SO: Submission + Oral

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

	Mode of Teaching				
	Theory			Lab	Total Credits
	Offline	Online	Blended	Offline	
	7	9	3	3	19
Credits %	37%	49%	16%	16%	

	Mode of Examination				
	Theory			Lab	Total Credits
	PP	AO	MCQ	SO	
	10	6	3	3	19
Credits %	51%	33%	16%	16%	

Civil Engineering Department, MITS Gwalior

Nov-12

S.No.	Name / Date →	7	8	9	10	12	16	17	19	20	21	22	23	24	26	27	29	30
1	Dr. S.K Jain																	
2	Prof. P. Sharma																	
3	Dr. M. Sagar									EL	EL	CL	CL	CL	EL	EL	EL	EL
4	Er. P. Gupta									R	R	R	R	R	R	R		
5	Sh. Atul Chauhan						EL	EL	EL	EL								
6	Sh. Devendra Singh																	
7	Sh. Sanjeev Saxena																	
8	Sh. Lov Sharma																	
9	Sh. Brajesh Mishra	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10	Sh. Birwal																	
11	Sh. Virendra Parihar																	
12	Sh. Laxman																	
13	Sh. Jameel Khan																	
14	Sh. Shriram																	
15	Sh. Shivnath																	
16	Sh. Kamlesh																	

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Department of Civil Engineering
Scheme of Evaluation
B. Tech. I Semester *CIVIL ENGINEERING*

(for batch admitted in academic session 2023-24)

No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted - Theory Slot - End Term Evaluation - End Sem. Exam	Proficiency in subject /course	Continuous Evaluation - Mid Sem. Exam.	Quiz/Assign ment	Practical Slot - End Sem. Exam	Practical Slot - Continuous Evaluation - Lab Work & Sessional	Skill Based Mini Project	Total Marks	Contact Hours per week - L	T	P	Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam.
1.	3100011	BSC	Engineering Mathematics – I (BSC - 1)	50	10	20	20	-	-	-	100	3	1	-	4	Offline	PP	2 Hrs
2.	3100121	ESC	Computer Programming (ESC - 1)	50	10	20	20	40	30	30	200	2	1	2	4	Blended	AO	2 Hrs
3.	3100014	ESC	Engineering Graphics (ESC - 2)	50	10	20	20	-	-	-	100	1	2	-	3	Offline	AO	2 Hrs
4.	3110121	DC	Building Materials & Construction (DC - 1)	50	10	20	20	40	30	30	200	3	-	2	4	Blended	PP	2 Hrs
5.	3110123	DC	Engineering Mechanics (DC - 2)	50	10	20	20	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
6.	3100018	ESC	Engineering Graphics Lab (ESC – 3)	-	-	-	-	40	30	30	100	-	-	2	1	Offline	SO	-
			Total	250	50	100	100	120	90	90	800	12	4	6	19	-	-	-
7.	3000005	Natural Sciences & Skills	Environmental Engineering	50	10	20	20	30	10	10	150	2	-	4	GRADE	Blended	MCQ	1.5 Hrs

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

§Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

Natural Sciences & Skills: Engineering Physics / Engineering Chemistry / Environmental Engineering / Language, Credits of natural Sciences & Skills will be added in VI Semester.

MCQ: Multiple Choice Question   AO: Assignment + Oral   PP: Pen Paper   OB: Open Book   SO: Submission + Oral

	Mode of Teaching			Mode of Examination					
	Theory		Lab		Theory			Lab	
	Online	Blended	Offline	Blended	Offline	PP	AO	MCQ	Offline	SO
		9	7	9	3	10	6	3	3	3
		49%	37%	49%	16%	51%	33%	16%	16%	

Total Credits			
Theory			Lab
PP	AO	MCQ	SO
10	6	3	3
51%	33%		16%
	19		
	Credits %		

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS B.Tech Civil Engineering

2023 ADMITTED BATCH

SEMESTER-I

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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Course Code: 3110122
Course Name: Building Materials & Construction

L	T	P	Credit
3	0	2	4

Course Objectives:

1. To study the properties of concrete ingredients i.e. cement. Sand and coarse aggregate by conducting different tests.
2. To select of different types of admixtures to improve the properties of concrete for different field applications.
3. To conduct the field and laboratory tests on concrete in fresh and hardened state.
4. To provide knowledge about various types of bricks, stones, woods & timber, ferrous & nonferrous construction material & their applications.
5. To provide knowledge on design of foundation, including selection of appropriate foundation.
6. To understand laying & construction of brick & stone masonry and various methods of damp proofing etc.
7. To provide knowledge about stairs, floors & roofs in various types of buildings.

Syllabus:

Unit-I

Types of Foundation& its design: masonry construction, masonry classification, stone v/s brick masonry, joints in stone masonry, brick masonry (bonds in brick masonry, characteristics of bonds, type of bonds), typical structures in brickwork, Damp prevention (causes, effects, control & prevention techniques, material used for damp proofing), Anti termite treatment, water proofing treatment, Arches & lintels, stair & stair case, (types & design of stair case), Types of floor & flooring, Roof & roof covering.

Unit – II

Ingredients of Concrete: Portland cement Chemical composition of cement, Hydration of cement, setting of cement, tests on physical properties of cement. Types of Portland cement – Ordinary Portland cement – Rapid Hardening Portland cement – low heat Portland cement- Sulphate Resisting cement – Portland Blast furnace cement- Super Sulphated cement- Portland Pozzolana cement and Pozzolanas: Fly ash; use of pozzolanas, white cement, Expansive cements – High alumina cement.

Aggregates: General classification of aggregates, natural and artificial aggregates, particle shape and texture, strength of aggregate, Mechanical properties of aggregate, specific gravity, Bulk density, porosity and absorption of aggregate, moisture content of aggregate, Bulking of sand deleterious substances in aggregates, Soundness of aggregates, Alkali- aggregate reaction, Fineness modulus, Grading requirements.

Admixtures: Introduction, functions of admixtures, classification of admixtures, Accelerators, Retarders, Water Reducing Agents, Super plasticizers, air entraining admixtures.

Unit-III

Fresh and Hardened Concrete: Fresh Concrete, Workability of concrete, factors affecting workability, measurement of workability using slump test, Compaction factor test, Flow test, Vee-Bee Test, Ball penetration test, Segregation and Bleeding of concrete, process of concrete manufacturing.

Hardened Concrete: Compressive & Flexural strength of concrete, drying shrinkage of concrete, Creep of concrete, Permeability and durability of concrete, Thermal properties of concrete.

Unit IV

Bricks (classification, characteristics, manufacturing, testing, and types), Stones (classification, Quarrying, seasoning characteristics, testing, selection & uses, preservation), Wood & Timber (Classification, Structure & characteristics, seasoning and its methods, defects & diseases, preservation & various treatment testing), wood products and their applications

Unit V

Mortar (Classification, characteristics, functions of ingredients), Types of mortar and their uses grout, guniting, ferrous material (Pig iron, CI, Mild steel, wrought iron, stainless steel, compositions & proposition), Reinforced steel bars (classification, types, designation), Aluminium (its alloys & uses), Copper (its alloys & uses), Ceramics (classification, properties, commercial forms), Paint varnishes & enamels (types, composition, method of application, defects)

Course Outcomes:

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

CO1: **Explain** the basic elements of buildings, engg. materials & construction.

CO2: **Evaluate** the properties of various materials like cement, aggregate, concrete, admixture, brick, stone etc.

CO3: **Distinguish** the suitability of building materials in the construction of elements of buildings.

CO4: **Evaluate** various types of concrete in building construction accordingly.

CO5: **Apply** various techniques for finishing & protection works of various elements of building.

Text Books:

1. Concrete Technology, M. L. Gambhir, Tata McGraw Hill education Pvt. Ltd., 5th edition 2013
2. Concrete Technology, M.S. Shetty, S. Chand Publications, 2006
3. Building Materials, M.L. Gambhir, Tata McGraw Hill education Pvt. Ltd., 2017
4. Building Construction, B.C. Punmia, A.K. Jain, Laxmi Publishers New Delhi, 2016

Reference Books:

1. Properties of Concrete, Neville, ELBS, Pearson Education, 5th edition 2012
2. Building Material, S.K. Duggal, New Age Publishers, 4th revised edition 2012

List of Experiments:

1. Determination of properties of cement.
2. Determination of properties of sand.
3. Determination of properties of aggregate.
4. Determination of Fineness of cement.
5. Determination of consistency of cement.
6. Determination of workability of concrete by slump test.

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7. Determination of workability of concrete by compacting factor apparatus.
8. Determination of workability by Vee Bee consistometer.
9. Determination of water absorption of bricks.
10. Determination of efflorescence of brick.
11. Field testing on bricks.
12. Determination of crushing strength of bricks.

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

CO 1: Determine the properties of cement, sand & aggregate as per IS code.

CO 2: Determine the workability of concrete for suitability of concrete mix in different construction works.

CO 3: Evaluate compressive strength of various concrete mixes.

CO 4: Determine physical properties of brick by experiment and practice accordingly.

CO 5: Examine the properties of the cement mortar for various elements of the buildings.

Suggestive List of Skill Based Mini Project:

1. Mix Design – (M20 & M25)
2. Fresh & Hardened Concrete Design.
3. Development of Innovative Building Materials like brick etc using waste materials.

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Course Code: 3110123
Course Name: Engineering Mechanics

L	T	P	Credit
3	0	0	3

COURSE OBJECTIVES:
1. To learn about basic laws of Mechanics and its application for different types of force systems.
2. To learn the Laws of friction and its applications
3. To study the applications of equilibrium concepts in Engineering problems.
4. To study about properties of areas like Centroid and Moment of Inertia.
5. To learn the basics of kinematics and Kinetics of particles and its applications in free vibration.

SYLLABUS

Unit-I
Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent coplanar forces, free body Diagram, Force Diagram and Bow's notations, Introduction to force system in space; Equilibrium Concepts.

Unit-II
Equilibrium Problem involving Frictional forces. Friction: Laws of Coulomb friction, inclined plane; ladder friction; wedge friction, square threaded screws; belt friction; rolling resistance

Unit-III
Support Reactions. Analysis of plane Trusses, method of joints, method of Sections, Graphical method. Shear force and bending moment diagram for cantilever, simply supported and overhanging beam with concentrated, distributed load and Couple.

Unit-IV
Properties of areas: Centroid of plane areas, Moments of inertia, theorem of parallel axis and theorem of perpendicular axis; product of inertia of areas, polar moment of inertia, principal axes and principal moments of inertia.

Unit-V
Kinematics and Kinetics of particles: Particle dynamics; Free Vibrations of undamped Single Degree of Freedom system

COURSE OUTCOMES
On successful completion of teaching-learning and evaluation activities, a student would be able to
1. Apply basic laws of Mechanics for different types of force systems.
2. Apply the Laws of friction in engineering problems.
3. Apply the concept of equilibrium in statically determinate beams and trusses.
4. Determine the properties of areas for different shapes.
5. Apply the basics of Kinematics and Kinetics of particles in motion and undamped free vibration.

Text book:
1. R. C. Hibbeler, *Engineering Mechanics (Statics and Dynamics)*, Pearson Education Asia Pvt. Ltd
2. RS Khurmi and N Khurmi, A Textbook of Engineering Mechanics, S. Chand and Co. Ltd.
3. R. K. Rajput, Engineering Mechanics, Dhanpat Rai Publications (P) Limited
4. J. L. Meriam and L.G. Kraige, *Engineering Mechanics (Static & Dynamics)*, John Wiley

Reference books
1. F. P. Beer and E. R. Johnston, *Mechanics for Engineers (Static & Dynamics)*, McGraw Hill
2. S. P. Timoshenko, D. H. Young, and J. V. Rao, *Engineering Mechanics*, Tata-McGraw Hill.

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Course Code: 3000003
Course Name: Environmental Engineering

L	T	P	Credit	Mode of Teaching	Mode of End Sem Exam
2	0	0	GRADE	Blended	MCQ (1.5 Hrs)

Course Objectives:

1. To create awareness about various sources of energy and their applications.
2. To create awareness about various environmental issues and how to deal with those environmental issues.
3. To impart fundamental concepts in environmental engineering dealing with air, water and waste management.
4. To create awareness about sustainability concepts and need of sustainable development for development of society.
5. To create awareness about various environmental policies.

Syllabus:

Unit 1: Energy: Various forms of Renewable and non-renewable energy and their applications, Solar Energy, Hydro, wind, biomass, geothermal, tidal and nuclear energy, green energy, clean energy, role of energy in economic and social development.

Unit 2: Water Environment: Ecosystems & its components, Water Cycle, Water availability & uses, Water resources problems and its solutions, Water pollution problems, Water quality characteristics & standards, Introduction to water treatment mechanisms.

Unit 3: Air Environment: Air pollution, causes, global effects, climate change and its impact, Introduction to air pollution control measures, Carbon credit, Carbon trading, Clean Development Mechanism (CDM).

Unit 4: Waste Management: Introduction to management of municipal solid waste, E-waste and plastic waste, various initiatives in management of waste.

Unit 5: Sustainability: Introduction to the concept of sustainability & sustainable development, Sustainable development goals, TBM, Challenges for sustainable development.

Policies: Multilateral environmental agreements and Protocols – Kyoto Protocol, Montreal Protocol, Indian policies - Environment Protection Act 1986, Waste Management rules 2000.

Course Outcomes:

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

CO 1. Explain the fundamental concepts of energy, ecosystems & environment.

CO 2. Recognize various environmental problems and their effects.

CO 3. Apply various air & water remediation methods.

CO 4. Apply waste management techniques.

CO 5. Apply the concepts of sustainability

Text Books:

1. D. K. Asthana, Meera Asthana, A Text Book of Environmental Studies, S Chand & Co., New Delhi.

2. P. Meenakshi, Elements of Environmental Science & Engineering, PHI, New Delhi

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3.   M.M. Sulphey, M.M. Safeer, Introduction to Environment Management, PHI, New Delhi

4.   S K Dhameja, Environmental Engineering & Management, S K Kataria & Sons, new Delhi

Lab Work:
Basic Analysis of Water Quality Parameters: pH, Acidity, Alkalinity, Solids.

Skill Based Mini Project:
Students have to deliver a presentation in class preferably on power point and submit a write up of the same on following topics (preferably group project wherein students divided into group of 4):

1. Identification of potential water related problems in the vicinity of their residence and propose solutions for these problems.

2. Identification of potential air pollution issues in the vicinity of their residence and propose solutions for these problems.

3. Identify waste related issues in the vicinity of their residence and propose solutions for these issues.

4. Study of Solar Energy Panel in the Institute.

5. Study of Wind Mill in the Institute.

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Course Code: 3100020
Course Name: Basic Civil Engineering & Mechanics

L	T	P	Credit
3	0	0	3

Course Objectives:

1. To understand the utility of various types of building materials.
2. To understand the location, construction detail and suitability of various building elements.
3. To determine the location of object on ground surface.
4. To stabilize the position of various object.
5. To understand the effects of system of forces on rigid body in static conditions.
6. Analysis of determinate structure (beam & truss)

Syllabus:

Unit- I

Building Materials: Stones, bricks, cement, timber - types, properties, test & uses, Introduction of concrete properties & Laboratory tests on concrete, curing of concrete and mortar Materials.

Unit- II

Surveying & Positioning: Introduction to surveying, Survey stations, Measurement of distances-conventional and EDM methods, Measurement of directions by different methods, Measurement of elevations by different methods, reciprocal leveling.

Unit- III

Mapping & Sensing: Mapping details and contouring, Plane tables and related devices. Introduction of theodolite. Measurement of areas and volumes, application of measurements in quantity computations, Introduction of remote sensing and its applications.

Unit- IV

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent co-planner forces, free body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses, method of joints, method of Sections. Frictional force in equilibrium problems.

Unit -V

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment of Inertia of Composite section, Radius of Gyration, Introduction to product of Inertia and Principle Axes.
Support Reactions, Shear force and bending moment diagram for cantilever & simply supported beam with concentrated, distributed load and Couple.

Course Outcomes:

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

CO1: Explain concepts and terminologies of building materials, surveying and mechanics.

CO 2: Apply various methods for surveying and mechanics.

CO 3: Determine the location, area and volume of objects on ground surface.

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CO4: Solve the problems of surveying and mechanics by using various methods.

CO5: Analyse the effects of system of forces on rigid bodies in static conditions.

Text Books:

1. Surveying, Vol. – I, Punmia B.C., Laxmi Publications, 17th edition, 2016
2. Building Material, B. C. Punmia, Laxmi Publications, 2016
3. A textbook of Engineering Mechanics, D. S. Kumar, Katsons Publications, 2013

Reference Books:

1. Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3rd edition, 2013
2. Applied Mechanics, Prasad I.B., Khanna Publication 17th edition, 1996
3. Surveying, Duggal, Tata McGraw Hill New Delhi, 4th edition, 2013
4. Engineering Mechanics - Statics &Dynamics, R.C. Hibbler, Pearson Publications, 14th edition, 2015
5. Engineering Mechanics - statics dynamics, A. Boresi & Schmidt, Cengage learning, 1st edition, 2008.
6. Applied Mechanics, R.K. Rajput, Laxmi Publications, 3rd edition, 2016

ANNEXURE – XI

(CO Attainment for July Dec 2022 Session)

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ANNEXURE – XI

CO Attainment & Gap Analysis July – December 2022

Table.1: CO Attainment & Gap Analysis of I Year, I SEM

Course Code & Name	Course Outcomes	Direct CO Attainment Level	Indirect CO Attainment Level	Overall CO Attainment	Target Attainment	Gap in Attainment	Status of CO Attainment	Action Taken
2110122: Engineering Mechanics	CO1	0.38	2.72	0.85	2.5	1.66	Not Attained	More Assignments and numerical problems to be given
	CO2	0.39	2.62	0.84	2.5	1.67	Not Attained	
	CO3	0.41	2.81	0.89	2.5	1.61	Not Attained	
	CO4	0.41	2.73	0.87	2.5	1.64	Not Attained	
	CO5	0.38	2.64	0.83	2.5	1.68	Not Attained	
2110121: Building Materials & Construction	CO1	1.59	2.69	1.81	2.5	0.7	Not Attained	More demonstration regarding building materials to be given
	CO2	0.63	2.82	1.07	2.5	1.44	Not Attained	
	CO3	2.28	2.81	2.39	2.5	0.12	Not Attained	Suitability of building material will be explain more.
	CO4	0.41	2.75	0.88	2.5	1.63	Not Attained	More explain the various types of concrete
	CO5	2.46	2.64	2.5	2.5	0.01	Not Attained	More demonstration of different techniques for finishing & protection works

Table.2: CO Attainment & Gap Analysis of II Year, III SEM

Course Code & Name	Course Outcomes	Direct CO Attainment Level	Indirect CO Attainment Level	Overall CO Attainment	Target Attainment	Gap in Attainment	Status of CO Attainment	Action Taken
11031: Building Materials & Construction	CO1	2.32	2.75	2.41	2.5	0.1	Not Attained	More demonstration regarding building materials to be given
	CO2	1.2	2.78	1.52	2.5	0.99	Not Attained	
	CO3	0.6	2.78	1.04	2.5	1.47	Not Attained	Suitability of building material will be explain more.
	CO4	0.6	2.78	1.04	2.5	1.47	Not Attained	More explain the various types of concrete
	CO5	0.6	2.75	1.03	2.5	1.48	Not Attained	More demonstration of different techniques for finishing & protection works

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Course	CO								Remarks
110311: Building Materials & Construction (Practical)	CO1	3	2.52	2.91	2.5	-0.41	Attained	Rubrics for the level can be modified
	CO2	3	2.49	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO3	3	2.63	2.93	2.5	-0.43	Attained	Rubrics for the level can be modified
	CO4	3	2.54	2.91	2.5	-0.41	Attained	Rubrics for the level can be modified
	CO5	3	2.49	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
110312: Fluid Mechanics -I	CO1	1.12	2.7	1.44	2.5	1.07	Not Attained	More problems on fluid properties to be given
	CO2	0.6	2.69	1.02	2.5	1.49	Not Attained	More assignments will be given to solve fluid flow, dimensional analysis, fluid measurement
	CO3	1.2	2.72	1.5	2.5	1.01	Not Attained	
	CO4	1.08	2.7	1.41	2.5	1.1	Not Attained	
	CO5	0.71	2.7	1.11	2.5	1.4	Not Attained	
110312: Fluid Mechanics-I (Practical)	CO1	3	2.48	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO2	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO3	3	2.44	2.89	2.5	-0.39	Attained	Rubrics for the level can be modified
	CO4	3	2.42	2.89	2.5	-0.39	Attained	Rubrics for the level can be modified
110314: Strength of Materials	CO1	1.66	2.51	1.83	2.5	0.68	Not Attained	Concept of stress, bending, deflection, buckling & torsion will be explain more
	CO2	1.62	2.49	1.8	2.5	0.71	Not Attained	various theories for determining stress and deflection will be explain more.
	CO3	0.42	2.48	0.83	2.5	1.68	Not Attained	Application of various theories will be elaborated more.
	CO4	0.5	2.47	0.9	2.5	1.61	Not Attained	More assignment will be given to analyse stress and strain.
	CO5	0.48	2.47	0.88	2.5	1.63	Not Attained	
110314: Strength of Materials (Practical)	CO1	3	2.39	2.88	2.5	-0.38	Attained	Rubrics for the level can be modified
	CO2	3	2.37	2.88	2.5	-0.38	Attained	Rubrics for the level can be modified
	CO3	3	2.31	2.87	2.5	-0.37	Attained	Rubrics for the level can be modified
	CO4	3	2.37	2.88	2.5	-0.38	Attained	Rubrics for the level can be modified
110315: Survey Practice Lab	CO1	3	2.66	2.94	2.5	-0.44	Attained	Rubrics for the level can be modified
	CO2	3	2.66	2.94	2.5	-0.44	Attained	Rubrics for the level can be modified
	CO3	3	2.69	2.94	2.5	-0.44	Attained	Rubrics for the level can be modified
	CO4	3	2.61	2.93	2.5	-0.43	Attained	Rubrics for the level can be modified
	CO5	3	2.64	2.93	2.5	-0.43	Attained	Rubrics for the level can be modified
	CO6	3	2.61	2.93	2.5	-0.43	Attained	Rubrics for the level can be modified

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Course	CO						Status	Action Taken
110316: Self Learning / Presentation	CO1	3	2.6	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified
	CO2	3	2.63	2.93	2.5	-0.43	Attained	Rubrics for the level can be modified
	CO3	3	2.63	2.93	2.5	-0.43	Attained	Rubrics for the level can be modified
	CO4	3	2.6	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified
	CO5	3	2.6	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified
110317: SIP - 1	CO1	3	0.67	2.54	2.5	-0.04	Attained	Rubrics for the level can be modified
	CO2	3	0.5	2.5	2.5	0	Attained	Rubrics for the level can be modified
	CO3	3	0	2.4	2.5	0.1	Not Attained	
	CO4	3	0	2.4	2.5	0.1	Not Attained	More practice problems to be given
	CO5	3	0	2.4	2.5	0.1	Not Attained	

Table 3: CO Attainment & Gap Analysis of III Year, V SEM

Course Code & Name	Course Outcomes	Direct CO Attainment Level	Indirect CO Attainment Level	Overall CO Attainment	Target Attainment	Gap in Attainment	Status of CO Attainment	Action Taken
110511: Water Supply Engineering	CO1	0.99	2.74	1.34	2.5	1.17	Not Attained	More problems on water demand calculation
	CO2	1.06	2.49	1.34	2.5	1.17	Not Attained	More practice on water quality analysis
	CO3	1.09	2.51	1.37	2.5	1.14	Not Attained	More design problems to be given
	CO4	1.01	2.14	1.23	2.5	1.28	Not Attained	More assignments should be given on analysis of water supply scheme
	CO5	0.86	2.24	1.14	2.5	1.37	Not Attained	More assignments should be given on design of water supply scheme
110511: Water Supply Engineering (Practical)	CO1	2.94	2.56	2.87	2.5	-0.37	Attained	Rubrics for the level can be modified
	CO2	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO3	3	2.67	2.94	2.5	-0.44	Attained	Rubrics for the level can be modified
	CO4	3	2.56	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified
110512: Theory of Structures-II	CO1	0.93	2.55	1.25	2.5	1.26	Not Attained	various methods for analysis of structures will be explain more.
	CO2	0.64	2.43	1	2.5	1.51	Not Attained	Various loads for analysis of Structures will be elaborated more.
	CO3	0.49	2.49	0.89	2.5	1.62	Not Attained	Analysis methods based practical hands on will be conducted more.

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Course	CO						Status	Remarks
	CO4	0.5	2.49	0.9	2.5	1.61	Not Attained	Influence line diagram will be more explain
	CO5	0.47	2.41	0.86	2.5	1.65	Not Attained	More assignments should be given on plastic analysis
110513: S.D.D. (RCC)	CO1	0.95	2.44	1.25	2.5	1.26	Not Attained	More explanation on design philosophy
	CO2	0.64	2.52	1.02	2.5	1.49	Not Attained	More hands on session will be conducted
	CO3	0.68	2.52	1.05	2.5	1.46	Not Attained	More assignments will be given to analyse the RC elements,
	CO4	0.81	2.59	1.16	2.5	1.35	Not Attained	More assignments will be given to design the RC elements.
	CO5	0.48	2.59	0.9	2.5	1.61	Not Attained	Hands on will be conducted for design sketch.
110514: Fluid Mechanics-II	CO1	0.8	2.63	1.16	2.5	1.35	Not Attained	Types of fluid flow & machinery will be elaborated more
	CO2	0.81	2.63	1.18	2.5	1.33	Not Attained	Principles of analysis of fluid flow will be explain more.
	CO3	0.55	2.63	0.97	2.5	1.54	Not Attained	Measurement of different forces acting on fluid body will be demonstrate more.
	CO4	0.57	2.63	0.98	2.5	1.53	Not Attained	More assignments will be given to analyse various problems
	CO5	0.58	2.65	1	2.5	1.51	Not Attained	Design of open & closed conduit systems will be explain more.
110515: Minor Project - I	CO1	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO2	3	2.57	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified
	CO3	3	2.44	2.89	2.5	-0.39	Attained	Rubrics for the level can be modified
	CO4	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO5	3	2.57	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified
110516: Self Learning / Presentation	CO1	0	2.59	0.52	2.5	1.99	Not Attained	Better speaking skills to be developed
	CO2	3	2.67	2.94	2.5	-0.44	Attained	Rubrics for the level can be modified
	CO3	0	2.67	0.54	2.5	1.97	Not Attained	Better speaking skills to be developed
	CO4	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO5	0	2.67	0.54	2.5	1.97	Not Attained	Better speaking skills to be developed
110520: Data Science (P)	CO1	1	2.3	2.86	2.5	-0.36	Attained	Rubrics for the level can be modified
	CO2	3	2.24	2.85	2.5	-0.35	Attained	Rubrics for the level can be modified

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CO3	3	2.24	2.85	2.5	-0.35	Attained	Rubrics for the level can be modified
CO4	3	2.12	2.83	2.5	-0.33	Attained	Rubrics for the level can be modified
CO5	3	2.18	2.84	2.5	-0.34	Attained	Rubrics for the level can be modified
CO6	3	2.18	2.84	2.5	-0.34	Attained	Rubrics for the level can be modified

Table.4: CO Attainment & Gap Analysis of IV Year, VII SEM

Course Code & Name	Course Outcomes	Direct CO Attainment Level	Indirect CO Attainment Level	Overall CO Attainment	Target Attainment	Gap in Attainment	Status of CO Attainment	Action Taken
110701: Software Application for Civil Engineering Problems	CO1	3	3	3	2.5	-0.5	Attained	Rubrics for the level can be modified
	CO2	3	3	3	2.5	-0.5	Attained	Rubrics for the level can be modified
	CO3	3	3	3	2.5	-0.5	Attained	Rubrics for the level can be modified
	CO4	3	3	3	2.5	-0.5	Attained	Rubrics for the level can be modified
	CO5	3	3	3	2.5	-0.5	Attained	Rubrics for the level can be modified
110703: Creative Problem Solving	CO1	3	2.47	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO2	3	2.38	2.88	2.5	-0.38	Attained	Rubrics for the level can be modified
	CO3	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
	CO4	3	2.5	2.9	2.5	-0.4	Attained	Rubrics for the level can be modified
110713: Advanced Structural Design-I (RCC)	CO1	2.32	2.89	2.43	2.5	0.08	Not Attained	More assignments for determining the forces in water retaining structures
	CO2	2.17	2.78	2.3	2.5	0.21	Not Attained	
	CO3	0.49	2.56	0.9	2.5	1.61	Not Attained	More problems to be given for analyzing different structures
	CO4	0.5	2.66	0.94	2.5	1.57	Not Attained	More assignments will be given to design different structures
	CO5	2.02	2.45	2.11	2.5	0.4	Not Attained	
110714: Hydraulic Structure	CO1	2.02	2.39	2.09	2.5	0.42	Not Attained	Different components of hydro project will be demonstrate more.
	CO2	0.52	2.29	0.87	2.5	1.64	Not Attained	Principles of designing hydropower plant & cross drainage work will be explain more.
	CO3	0.84	2.43	1.16	2.5	1.35	Not Attained	
	CO4	1.54	2.51	1.74	2.5	0.77	Not Attained	Suitability of hydraulic structures will be more explain.
	CO5	0.54	2.39	0.91	2.5	1.6	Not Attained	Hands on design of hydraulic structure

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Course	CO						Attained	Remarks
110715: Advanced Structural Analysis	CO1	2.66	2.75	2.68	2.5	-0.18	Not Attained	Rubrics for the level can be modified
	CO2	1.01	2.25	1.26	2.5	1.25	Not Attained	More assignments to be given for structural analysis using different methods.
	CO3	1.11	2.75	1.44	2.5	1.07	Not Attained	
	CO4	1.09	2.75	1.42	2.5	1.09	Not Attained	
	CO5	1.1	2.75	1.43	2.5	1.08	Not Attained	
100008: Intellectual Property Rights	CO1	1.17	2.5	1.44	2.5	1.07	Not Attained	Concepts of IPR to be demonstrated through case study, expert lectures etc
	CO2	1.18	2.62	1.47	2.5	1.04	Not Attained	
	CO3	1.19	2.5	1.45	2.5	1.06	Not Attained	
	CO4	1.18	2.56	1.46	2.5	1.05	Not Attained	
	CO5	0.56	2.39	0.93	2.5	1.58	Not Attained	
900201: Integrated Waste Management for Smart City	CO1	2.96	2.37	2.84	2.5	-0.34	Attained	Rubrics for the level can be modified
	CO2	2.45	2.37	2.44	2.5	0.07	Not Attained	More Assignments regarding waste management to be given
	CO3	2.89	2.37	2.79	2.5	-0.29	Attained	Rubrics for the level can be modified
	CO4	2.87	2.42	2.78	2.5	-0.28	Attained	Rubrics for the level can be modified
900202: Project Planning & Control	CO1	2.94	2.37	2.82	2.5	-0.32	Attained	Rubrics for the level can be modified
	CO2	2.99	2.39	2.87	2.5	-0.37	Attained	Rubrics for the level can be modified
	CO3	1.87	2.31	1.95	2.5	0.56	Not Attained	More practice problems on CPM, PERT, Cost Analysis etc to be given
	CO4	1.46	2.35	1.63	2.5	0.88	Not Attained	
	CO5	2.36	2.32	2.35	2.5	0.16	Not Attained	
900213: Urban Planning & Transportation Systems	CO1	2.6	2.34	2.55	2.5	-0.05	Attained	Rubrics for the level can be modified
	CO2	2.7	2.3	2.62	2.5	-0.12	Attained	Rubrics for the level can be modified
	CO3	2.49	2.26	2.45	2.5	0.06	Not Attained	More explain on Urban Planning techniques
	CO4	2.55	2.38	2.52	2.5	-0.02	Attained	Rubrics for the level can be modified
	CO5	2.29	2.26	2.29	2.5	0.22	Not Attained	More assignments to be given
900226: Safety & Quality Management	CO1	1.07	2.56	1.37	2.5	1.14	Not Attained	More assignments to be given
	CO2	2.89	2.67	2.85	2.5	-0.35	Attained	Rubrics for the level can be modified
	CO3	2.87	2.59	2.81	2.5	-0.31	Attained	Rubrics for the level can be modified
	CO4	2.89	2.88	2.89	2.5	-0.39	Attained	Rubrics for the level can be modified
	CO5	2.95	2.81	2.92	2.5	-0.42	Attained	Rubrics for the level can be modified

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ANNEXURE – XII

(PO ATTAINMENT for 2018-2022 Batch)

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ANNEXURE – XII

PO ATTAINMENT FOR 2018-2022 BATCH

OVERALL PO ATTAINMENT CALCULATION (2018-2022) along with Action taken

Programme Outcomes (PO)	Direct PO Attainment Level	Indirect PO Attainment Level	Overall PO Attainment Level (80% of Direct Attainment + 20% of Indirect Attainment)	Target Attainment Level	Gap in Attainment	Status of PO Attainment	Action Taken
PO 1	2.64	2.13	2.54	2.5	-0.04	Attained	1. Extra practice problems are to be given for courses like Strength of Materials, Fluid Mechanics, Surveying, Structural Analysis and solutions are discussed in the tutorial class. 2. Revision sessions are to be conducted of Engineering Mechanics prerequisite for the subject Strength of Materials. 3. Assignments based on Bernoulli's equation, Fluid Flow problems, Tacheometry, Theodolite traversing, Stress-Strain Analysis, Torsion etc. are to be given at second year level.
PO 2	2.70	2.42	2.65	2.5	-0.15	Attained	1. Students are encouraged to observe their surroundings to gain insight into real life engineering problems and think of possible solutions for these problems. 2. Field/Technical visits are carried out so that student can gain knowledge on complex engineering problems and their solutions. 3. Incorporating more numerical problems and conducting tutorials during regular lectures in courses like Surveying, Structural Analysis, Fluid Mechanics etc.

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PO		Status					
PO 3	1. Design problems are given to students in tutorial classes of courses like R.C.C. design, Steel design, Hydraulic Structures, Highway Engineering. 2. Practical implementation of engineering systems was done through third year minor projects and final year B. Tech projects. 3. Projects are undertaken which are based on environmental and social needs.	Not Attained	0.21	2.5	2.29	2.36	2.27
PO 4	1. For projects, students are asked to refer technical literature like Journal Papers, product catalogues and suggest solution by comparing various available techniques. 2. Students are encouraged to participate in national level conferences for paper presentations. 3. Workshops are conducted so that students gain knowledge on investigation of complex problems.	Attained	-0.01	2.5	2.51	2.42	2.53
PO 5	1. Students are asked to perform the experiments and projects using simulation software's like Virtual Lab, AutoCAD, STAAD Pro, MATLAB. 2. Industry experts are also invited to conduct the hands-on training on MATLAB, AutoCAD, STAAD-Pro. 3. The students get acquainted with modern tools which are added to the lab like Roadpod VT meter, Noise level meter, Total Station etc.	Not Attained	0.09	2.5	2.41	2.29	2.44
PO 6	1. Industry visits are conducted to understand the various safety and legal issues and expand their practical knowledge. 2. Students undertake major and minor projects based on safety issues. 3. Information about safety facilities available in laboratories was given to students. Demonstration of safety equipments like fire extinguisher was given to understand personal and equipment safety	Not Attained	0.15	2.5	2.35	2.46	2.32
PO 7	1. Students gain knowledge in environmental and sustainable issues through Industry visits conducted to Water Treatment and Sewage Treatment Plants in the city.	Not Attained	0.08	2.5	2.42	2.33	2.45

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							Description
PO 8	2.14	2.50	2.21	2.5	0.29	Not Attained	2. Students undertake major and minor projects based on environmental and sustainability issues. 3. Students study various courses on Environmental Engineering like Water Supply, Waste Water, Waste Management. 1. Courses like Human Values and Professional Ethics, and Professional Communication are included in the curriculum. 2. Topics related to professional ethics are covered in course PMME. 3. Students are motivated to write the project, seminar reports and lab write-ups in their own words avoiding "copy-paste" practices by using Turnitin software. 4. Lectures/sessions/awareness programs are conducted on career readiness by T&P cell.
PO 9	2.24	2.34	2.26	2.5	0.24	Not Attained	1. Students are encouraged to work in team during practical classes in course of Surveying. 2. Students are encouraged to work in team during practicals like SPT test, Triaxial test, Plate load test etc.
PO 10	2.22	2.34	2.25	2.5	0.25	Not Attained	1. In-house Soft skill training is imparted to students after completion of Second Year. 2. Department arrange Guest lectures for overall personality development of students. 3. Extra sessions are conducted by the institute faculty under the subject of Professional Communications to improve communication skills of weak students. 4. Technical and HR Mock orals are arranged for Final Year B.Tech students by T&P Cell 5. Students are asked to prepare report more critically after completion of B.Tech project, Internship and Seminars.
PO 11	2.19	2.34	2.22	2.5	0.28	Not Attained	1. The courses relevant to management principles need to be revised and regularly updated. 2. Students are encouraged to undertake projects using principles of construction management.

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PO 12	2.54	2.56	2.55	2.5	-0.05	Attained	1. New experiments are designed based on latest trends. 2. Lectures by industry experts are arranged to understand the current trends in industry. Curriculum is updated based on latest trends.
PSO 1	2.20	2.39	2.24	2.5	0.26	Not Attained	1. The assignments and tutorials are designed in such a way that students are able to practice the use of standard codes. 2. A wide awareness of use of codes like IS, IRC, NBC, CPHEEO to the students are given. 3. Students utilize the guidelines of IS codes, IRC, NBC, CPHEEO during B. Tech projects.
PSO 2	2.41	2.57	2.44	2.5	0.06	Not Attained	1. In the curriculum, multi decision criteria methods and determination of uncertainity are to be added. 2. Students utilize the knowledge acquired during Internship in industry to critically analyse a problem and subsequently plan for solutions. 3. Students are given insight in the critical issues which involve decision making through expert lectures from industry persons.

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ANNEXURE – XIII

(Curriculum Feedback Analysis)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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CIVIL ENGINEERING DEPARTMENT

ANNEXURE – XIII (a)

CURRICULUM FEEDBACK ANALYSIS FROM STAKEHOLDERS

A1. CURRICULUM FEEDBACK ANALYSIS FROM STUDENTS – (UG Second Year) – May. 2023

Course Content Faculty Feedback - UG 2nd year

110411 - GEOTECHNICAL ENGINEERING   110412 - THEORY OF STRUCTURES-I   110413 - TRANSPORTATION ENGINEERING   110414 - WATER RESOURCES ENGINEERING

1. The availability of books & E-learning material in the institute is good.

2. The Courses and content are up to date.

3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends.

4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.

5. The curriculum is capable of inculcating life-long learning abilities in students.

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Subjects	110411: Geotechnical Engineering	110412: Theory of Structures-I	110413: Transportation Engineering	110414: Water Resource Engineering
1. The course is well designed	4.642857	4.269231	4.258621	3.823529
2. The syllabus units are balanced	4.678571	4.269231	4.275862	3.838235
3. The learning material was available to you	4.678571	4.173077	4.344828	3.558824
4. The content was clear and easy to understand	4.678571	4.153846	4.310345	3.691176
5. The course was relevant and updated for present needs	4.607143	4.192308	4.275862	3.823529
6. The course meets your career expectations	4.642857	4.115385	4.275862	3.955882
7. The course will be useful to meet your higher studies/future aspirations.	4.642857	4.192308	4.344828	3.911765

Subjects	Mention the course / contents which in your opinion is outdated & needs to be removed.	Name course / contents which needs to be updated.	Is any new course required to meet current needs?

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A2. CURRICULUM FEEDBACK ANALYSIS FROM STUDENTS – (UG Third Year) – May, 2023

Course Content Faculty Feedback - UG 3rd year

110520 - AI & ML

110521 - WASTEWATER
ENGINEERING

110522 - S.D.D. (STEEL)

110623 - ESTIMATING COSTING &
CONTRACTING

- 1. The availability of books & E-learning material in the institute is good. 2. The Courses and content are up to date.
- 2. The Courses and content are up to date.
- 3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends.
- 4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.
- 5. The curriculum is capable of inculcating life-long learning abilities in students.

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	110621: Water Supply Engineering	110622: Theory of Structures-II	110622: S.D.D (R.C.C) Steel	110620: AI & ML	910111 - Building, Maintenance & Services
1. The course is well designed	4.1	3.764706	4	4.15	4.553191
2. The syllabus units are balanced	4.2	3.588235	4.333333	4.31	4.531915
3. The learning material was available to you	4.2	3.882353	4.333333	4.31	4.595745
4. The content was clear and easy to understand	4.25	3.705882	3.666667	4.46	4.531915
5. The course was relevant and updated for present needs	4.1	3.823529	3.916667	4.54	4.553191
6. The course meets your career expectations	4.1	3.529412	3.583333	4.38	4.404255
7. The course will be useful to meet your higher studies/future aspirations.	4.2	3.705882	3.916667	4.31	4.531915

Mention the course / contents which in your opinion is outdated & needs to be removed.	Name course / contents which needs to be updated.	Is any new course required to meet current needs?

Choices for Honor/Minor/DE (SWAYAM)

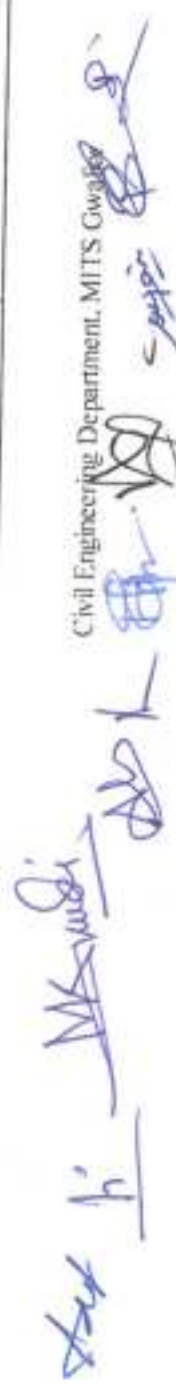| |
|---|
| DE – Municipal Solid Waste Management |
| DE – Foundation Engg |
| Honor – Bridge Engineering |

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B. FACULTY FEEDBACK ANALYSIS ON COURSE CONTENT – May 2023

Faculty Feedback

■ 1. The availability of books & E-learning material in the institute is good.

■ 2. The Courses and content are up to date.

■ 3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends.

■ 4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.

■ 5. The curriculum is capable of inculcating life-long learning abilities in students.

■ 1. The availability of books & E-learning material in the institute is good.

■ 2. The Courses and content are up to date.

■ 3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends.

■ 4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.

■ 5. The curriculum is capable of inculcating life-long learning abilities in students.

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Select your course	Select your Subject	1. The availability of books & E-learning material in the institute is good.	2. The Courses and content are up to date.	3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends.	4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.	5. The curriculum is capable of inculcating life-long learning abilities in students.
B. Tech	110411 - Geotechnical Engineering	5	5	5	4	4
B. Tech	110412 - Theory of Structures-I	5	5	5	5	5
B. Tech	110413 - Transportation Engineering	5	5	5	5	5
B. Tech	110414 - Water Resources Engineering	5	5	5	5	5
B. Tech	110620 - AI & ML	4	5	5	5	5
B. Tech	110621 - Wastewater Engineering	5	5	5	5	5
B. Tech	110622 - S.D.D. (Steel)	5	5	4	5	5
B. Tech	110623 - Estimating Costing & Contracting	4	4	5	5	5
B. Tech	910111 - Building, Maintenance & Services	5	5	4	4	4
B. Tech	910110 - Sustainable Materials & Green Building	5	5	4	5	5

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Inputs received from Faculty:

Course level	Course	1. The availability of books & E-learning material in the institute is good. (Please give your opinion)	2. The Courses and content are up to date. Please suggest if you feel any new course(s) need to be introduced to meet current needs & technological changes?	3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends.	4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present. [If you feel some changes (new content to be added or outdated content to be removed) are needed]	5. The curriculum is capable of inculcating life-long learning abilities in students.	6. The environment of department/institute is conducive for innovative teaching and research.	7. The institute supports you in your initiatives for updating your knowledge/skills and in achieving career growth.

(i) Honours:

Admixtures and Special Concretes

Advanced Reinforced Concrete Design

Bridge Engineering

Optimization Methods for Civil Engineering

Project Planning & Control

Integrated Waste Management for Smart City

(ii) Minor specialization:

Strength of Materials,

Fluid Mechanics

Environmental Modeling and Simulation, ...

Principles of Construction Management

Remote Sensing and GIS, Ground Improvement, GPS Surveying

(iii) Departmental electives:

Advanced Geomatic Engineering

Solid Waste Management

Remote Sensing

Urban Transportation

Sustainable Engineering Concepts and Life Cycle Analysis

Wastewater Treatment and Recycling

(iv) Open electives:

Introduction to Multimodal Urban Transportation Systems (MUTS)

Sustainable Transportation Systems

Safety Quality Management

SAFETY IN CONSTRUCTION

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CIVIL ENGINEERING DEPARTMENT

C. ALUMNI SATISFACTION SURVEY – May 2023

Alumni Satisfaction Survey

Do you find yourself capable of making a...

Are you able to apply the concepts of civil...

Have you been able to pursue higher studies?

Are you able to exhibit leadership skills...

You feel proud to be known as an MITS...

Institute organizes various kinds of activities.

Are you willing to contribute in the...

Institute handles students' grievances.

Institute has adequate laboratories and...

The education imparted at MITS is useful.

Have you obtained sufficient student technical...

Overall are you satisfied with the Faculty.

■ Strongly Disagree   ■ Disagree   ■ Neutral   Agree   ■ Strongly Agree

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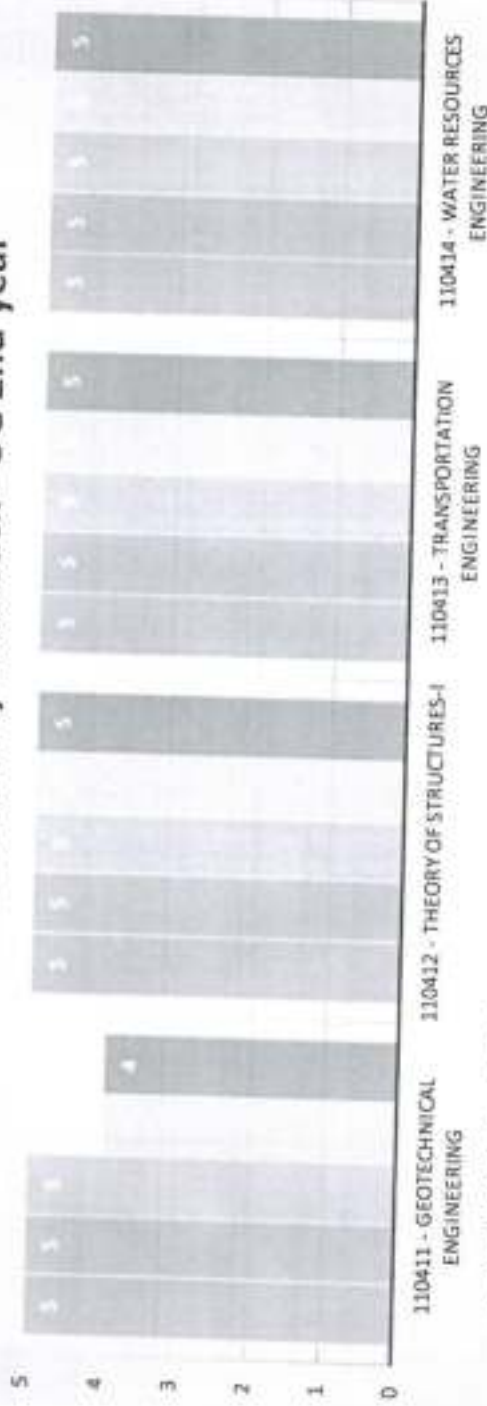(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

CIVIL ENGINEERING DEPARTMENT

ALUMNI SATISFACTION SURVEY

Sample Size: 14

S. No.	Parameter	Poor	Fair	Good	Very Good	Excellent	Alumni Satisfaction Index
1	Do you find yourself capable of making a good career?	0	0	0	2	10	4.83
2	Are you able to apply the concepts of civil engineering in your profession?	0	2	2	3	5	3.91
3	Have you been able to pursue higher studies?	0	0	0	3	9	4.75
4	Are you able to exhibit leadership skills, team spirit & ethical practices while performing your duty?	0	2	4	3	3	3.58
5	You feel proud to be known as an MITS Alumnus	0	0	4	3	5	4.08
6	Institute organizes various kinds of activities for the overall development of students	0	1	2	5	4	4
7	Are you willing to contribute in the development of the Institute	0	0	4	5	3	3.91
8	Institute handles students' grievances properly	0	0	0	3	9	4.75
9	Institute has adequate laboratories and equipment for practical exposure to students	0	0	3	4	5	4.17
10	The education imparted at MITS is useful and relevant in your career and present job	0	0	2	6	4	4.17
11	Have you obtained sufficient technical knowledge (both in theory and practical) at MITS	0	0	0	5	7	4.58
12	Overall are you satisfied with the Faculty, Staff and Administration during Program	0	0	0	4	8	4.67

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CIVIL ENGINEERING DEPARTMENT

ANNEXURE – XIII (b)

Action Taken Report based on Curriculum Feedback Received from Stakeholders

A. Action taken based on Curriculum Feedback received from Students

S. No.	Comments /Suggestions Received during Feedback	Action Taken
1	Opinion regarding courses to be included as DE (Through SWAYAM) - Air Pollution & Control - Foundation Engg	The opinions of students were taken into consideration while finalizing the list of DE courses (SWAYAM)
2	Opinion regarding courses to be included as Honors (Through SWAYAM) - Bridge Engineering	The opinions of students were taken into consideration while finalizing the list of Honor courses (SWAYAM)

B. Action taken based on Curriculum Feedback received from Faculty

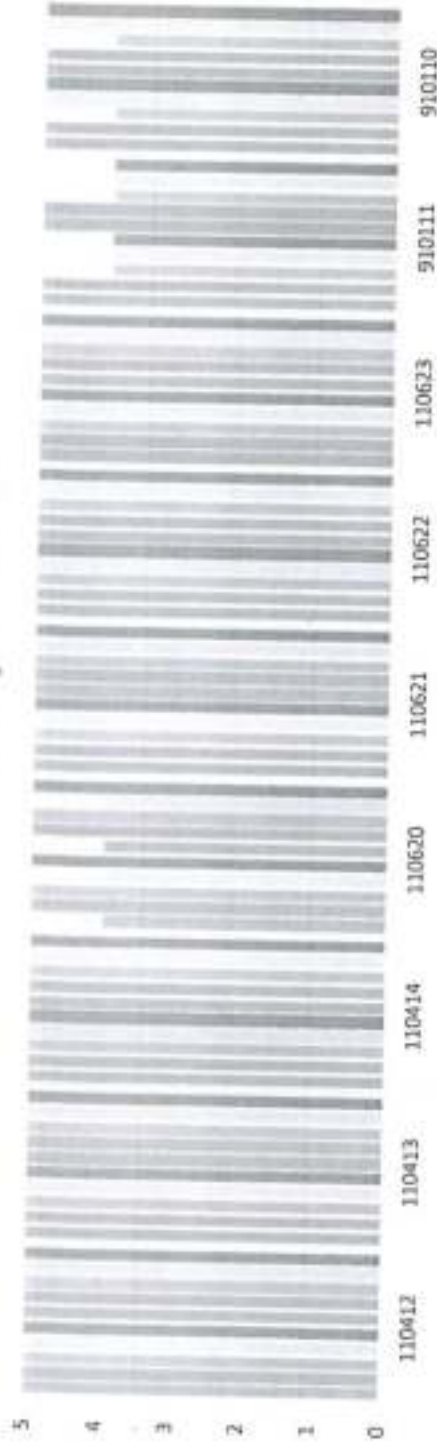| S. No.	Comments /Suggestions Received during Feedback	Action Taken
1	Opinion regarding courses to be included as DE (Through SWAYAM) - Solid Waste Management - Remote Sensing - Urban Transportation System - Sustainable Engineering Concepts & Life Cycle Analysis - Advanced Geomatics Engineering	The opinions of faculty members were taken into consideration while finalizing the list of DE courses (SWAYAM)
2	Opinion regarding courses to be included as Honors (Through SWAYAM) - Bridge Engineering - Admixtures & Special Concretes - Integrated Waste Management for Smart City - Project Planning & Control - Advanced reinforced Concrete Design	The opinions of faculty members were taken into consideration while finalizing the list of Honor courses (SWAYAM)
3	Opinion regarding courses to be included as Minor (Through SWAYAM) - Strength of Materials - Fluid Mechanics - Principles of Construction Management - Soil Mechanics - Remote Sensing - Ground Improvement	The opinions of faculty members were taken into consideration while finalizing the list of Minor courses (SWAYAM)

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4	Opinion regarding courses to be included as OC - Safety & Quality Management - Sustainable Transportation Systems - Safety in Construction	The opinions of faculty members were taken into consideration while finalizing the list of OC courses

C. Action taken based on Feedback received from Alumni

S. No.	Comments /Suggestions Received during Feedback	Action Taken
1	Institute should have tie up with the industry for suitable employment of the students in time to come	MoU are already done with some of the Research Organizations like CRRI, NHAI and efforts are being done to get students placed in them after their internship and more MoU are planned in future specially with leading Industry like L&T etc.
2	More industry Academia interaction	A team is already constituted in the department to plan programs for student industry interaction etc.

ANNEXURE – XIV

(CO Feedback Analysis)

ANNEXURE – XIV

Course Outcome Feedback Analysis & Impact (July – Dec 2022)

Review, Analysis, Impact& Action taken Report (ATR) of Course Outcome Feedback of JULY - DEC 2022 Semester

Index Scale: < = 2 (Satisfactory), 2 - 2.5 (Good), > 2.5 (Very Good) & 3 (Excellent)

Name of the Course & Code		Course Outcomes	Responses				Index (Scale of 1-3)	Comments/Impact & Action to be taken
			Strongly Agree	Agree	Average	Total		
110702 - Summer Internship Project – III	CO1	Observe various activities of civil construction works.	8	12	1	21	2.33	Good (Students have grasped the CO)
	CO2	Examine the utility of general and specific equipments for construction.	10	10	1	21	2.43	Good (Students have grasped the CO)
	CO3	Differentiate the construction projects individually and in team.	10	10	1	21	2.43	Good (Students have grasped the CO)
	CO4	Develop the writing and communication skills for various engineering problems.	10	9	2	21	2.38	Good (Students have grasped the CO)
	CO5	Adapt lifelong learning for benefit of society.	8	11	2	21	2.29	Good (Students have grasped the CO)
110703 - Creative Problem Solving	CO1	Identify various on field problems	18	11	3	32	2.47	Good (Students have grasped the CO)
	CO2	Practice various methods to solve problems.	17	10	5	32	2.38	Good (Students have grasped the CO)
	CO3	Produce solutions to various problems.	17	14	1	31	2.50	Very Good (Students have grasped the CO)
	CO4	Demonstrate various problem solving skills	19	10	3	32	2.50	Very Good (Students have grasped the CO)
110713: Advanced Structural Design-I (RCC)	CO1	Explain behaviour of RCC and Prestressed concrete structures under loads	8	1	0	9	2.89	Very Good (Students have grasped the CO)
	CO2	Determine forces developed in RCC and Prestressed concrete structures under loads	7	2	0	9	2.78	Very Good (Students have grasped the CO)
	CO3	Compare designs of RCC and Prestressed concrete structures for given loadings	5	4	0	9	2.56	Very Good (Students have grasped the CO)
	CO4	Develop economic and safe designs of RCC and Prestressed concrete structures.	5	3	1	9	2.44	Good (Students have grasped the CO)
110714: Hydraulic Structure	CO1	Identify different components of hydro project.	9	11	1	21	2.38	Good (Students have grasped the CO)
	CO2	Explain basic principles of designing hydropower plant & cross drainage works.	8	11	2	21	2.29	Good (Students have grasped the CO)
	CO3	Solve problems of dam analysis, energy dissipators & cross drainage works.	10	10	1	21	2.43	Good (Students have grasped the CO)
	CO4	Evaluate suitability of types of hydraulic structures.	11	10	0	21	2.52	Very Good (Students have grasped the CO)
	CO5	Design various elements of hydraulic structures.	9	11	1	21	2.38	Good (Students have grasped the CO)
110715-Advanced Structural Analysis	CO1	Determine response of structures by classical methods	3	1	0	4	2.75	Very Good (Students have grasped the CO)
	CO2	Use approximate methods for analysis of statically indeterminate structures	2	1	1	4	2.25	Good (Students have grasped the CO)
	CO3	Determine response of structures by matrix force method.	3	1	0	4	2.75	Very Good (Students have grasped the CO)
	CO4	Evaluate and draw the influence lines for reaction, shears, and bending moments in beams and girders due to moving loads	3	1	0	4	2.75	Very Good (Students have grasped the CO)

Semester VII

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Semester V

Course	CO	3	1	0	4		Remark
	CO5	Model and analyze structural systems (building) with the aid of softwares	9	9	0	18	2.75	Very Good (Students have grasped the CO)
100008: Intellectual Property rights (IPR)	CO1	Imbibe the knowledge of Intellectual Property and its protection through various laws	11	7	0	18	2.50	Very Good (Students have grasped the CO)
	CO2	Apply the knowledge of IPR for professional development	9	9	0	18	2.61	Very Good (Students have grasped the CO)
	CO3	Develop a platform for protection and compliance of Intellectual Property Rights & knowledge	10	8	0	18	2.50	Very Good (Students have grasped the CO)
	CO4	Create awareness amidst academia and industry of IPR and Copyright compliance	8	9	1	18	2.56	Very Good (Students have grasped the CO)
	CO5	Deliver the purpose and function of IPR and patenting	8	9	1	18	2.39	Good (Students have grasped the CO)
900201 - Integrated Waste Management for Smart City (OC - 2)	CO1	Explain the principles & concepts of waste management.	20	16	5	41	2.37	Good (Students have grasped the CO)
	CO2	Apply various techniques of handling the waste.	21	14	6	41	2.37	Good (Students have grasped the CO)
	CO3	Apply various techniques of energy recovery from waste.	20	16	5	41	2.37	Good (Students have grasped the CO)
	CO4	Plan an effective & efficient waste management system.	22	14	5	41	2.41	Good (Students have grasped the CO)
900202 - Project Planning & Control (OC - 2)	CO1	Know the project planning and project network.	32	40	4	76	2.37	Good (Students have grasped the CO)
	CO2	Analyze the network by CPM & PERT.	33	39	4	76	2.38	Good (Students have grasped the CO)
	CO3	Analyze the project using precedence network.	28	43	5	76	2.30	Good (Students have grasped the CO)
	CO4	Analyze the effect of resource planning on project.	32	38	6	76	2.34	Good (Students have grasped the CO)
	CO5	Evaluate the cost of project during planning.	31	38	7	76	2.32	Good (Students have grasped the CO)
900213 - Urban Planning & Transportation Systems (OC - 3)	CO1	Explain the concepts for planning a city and land-use pattern.	11	14	2	27	2.33	Good (Students have grasped the CO)
	CO2	Differentiate various theories used in urban planning.	10	15	2	27	2.30	Good (Students have grasped the CO)
	CO3	Analyse various requirements for transportation systems.	8	18	1	27	2.26	Good (Students have grasped the CO)
	CO4	Design approaches in addressing the issues and concerns of urban environment through planning.	12	13	2	27	2.37	Good (Students have grasped the CO)
	CO5	Plan strategies for any project with an urban planning perspective as a member and/or leader in a team of planning projects.	9	16	2	27	2.26	Good (Students have grasped the CO)
Water Supply Engineering 110511	CO1	Explain the concepts of water supply engineering.	15	6	2	23	2.48	Good (Students have grasped the CO)
	CO2	Determine the requirements for safe supply of water.	14	7	2	23	2.57	Very Good (Students have grasped the CO)
	CO3	Apply suitable water treatment technique based upon the available data.	15	6	2	23	2.52	Very Good (Students have grasped the CO)
	CO4	Analyse a given water supply scheme.	13	8	2	23	2.57	Very Good (Students have grasped the CO)
	CO5	Design a water supply system based upon the needs of society.	12	9	2	23	2.48	Good (Students have grasped the CO)
Water Supply Engineering (P) 110511	CO1	Follow sampling procedure & other guidelines for sampling & analysis of water samples.	10	7	1	18	2.56	Very Good (Students have grasped the CO)
	CO2	Check various water quality parameters.	12	6	0	18	2.50	Very Good (Students have grasped the CO)
	CO3	Improve the water quality by suggesting suitable corrective measures.	11	6	1	18	2.67	Very Good (Students have grasped the CO)
	CO4	Train others on various ways of improving the quality of water.	11	6	1	18	2.56	Very Good (Students have grasped the CO)
Theory of Structure – II 110512	CO1	Explain various methods for analysis of structures and frames.	20	11	5	36	2.42	Good (Students have grasped the CO)
	CO2	Analyse various loads on framed structures using codal provisions.	14	15	7	36	2.19	Good (Students have grasped the CO)

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Subject	CO	CO Statement					Value	Remark
	CO3	Analyse different type of structures for various load conditions by different methods.	16	15	5	36	2.31	Good (Students have grasped the CO)
	CO4	Draw influence line diagrams for statically determinate & indeterminate structure.	16	15	5	36	2.31	Good (Students have grasped the CO)
	CO5	Analyse beams & frames using plastic analysis.	12	17	7	36	2.14	Good (Students have grasped the CO)
Structural Design & Drawing (R.C.C):110513	CO1	Apply the concepts of different design philosophies for deriving basic expressions used in RC design	4	9	1	14	2.21	Good (Students have grasped the CO)
	CO2	Determine the capacity of RC elements using IS456 guidelines	5	8	1	14	2.29	Good (Students have grasped the CO)
	CO3	Analyze the RC elements for determining design variables as per IS456 & IS 875	6	6	2	14	2.29	Good (Students have grasped the CO)
	CO4	Design the RC elements as per IS 456 provisions.	7	6	1	14	2.43	Good (Students have grasped the CO)
	CO5	Develop the design sketches for RC elements as per IS456; IS13920 and SP34 provisions.	7	6	1	14	2.43	Good (Students have grasped the CO)
Fluid Mechanics – II: 110514	CO1	Differentiate different types of fluid flow & fluid machinery.	17	7	1	25	2.64	Very Good (Students have grasped the CO)
	CO2	Describe principles of analysis of fluid flow problem.	17	7	1	25	2.64	Very Good (Students have grasped the CO)
	CO3	Explain basic principles for measurement of different forces acting on fluid body.	17	7	1	25	2.64	Very Good (Students have grasped the CO)
	CO4	Analyse pipe flow, open channel flow problems & various characteristics of hydraulic machines.	17	7	1	25	1.89	Satisfactory (Students have not grasped much about the CO) Action: Skill based project to be given
	CO5	Design open & closed conduit systems.	18	6	1	25	2.68	Very Good (Students have grasped the CO)
Minor Project – 1 110515	CO1	Recognize various engineering problems and techniques to solve them	19	7	4	30	2.50	Very Good (Students have grasped the CO)
	CO2	Reproduce the solution of the problems upon the need of society.	18	11	1	30	2.57	Very Good (Students have grasped the CO)
	CO3	Cooperate to work within group.	17	9	4	30	2.43	Good (Students have grasped the CO)
	CO4	Develop the writing and communication skills for various engineering problems.	17	11	2	30	2.50	Very Good (Students have grasped the CO)
	CO5	Display lifelong learning.	19	9	2	30	2.57	Very Good (Students have grasped the CO)
Self Learning/ Presentation 110516	CO1	Analyze contemporary issues in civil engineering & its allied areas through literature survey.	8	3	1	12	2.58	Very Good (Students have grasped the CO)
	CO2	Distinguish state of art & relevance of the topic in national & international arena	9	2	1	12	2.67	Very Good (Students have grasped the CO)
	CO3	Demonstrate good oral & written communication skills	9	2	1	12	2.67	Very Good (Students have grasped the CO)
	CO4	Develop poster and power point presentations for effective communication	7	4	1	12	2.44	Good (Students have grasped the CO)
	CO5	Display lifelong learning	9	2	1	12	2.67	Very Good (Students have grasped the CO)
Data Science: 110520	CO1	Define different Data Science techniques	6	10	1	17	2.29	Good (Students have grasped the CO)
	CO2	Illustrate various tools used for Data Science technique.	7	7	3	17	2.24	Good (Students have grasped the CO)
	CO3	Apply data visualization techniques to solve real world problems.	6	9	2	17	2.24	Good (Students have grasped the CO)
	CO4	Build exploratory data analysis for Data Science methods.	5	9	3	17	2.12	Good (Students have grasped the CO)
	CO5	Apply Data Science techniques for solving real world problems.	5	10	2	17	2.00	Satisfactory (Students have not grasped much about the CO) Action: Skill based project to be given

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Semester III

Course	CO	Description						Remark
	CO6	Evaluate the performance of algorithms in data science	6	8	3	17	2.18	Good (Students have grasped the CO)
Project Management and Financing: 100005	CO1	Know the attributes of project and its different phases	18	7	1	26	2.65	Very Good (Students have grasped the CO)
	CO2	Develop the project network based on work breakdown structure and estimation of activity durations	16	9	1	26	2.58	Very Good (Students have grasped the CO)
	CO3	Analyze the project network and make decide the various alternates	18	7	1	26	2.65	Very Good (Students have grasped the CO)
	CO4	Evaluate the optimum cost of project for assigned deadlines	15	10	1	26	2.54	Very Good (Students have grasped the CO)
	CO5	Understand the different options to arrange the finances to complete it within stipulated time	17	9	0	26	2.65	Very Good (Students have grasped the CO)
110311: Building Materials & Construction	CO1	Explain the basic elements of buildings, range materials & construction	39	28	1	68	2.56	Very Good (Students have grasped the CO)
	CO2	Evaluate the properties of various materials like cement, aggregate, concrete admixture, brick, stone etc	43	24	1	68	2.62	Very Good (Students have grasped the CO)
	CO3	Distinguish the suitability of building material in the construction of elements of buildings	44	22	2	68	2.62	Very Good (Students have grasped the CO)
	CO4	Evaluate various types of concrete in building construction accordingly	44	21	3	68	2.60	Very Good (Students have grasped the CO)
	CO5	Apply various techniques for finishing & protection works of various elements of building	41	24	3	68	2.56	Very Good (Students have grasped the CO)
110311 (P): Building Materials & Construction	CO1	Determine the properties of cement, sand & aggregate as per IS code	25	15	3	43	2.51	Very Good (Students have grasped the CO)
	CO2	Determine the workability of concrete for suitability of concrete mix in different construction works	24	16	3	43	2.49	Good (Students have grasped the CO)
	CO3	Evaluate compressive strength of various concrete mixes	29	12	2	43	2.63	Very Good (Students have grasped the CO)
	CO4	Determine physical properties of brick by experiment and practice accordingly	26	14	3	43	2.53	Very Good (Students have grasped the CO)
	CO5	Examine the properties of the cement mortar for various elements of the buildings	25	14	4	43	2.49	Good (Students have grasped the CO)
110312: Fluid Mechanics-I	CO1	Define various fluid properties & states of fluid	43	23	5	71	2.54	Very Good (Students have grasped the CO)
	CO2	Apply principles of fluid flow & dimensional analysis	41	25	5	71	2.51	Very Good (Students have grasped the CO)
	CO3	Solve fluid flow problems	43	25	3	71	2.56	Very Good (Students have grasped the CO)
	CO4	Analyze characteristics of fluid at rest, fluid at motion & dimensionless number	42	25	4	71	2.56	Very Good (Students have grasped the CO)
	CO5	Determine different types of fluid flow measurement techniques & principles	44	21	6	71	2.56	Very Good (Students have grasped the CO)
	CO6	Apply the concepts of laminar flow in solving various fluid flow problems	43	22	6	71	2.52	Very Good (Students have grasped the CO)
110312: Fluid Mechanics-I (P)	CO1	Differentiate between different flow measurement devices	28	22	3	53	2.47	Good (Students have grasped the CO)
	CO2	Notice flow through pipes & fall velocity of particle	29	21	3	53	2.49	Good (Students have grasped the CO)
	CO3	Correct the instrumental errors	28	20	5	53	2.43	Good (Students have grasped the CO)
	CO4	Apply Stoke's law to calculate terminal velocity	27	21	5	53	2.42	Good (Students have grasped the CO)
110313: Surveying	CO1	Explain the techniques used for linear & angular measurements in surveying	36	23	2	61	2.56	Very Good (Students have grasped the CO)
	CO2	Analyse different geodetic methods of survey such as triangulation, transmetric levelling, tacheometry, photographic & GIS	36	23	2	61	2.56	Very Good (Students have grasped the CO)
	CO3	Apply methods in remote sensing	35	24	2	61	2.54	Very Good (Students have grasped the CO)

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	CO	Description						
	CO4	Apply tachometry in traverse computations.	35	21	5	61	2.49	Good (Students have grasped the CO)
	CO5	Apply various methods for setting curves, area & volume computations.	36	21	4	61	2.52	Very Good (Students have grasped the CO)
110314: Strength of Materials	CO1	Explain the concepts of stress, strain, bending, deflection, buckling & torsion.	32	32	8	72	2.33	Good (Students have grasped the CO)
	CO2	Explain various theories for determining stress, buckling of columns & deflections of structures	33	27	12	72	2.29	Good (Students have grasped the CO)
	CO3	Apply various theorem for determining stress, buckling of columns & deflections of structures	32	28	12	72	2.28	Good (Students have grasped the CO)
	CO4	Evaluate the stresses in bending, shear and torsion	31	29	12	72	2.26	Good (Students have grasped the CO)
	CO5	Analyze various sections for stresses, strain, bending, torsion, buckling & deflections	32	27	13	72	2.26	Good (Students have grasped the CO)
110314(P): Strength of Materials	CO1	Evaluate properties of material by impact test	33	28	7	68	2.38	Good (Students have grasped the CO)
	CO2	Evaluate properties of material by hardness test	31	31	6	68	2.37	Good (Students have grasped the CO)
	CO3	Evaluate properties of material by tensile test	29	31	8	68	2.31	Good (Students have grasped the CO)
	CO4	Determine compressive & flexural strength of materials	31	31	6	68	2.37	Good (Students have grasped the CO)
110315 (P): Survey Practice Lab	CO1	Follow the guidelines for field surveying	27	14	0	41	2.66	Very Good (Students have grasped the CO)
	CO2	Follow the working principles of survey instruments for measurements	28	12	1	41	2.66	Very Good (Students have grasped the CO)
	CO3	Measure horizontal & vertical angle by theodolite for traversing and leveling	28	13	0	41	2.68	Very Good (Students have grasped the CO)
	CO4	Determine tachometric constants for linear measurements by tachometry	26	14	1	41	2.61	Very Good (Students have grasped the CO)
	CO5	Create a simple circular curve by using Rankine's method for alignment	26	15	0	41	2.63	Very Good (Students have grasped the CO)
	CO6	Develop contour map by using tachometric & total station	26	14	1	41	2.61	Very Good (Students have grasped the CO)
110316: Self Learning / Presentation	CO1	Analyze contemporary issues in civil engineering & its allied areas through literature survey	17	9	1	27	2.59	Very Good (Students have grasped the CO)
	CO2	Distinguish state of art & relevance of the topic at national & international arena	18	8	1	27	2.63	Very Good (Students have grasped the CO)
	CO3	Demonstrate good oral & written communication skills	18	8	1	27	2.63	Very Good (Students have grasped the CO)
	CO4	Develop poster and power point presentations for effective communication	18	7	2	27	2.59	Very Good (Students have grasped the CO)
	CO5	Display lifelong learning	19	5	3	27	2.59	Very Good (Students have grasped the CO)
Project Management and Finance: 100005	CO1	Know the attributes of project and its different phases	34	22	2	58	2.55	Very Good (Students have grasped the CO)
	CO2	Develop the project network based on work breakdown structure and estimation of activity duration	35	21	2	58	2.57	Very Good (Students have grasped the CO)
	CO3	Analyze the project network and make decide the various alternates	35	20	3	58	2.55	Very Good (Students have grasped the CO)
	CO4	Evaluate the optimum cost of project for assigned deadlines	33	20	5	58	2.48	Good (Students have grasped the CO)
	CO5	Understand the different options to arrange the finances to complete it within stipulated time	31	24	3	58	2.48	Good (Students have grasped the CO)

Civil Engineering Department, MITS Gwalior

ANNEXURE – XV

(Scheme & Syllabus PG Programme 1st Semester for 2023 admitted batch & Scheme PG programme 3rd Semester for 2022 admitted batch)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute affiliated to RGPV, Bhopal)

Master of Engineering in Construction Technology & Management (Semester – III)

For batch admitted in academic session 2022 – 23

Scheme of Examination

S. No.	Subject Code	Subject Name	Theory Slot End Sem.	Theory Slot Mid Sem.	Theory Slot Quiz/ Assignment	Practical Slot End Sem./Practical Viva	Practical Slot Sessional Work/Practical Record/Assignment/Quiz/Presentation	MOOCs Assignment	MOOCs Exam	Total Marks	L	T	P	Total Credits
1.	510311	Dissertation Part-I (Literature Review/ Problem Foundation/ Synopsis/survey paper, etc.)	-	-	-	150	100			250	-	-	10	10
2.	8003XX	*MOOC Course	-	-	-	-	-	25	75	100	02	-	-	02
		Total	-	-	-	150	100	25	75	350	02	-	10	12

*MOOC Course : Admixtures & Special Concretes

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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Master of Technology in Environmental Engineering (Semester – III)

For batch admitted in academic session 2022 – 23

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted								Total Marks	Contact Hours per week			Total Credits
			Theory Slot			Practical Slot		MOOCs				L	T	P	
			End Sem.	Mid Sem.	Quiz/ Assignment	End Sem. /Practical Viva	Sessional Work/ Practical Record/ Assignment/ Quiz/ Presentation	Assignment	Exam						
1.	530311	Dissertation Part-I (Literature Review/ Problem Foundation/ Synopsis/survey paper, etc.)			-	150	100				250			10	10
2.	8003XX	*MOOC Course			-	-		25	75		100	02	-	-	02
		Total			-	150	100	25	75		350	02	-	10	12

*MOOC Course : Sustainable Engineering Concepts & Life Cycle Analysis

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
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For Batch Admitted in 2023-2024

Master of Engineering in Construction Technology & Management (Semester – I)

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted							Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot		MOOCs			L	T	P	
			End Sem	Mid Sem	Quiz/ Assignment	End Sem	Lab Work / Sessional	Assignment	Exam					
1.	510111	Computational Techniques	70	20	10	-	-	-	-	100	3	-	-	3
2.	510121	Construction Materials, Machines & Techniques	70	20	10	-	-	-	-	100	3	-	-	3
3.	510113	Contract Management	70	20	10	-	-	-	-	100	3	-	-	3
4.		#Elective – I	70	20	10	-	-	-	-	100	3	-	-	3
5.		*Open Category Course (OC-1)	70	20	10	-	-	-	-	100	3	-	-	3
6.	510119	Construction Lab	-	-	-	90	60	-	-	150	-	-	4	4
7.	510120	S Self Learning / Presentation	-	-	-	-	100	-	-	100	-	-	2	2
		Total	350	100	50	90	160	-	-	750	15	-	6	21

#Elective – I
510114. Maintenance Management
510115. Infrastructure Development
510116. Formwork for Concrete Structures

*Open Category Course (OC-1) will have to be opted from the pool of open courses (Student can opt from parent department and other department) and based on interdisciplinary aspects.
800108. Organizational Behaviour & Management
800109. Safety & Quality Management

During labs, students have to perform practical/assignments/minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies / languages / tools etc.

Open Category Course (OC-1) will have to be opted from the pool of open courses (Student can opt from parent department and other department) and based on interdisciplinary aspects.

$Self learning / presentation through SWAYAM /APTEL. (Registration in a course will be compulsory for students bus assessment will be based on internal seminar presentation)

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For Batch Admitted in 2023-2024

Master of Technology in Environmental Engineering (Semester – I)

Scheme of Examination

S. No.	Subject Code	Subject Name	Theory Slot End Sem	Theory Slot Mid Sem	Theory Slot Quiz/Assignment	Practical Slot End Sem	Practical Slot Lab Work/Sessional	MOOCs Assignment	MOOCs Exam	Total Marks	L	T	P	Total Credits
1.	530111	Environmental Chemistry & Microbiology	70	20	10	-	-	-	-	100	3	-	-	3
2.	530112	Solid & Hazardous Waste Management	70	20	10	-	-	-	-	100	3	-	-	3
3.	530113	Advanced Treatment Process – I (Waste Water Engineering)	70	20	10	-	-	-	-	100	3	-	-	3
4.		#Elective - I	70	20	10	-	-	-	-	100	3	-	-	3
5.		*Open Category Course (OC-1)	70	20	10	-	-	-	-	100	3	-	-	3
6.	530118	Environmental Engineering Lab	-	-	-	90	60	-	-	150	-	-	4	4
7.	530119	S Self Learning / Presentation	-	-	-	-	100	-	-	100	-	-	2	2
		Total	350	100	50	90	160	-	-	750	15	-	6	21

##Elective-I

530114. Industrial Waste Management
530115. Environmental Auditing & Management System
530116. Environmental Hydraulics

* **Open Category Course (OC-1)** will have to be opted from the pool of open courses (Student can opt from parent department and other department) and based on interdisciplinary aspects.

800110. Sustainable Waste Management System.

During labs, students have to perform practical/assignments/minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies/ languages/ tools etc.

$Self learning / presentation through SWAYAM / NPTEL. (Registration in a course will be compulsory for students bus assessment will be based on internal seminar presentation)

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MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS M.E. CTM

2023 ADMITTED BATCH

SEMESTER-I

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Course Code: 510121

Course Name: Construction Materials, Machines & Techniques

L	T	P	C
3	-	-	3

Course Objectives:

1. To impart knowledge about ingredients of concrete, production of concrete at site and ready mix concrete.
2. To apprise about special concretes for different field requirements.
3. To apprise about various types of equipments/machineries used in construction industry.
4. To develop understanding of construction procedure for piles and well foundations.
5. To impart know-how of formwork and scaffolding.
6. To develop technical know-how of shop and insitu construction/fabrication.

Syllabus:

Unit-I

Concrete and its ingredients: Ingredients of concrete including mineral admixtures and chemical admixtures; Proportioning of ingredients; Stages in production of concrete i.e. Batching, Mixing, Transporting, Placing compacting and curing. Design of high strength concrete; Production of Ready mix concrete.

Unit-II

Special Concrete: Polymer concrete, Light weight concrete, Heavy weight concrete, Concrete for radiation shielding, No-Fines concrete, Pervious concrete; Ferro cement; Fiber reinforced concrete, Dry lean concrete and Pavement quality concrete; Self compacting concrete.

Unit-III

Construction Equipments: Characteristics, Operation and selection of different types of construction equipments viz. Power shovels, Drag lines, Scrapper, Bulldozer, Tractor, Rippers, Motor graders; Equipments for aggregate processing plant; Ready Mix Concrete Plant; and Hot Mix plant

Unit-IV

Foundations: Construction of piles, Well foundations, Cofferdams and diaphragms; Drilling and blasting, Underpinning, Shoring and shuttering.

Formwork: Different types of formworks, Stationary and slip formwork techniques, Formwork of special structures eg. Shells, Bridges, Towers etc; Scaffolding

Unit-V

Steel Construction: Shop and insitu construction techniques, Pre-engineered buildings; Erection of steel structures like bridges, and trusses.

Prefabrication: Application of prefabrication in construction, Modular coordination and standardization; equipments for industrial production of prefabricated components.

Prestressing: Prestressing methods; Materials; Loss of prestress; equipments for industrial production of prestressed components; Production of Railway Sleepers, Poles and Tanks.

Course Outcomes:

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

CO 1: Define the relevant characteristics of concrete and its ingredients.

CO 2: Explain the details of various stages in concrete production.

CO 3: Design concrete mix for specific requirements using codal provisions.

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CO 4: Determine the suitability of special concretes for specific requirements.

CO 5: Evaluate the suitability of various equipments for a construction site.

CO 6: Apply shop and insitu methods and the pre-stressing concepts for a construction project.

Reference Books:

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction Equipment Management for Engineers, Estimators, and Owners, Taylor & Francis, New York.

2. R. L. Peurifoy, C. J. Schexnayder, A. Shapira and R. Schmitt, Construction planning, equipment, and methods, 8th ed., McGraw Hill, New York, 2010.

3. A. R. Santha Kumar, Concrete Technology, Oxford University press.

4. A.M. Neville, Properties of concrete, Pearson Publication

5. M.L. Gambhir, Concrete Technology, Tata Mc Graw Hill Pub. Co.

6. Soil Mechanics by Gopal Ranjan, New Age Publishers.

7. Mahesh Verma, Construction Equipment, its planning & Application, Metropolitan Book Co.(P) Ltd.

8. Foundation Design Manual by Narayan V. Nayak, Dhanpat Rai Publications

9. Prestressed Concrete by T.Y. Lin and N.H. Burns, Wiley Publishers

10. Highway Engg by Justo and Khanna, Publisher: Nem Chand and Brothers

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Course Code: 510113

Course Name: Contract Management

L	T	P	C
3	-	-	3

Course Objectives:

1. To understand specification writing, rate analysis and estimating.

2. To understand necessity and methods of valuation.

3. To understand role of Architect, Engineer, Contractor and Owner in a construction project.

4. To know about different acts related to construction.

5. To know about various laws related to construction labour.

6. To know about important conditions of contract in construction.

7. To understand the construction contracts used in infrastructure projects.

Syllabus:

Unit-I

Quantity Surveying: Basic principles of estimating. Construction costs. Different methods and stages of estimating. Specification of construction items and method of statement. Principles of rate analysis and valuation.

Unit-II

Claims and Arbitration: Indian contract act and arbitration act. Variations in work and conditions. Claims and disputes. Liquidated damages. Rights. Responsibilities and duties of client (Owner). Architect. Engineer. Contractor etc. Purchase order as contracts insurance contract and claims.

Unit-III

Legal Frame Work of Construction: Contract labors act 1970 and other acts and laws relating to labors management. Wages. Bonus and Industrial disputes.

Unit-IV

Contract Conditions: Important contract clauses. Terms of payments. Retention. Acceptance and final payment. Time of completion. Extension of time. Maintenance period etc.

Unit-V

Construction Contracts: BOT projects, Variation in BOT projects. Infrastructural projects. International contract rules and regulation.

Course Outcomes:

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

CO1: Write the specifications and perform rate analysis of various construction items.

CO2: Prepare estimate of building/road works and valuation.

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CO3: Differentiate between rights and responsibilities of Architect, Engineer, Contractor and Owner in a construction project.

CO4: Apply the provisions of various acts and laws applicable in construction.

CO5: Draft tender document for construction project.

CO6: Identify the role of project participants and financing of infrastructure projects.

Reference Books:

1. Construction Engineering and Management by S. Seetharaman, Publisher Umesh Pub.

2. Construction Planning and Management by B. Sengupta, Pub. Tata McGraw-Hill Education

3. Construction and Project Management Theory And Practices by N.K. Jha, Pub. Pearson Education India

4. Construction Contracts by Jimmie Hinze, Publisher Tata McGraw-Hill Education

5. Estimating and Costing by B.N. Datta

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Course Code: 510114

Course Name: Maintenance Management

L	T	P	C
3	-	-	3

Course Objectives:

1. To learn about building services required in a building.

2. To learn about fire fighting systems in buildings.

3. To understand planning and maintenance requirements of lifts in high rise buildings.

4. To understand water management and planning system in a building.

5. To learn maintenance of building services and management of related tasks.

Syllabus:

Unit I

Introduction: Introduction to primary services in a building. Type of services required to keep facility usable, planning of services. Organization structures of services management. Role and administrative functions of supervisors. Outline of the concept of carbon trading and self sustainable zero carbon building. Importance

Unit II

Fire Fighting: Standard fire, fire resistance, classification of buildings. Basic requirement of the works for fighting system, various components of the fire fighting system. Maintenance required of the system, fire fighting in high-rise buildings, commercial/industrial complexes. Public buildings, checklist for fire safety. Provision of NBC.

Unit III

Lifts/Elevators, Escalators: Legal formalities for elevators, various types of lifts, working mechanisms of lift and escalators. Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts.

Unit IV

Plumbing Services Water Supply System: Basics of Plumbing systems. Requirement of Plumbing works, Agency. Activity flow chart for plumbing work. Quality checking of materials. Water supply and distribution system is high-rise building & other complexes, pumps and pumping mechanisms. Operation & maintenance of fittings & fixtures of water supply & sanitary. Do's & Don'ts for water pipe networks.

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Unit V

Maintenance and management of services: Telecommunication network, computer network LAN, Electrical network & appliances. Basics of single phase & three phase electrification, precautions and safety measures during electrification. Indian standard codes for electrical appliances & wiring operations & maintenance of network & appliances. Landscaping & Horticulture. Building maintenance management, applications of computer in service management. Flowcharts of air conditioning & heating. Centralised systems, monitoring and working of the equipments, Checklist of inspection, Performance testing. Water proofing. Damp proofing & Termite proofing. Working procedure & stages of work of water proofing for W.C., Bathrooms, Terrace, sloping roof, Basements, tanks. Use of chemicals for water proofing treatment.

Course Outcome:

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

CO1: Identify various services required in a building.

CO2: Carry out planning of fire fighting system for a building.

CO3: Develop a management strategy for maintenance of building services in a building.

CO4: Design a sustainable building services plan for a building.

Reference Books:

1. Building services Design and Management by Jakie Partman, Willey Blackwell 2014.

2. Building Services Engineering by David V .Chadderton, Routledge 2013.

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Course Code: 510115

Course Name: Infrastructure Development

L	T	P	C
3	-	-	3

Course Objectives:

1. To make them understand the various aspects like operation, maintenance, sustainability, life cycle cost of infrastructure systems.
2. To make them able to develop infrastructure system plan considering various risks.
3. To make them develop disaster management plan for Infrastructure systems.
4. To illustrate use of I. T. Tools for various phases of Infrastructure system.

Syllabus:

Unit-I

Infrastructure and economic development: Energy needs, sources and management. Different types of build infrastructure systems, challenges and opportunities.

Unit –II

Strategic issues in Infrastructure development: Planning, Design and Construction of Infrastructure. Quality control in Infrastructure development. Role of Public PPP in Infrastructure development.

Unit-III

Performance monitoring: Maintenance, Rehabilitation and Renovation of Infrastructure. Life cycle cost analysis of Infrastructure.

Unit-IV

Risk management in Infrastructure projects: Basic components of risk, components of risk management – risk assessment, risk acceptance, treatment, monitoring and communication.

Unit - V

Disaster management of Infrastructure: Application of IT tools in various phases of Infrastructure development.

Course Outcomes:

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

CO 1: Develop plan for infrastructure considering operation, maintenance, sustainability and life cycle cost.

CO2: Identify various risks in Infrastructure projects.

CO3: Illustrate management and disaster management needs for Infrastructure systems.

CO4: Apply I. T. Tools in various phases of Infrastructure system.

Reference Books:

1. Infrastructure Develpoment and Financing in India by N Mani Publisher Rediff books,2012

2. Risk Management in Civil Infrastructure by Mohammed M. Ettouney, Shreenivas Alampalli. Publisher CRC Press Taylor and Francis group.2017.

3. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation by W. Ronald Mudson, Ralph Haas . Publisher Mc Graw-Hill.1997

4. Disaster Resillence Management of Infrastructure System: Computational modeling and Geospatial Technologies by W Waheed Uddin Publisher CRC Press LLC.

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Course Code: 510116

Course Name: Formwork for Concrete Structures

L	T	P	C
3	-	-	3

Course Objectives:

1. To know about various formworks for concrete structure.

2. To know about various issues in formworks and subsequent solutions.

Syllabus:

Unit-1 Introduction

Introduction to Sheeting, Shuttering, Centering, Staging, Formwork, Scaffolding and False work, Mould. Formwork as a temporary structure. Requirements for a formwork. Classification (Types) of Formwork. Formwork Materials.

Unit-2 Formwork for building components

Formwork for raft foundation, pile foundation, footings, RCC columns, beams, slabs and wall. Formwork area calculation. Various loads and moments on formwork. Slip form and their types.

Unit-3 Formwork for special structure

Formwork for Highways. Formwork for Bridge structures. Formwork for Multi-Story Building Construction. Formwork for precast concrete. Formwork for pre-stressed concrete. Flying formwork and their advantages, disadvantages and limitations.

Unit-4 MIVAN Formwork

Introduction, materials used in MIVAN formwork, parts of MIVAN formwork, Procedure of MIVAN formwork construction, pin and wedge system in MIVAN formwork, Work cycle of MIVAN formwork, Comparison between MIVAN and traditional formwork, Technical specification of MIVAN formwork, advantages and disadvantages of MIVAN formwork
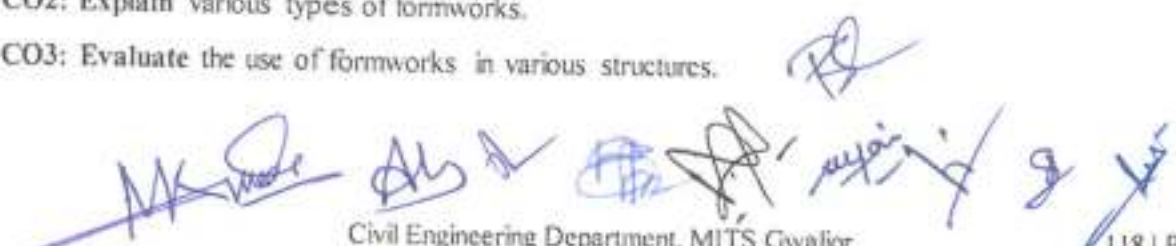
Unit-5 Issues and failure of Formwork

Causes of Formwork Failure. Common deficiency in design leading to formwork failure. A case study on formwork failure. Avoiding formwork failure. Pre-Award and Post –award Formwork Management Issues.

Course Outcomes:

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

CO1: Explain the concept of formworks.

CO2: Explain various types of formworks.

CO3: Evaluate the use of formworks in various structures.

CO4: Assess the failure issues in formworks.

Reference Books:

1. Jha, K.N., Formwork for Concrete Structures. First Edition, McGraw Hill, 2012

2. Austin, C.K., Formwork for concrete, Cleaver - Hume Press Ltd., London, 1996

3. Michael P. Hurst, Construction Press, London and New York. 2003

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Course Code: 800108

Course Name: Organizational Behaviour & Management

L	T	P	C
3	-	-	3

Course Objectives:

1. To know the environment levels in management.

2. To explore the organizational structure and its design.

3. To understand the stress management and communication.

4. To explore the leadership quality for updating the organisation structure.

5. To compare and explore the existing management activity in the world.

Syllabus:

Unit – I:

Nature of Management: Social Responsibilities of Business - Manager and Environment Levels in Management - Managerial Skills - Planning - Steps in Planning Process - Scope and Limitations - Short Range and Long Range Planning - Flexibility in Planning ¬Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies.

Unit-II

Organisation: Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organisational design - Mechanistic vs Adoptive Structures - Formal and Informal Organisation.

Unit – III

Perception and Learning - Personality and Individual Differences - Motivation and Job Performance - Values, Attitudes and Beliefs - Stress Management - Communication Types-Process - Barriers - Making Communication Effective.

Unit – IV

Group Dynamics: Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture - Organisational Change and Development.

Unit – V

Comparative Management Styles and approaches : Japanese Management Practices Organisational Creativity and Innovation - Management of Innovation - Entrepreneurial Management - Benchmarking - Best Management Practices across the world - Select cases of Domestic & International Corporations - Management of Diversity.

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Course Outcomes:

After completing this course, the students will be able to:

- **CO1:** **Explain** the environment levels in management.
- **CO2:** **Analyse** the organizational structure and its design.
- **CO3:** **Apply** the stress management and communication in organization.
- **CO4:** **Develop** the leadership quality for updating the organisation structure.
- **CO5:** **Evaluate** the existing management activity in the world.

Recommended Books:

1. Kast & R. Seuwing   : Organisation & Management
2. Singh & T. N. Chabra : Management Concepts & Practices
3. George R. Terry : Principles of Management
4. Anthony   : Art of Japanese Management
5. Aswathapa K   : Organisational Behaviour

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Course Code: 800109

Course Name: Safety & Quality Management

L	T	P	C
3	-	-	3

Course Objectives:

1. To study the basics of quality and safety management.

2. To learn the code of practice in design and construction for quality standards.

3. To understand and evaluate quality and safety management principles and best practices in construction.

4. To understand and evaluate safety management principles in construction;

5. To acquire good basic practices for quality system and progress for quality assurance and quality improvement for construction companies.

Syllabus:

Unit – I

Quality Management: Introduction – Definitions and objectives, Factors influencing construction quality; Responsibilities and authority; Quality plan; Quality Management Guidelines; Quality circles; cost of quality and safety; Quality transition - quality control and inspection; quality assurance; total quality management-principles, tools and techniques; Planning and control of quality during design of structures; Tools and techniques for quality management.

Unit – II

Quality Systems: Introduction - Quality system standard, ISO 9000 family of standards; Requirements-Preparing Quality System Documents; Quality related training; Implementing a Quality system; Third party Certification; Quality assurance in construction; Concepts of quality control- Objectives, definitions, and systems.

Unit – III

Quality Planning: Quality Policy, Objectives and methods in Construction industry; Consumers satisfaction, Ergonomics, Time of Completion, Statistical tolerance, Taguchi'sconcept of quality; Inspection procedures-Processes and products (materials and machinery); Total cost implication.
Quality Assurance and Quality Improvement Techniques:

Objectives of quality assurance; Methods, Techniques and needs of quality assurance; Different aspects of quality Appraisals; Critical, major failure aspects and failure mode analysis; Stability methods and tools; Reliability testing, Reliability coefficient and reliability prediction; Life cycle costing; Value engineering and value analysis; Quality Improvement Tools and Techniques.

Unit – IV

Safety management : Planning for safety provisions, budgeting for safety, safety policy, Safety audit, safety management practices, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety; Construction hazards and safety guidelines; Overall accident investigation process; Risk management; Prevention techniques for construction accidents; Site management with regard to safety recommendations; Training for safety awareness and implementation; Construction safety and health manual.

Unit-V

Recent trends and Case studies: Quality and safety issues in steel construction, concrete construction (including pre-cast, and pre-stressed); computer aided hazard analysis.

Course Outcomes:

After this course, students will be able to:

CO 1: Explain the quality management systems and utilize the ISO 9000 family of standards.

CO 2: Improve the quality of the project through tools and techniques.

CO 3: Perform the environmental impact assessment (EIA) for construction projects towards quality.

CO 4: Analyse the quality assurance and quality control, quality improvement tools and techniques;

CO 5: Evaluate the contract and inspection procedures.

CO 6: Identify the safety management practices in construction industry.

Reference Books:

1. B. G. Dale, Managing quality,4th ed., Blackwell Publishing, Oxford, 2003.

2. D. Reese and J. V. Eidson, Handbook of OSHA construction safety and health, 2 n d ed., CRC Press, Bocaaton, 2006.

3. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6 t h ed., Blackwell Publishing, Oxford, 2006

4. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction management fundamentals, 2 nd ed., McGraw Hill, New York, 2008.

5. S. J. Holt, Principles of construction safety, Blackwell Publishing, Oxford, 2008.

6. The Management and Control of Quality: Sixth edition: James R.Evans, William M.Lindsay.

7. Safety management by John V.Grimaldi Rollin H.Simonds.

8. ISO 9000 family of standards.

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Course Code: 510119

Course Name: Construction Lab

L	T	P	C
-	-	4	2

Course Objectives:

1. To Study and understanding basic knowledge of building materials, such as their identification and classification, relationships between physical characteristics and mechanical properties experimentally measuring them.

2. To understand the role of water in soil and concrete behavior.

3. To understand the concrete mix design and testing; non-destructive testing methods; Studies on simple building system components

List of Experiments:

1. Mix Design of Concrete

2. Permeability Test of Concrete

3. Creep Test of Concrete

4. Measurement of In-situ Strength determination by Rebound Hammer and Moisture content in aggregates, soil and hardened concrete surface using NDT techniques.

5. Unconfined Compression Test

6. Direct Shear Test

7. Static Cone Penetration Test

8. Triaxial Shear Test

   (Unconsolidated Undrained, Consolidated Undrained, Consolidated Drained)

9. Vane Shear Test

10. C.B.R Test of Soil

11. Consolidation Test

12. SPT Test (Demonstration)

13. Marshall stability test of bitumen

Course Outcomes:

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

CO1: Check physical properties of soil, aggregate, and concrete.

CO2: Check strength properties of soil, aggregate, and concrete.

CO3: Differentiate the flow properties and stresses of soil.

CO4: Apply various non-destructive testing method on concrete.

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Reference Books:

1. Metha P.K and Monteiro. P.J.M, " CONCRETE", Microstructure, Properties and Materials. Third Edition. Tata McGraw- Hill Publishing company Limited. New Delhi, 2006

2. Shetty .M.S., " Concrete Technology. Theory and Practice", Revised Edition. S. Chand & company Ltd., New Delhi.2006

3. Neville. A.M., " Properties of Concrete", 4th Edition Longman,1995

4. Soil Mech. & Found. Engg., Dr. K. R. Arora, Std. Publishers Delhi, 7th edition 2014

5. Soil Mech. & Foundation, Dr. B. C. Punmia, Laxmi Publications. Delhi, 16th edition 2017

6. Soil Mech. & Found Engg., S. K. Garg. Khanna Publishers. Delhi, 1st edition, 2003

7. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc., 1969

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Course Code: 510120

Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

Course Objectives:

1) To encourage students to read, study & understand different topics of CTM published in articles, literatures.

2) To help in presenting different topics of CTM and related subjects to supplement theoretical knowledge gained in class.

3) To make student acquire good oral & written communication skills.

4) To promote the habit of lifelong learning.

5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

Syllabus:

Any relevant topic related to civil engineering/CTM from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

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

CO 1: Analyze contemporary issues in civil engineering/CTM & its allied areas through literature survey.

CO 2: Distinguish state of art & relevance of the topic in national & international arena.

CO 3: Demonstrate good oral & written communication skills.

CO 4: Develop poster and power point presentations for effective communication.

CO 5: Display lifelong learning.

DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS M.Tech Env Engg

2023 ADMITTED BATCH

SEMESTER-I

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Course Code: 530111

Course Name: Environmental Chemistry & Microbiology

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To impart knowledge of environmental chemistry and its concepts.

2) To apply concepts of environmental chemistry in various analysis of water and waste water.

3) To impart knowledge of environmental microbiology and its concepts.

4) To apply concepts of environmental microbiology in various analysis of water and waste water.

Syllabus:

Unit I:

Environmental Chemistry

Basic Principles: Physical and chemical properties of water and their significance in environmental engineering- Types of chemical reactions – stoichiometric calculations – solutions – chemical equilibrium. Acid-base equilibria – alkalinity, acidity, buffers and buffer index – Chemical thermodynamics – Oxidation-Reduction – Mass transfer and transport of impurities in water and air – diffusion, dispersion – Physical and chemical interactions due to various forces, suspensions and dispersions.

Unit II:

Analysis: Basic concepts of quantitative analytical chemistry – Instrumental methods of analysis – Determination of turbidity, colour, pH, acidity, alkalinity, hardness, residual chlorine and chlorine demand, chlorides, dissolves oxygen demand, nitrogen, solids, iron and manganese, fluoride, sulphate, phosphorous and phosphate, grease, volatile acids, gas analysis – Preparation of standard solutions – Drinking water and wastewater standards – Trace organics and inorganics.

Unit III:

Environmental Microbiology

Introduction: Microorganisms – Classification, prokaryotic and eukaryotic cells, structure, characteristics, nucleic acids, DNA and RNA, Viruses, their detection and quantification – Microscopy – Measurements and isolation of Microorganism – Different Cultures – Media and Techniques of Staining and Enumeration of microorganism.

Unit IV:

Microbial metabolism and growth: Enzyme and enzyme kinetics – Metabolism – Respiration – Fermentation – Glycolysis – Kreb's cycle – Carbohydrate – Protein, lipids, significance of energetic – Chemical composition of cell and nature of organic matter used by microorganisms – Metabolic classification of microorganisms: phototroph, chemotroph, applications in environmental engineering.

Unit V:

Microbiology of water and wastewater: Distribution of microorganisms in natural water – Indicator organisms – Coliforms – Faecal coliforms – E.coli, streptococcus faecalis – Differentiation of coliforms – Significance – MPN – M.F. techniques – Microbiology of waste-water treatment processes such as activated sludge process – Trickling filter – Anaerobic processes.

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Course Outcomes:

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

CO 1: **Explain** the concepts of environmental chemistry & microbiology.

CO 2: **Apply** the concepts of environmental chemistry in environmental engineering.

CO 3: **Analyse** water and waste water quality parameters using the concepts of environmental chemistry.

CO 4: **Apply** the concepts of environmental microbiology in environmental engineering.

CO 5: **Explain** the concepts of energy generation in cells.

Books Recommended:

1. Maier R.M. Pepper I.L and Gerba C.P. Environmental Microbiology. Elsevier- AP. New York 2009.
2. Pelczar Jr. M.J., Chan E.C.S., Krieg R.N., and Pelczar M.F., Microbiology, Tata McGraw-Hill, New Delhi, 1996.
3. Sawyer C.N., McCarty P. L., and Parkin G.F., Chemistry for Environmental Engineers, McGraw-Hill New Delhi, 1994.
4. Benefield, Judkins and Weand – Process Chemistry for Water and Wastewater Treatment, Prentice Hall, New Delhi, 1996.
5. Rittman B. McCarty P.L., and McCarty P., Environmental Biotechnology: Principles and Applications, McGraw-Hill, New Delhi, 2000

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Course Code: 530112

Course Name: Solid and Hazardous Waste Management

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To provide broad knowledge on various aspects of planning & implementation of waste management system in a smart city/town.

2) To understand the principles applied in waste management.

3) To understand various ways to collect, treat & disposal of waste.

4) To understand various methods of energy recovery from waste.

5) To understand various aspects of hazardous waste management, E-waste management, biomedical waste management etc.

Syllabus:

Unit I:

Introduction: Introduction to waste management, classification of solid waste, objective of solid waste management, Solid waste sources – Nature and characteristics (physical, chemical & biological) – Quantities and Qualities – Generation rates – Potential of disease – Nuisance and other problems.

Unit II:

Collection and Storage: Solid waste management – Functional elements of solid waste – on – site storage – Collection and separation – Containers and its location – Collection systems and its example – Vehicle routing – Route balance – Transfer station – Processing – Recovery and reuse.

Unit III:

Processing of Municipal Solid Waste: Conveying and compacting waste – Shredding – Types of shredders – Material separation – Types – Devices for material separation – Thermal processing of municipal solid waste – incineration, pyrolysis, gasification – Refuse Derived fuel – Biological process like composting, Vermicomposting and biomethanation.

Unit IV:

Disposal: Disposal methods – Sanitary land filling – Planning – Site selection – Design – Landfill Process – Monitoring Closure – Post closure monitoring – leachate management & control of gases in landfills, environmental monitoring of landfills. MSW rules, Introduction to swachh bharat mission and smart cities program - current status, challenges and future trend of waste management.

Unit V:

Hazardous Waste Management: Introduction to hazardous waste - Definition – Characterization and composition – TCLP test – Storage and transportation of hazardous waste – Labeling of hazardous waste – Physical, Chemical and Biological treatment of hazardous waste – Bioremediation of hazardous waste – Treatment of Bio medical – Nuclear waste and Radio – Active waste – Fly ash management and E-waste management.

Course Outcomes:

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

CO 1: Explain the principles & concepts of waste management.

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CO 2: Apply various techniques of handling the waste.

CO 3: Apply various techniques of energy recovery from waste.

CO 4: Plan an effective & efficient waste management system.

Text Books:
1. Text Book of Solid Wastes Management, Iqbal H. Khan and Naved Ahsan, CBS Publishers, 1st edition 2012
2. Integrated Solid Waste Management, Hilary Theisen and Samuel A. Vigil, George Tchobanoglous, McGraw Hill Yew York, 1993

Reference Books:
1. Environmental Engineering, Rowe, Peavy & Tchobanogolous, Tata McGraw Hill Publications, 2017
2. CPHEEO, Manual on Municipal Solid Waste management, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2016
3. Solid Waste Engineering, Vesilind P.A., Worrel H. W. and Reinhard, Thomson Learning Inc, 2003
4. Charles A. Wentz, Hazardous Waste Management, McGraw Hill, New York, 1995.
5. David Rimbers, Municipal Solid Waste Management: Pollution Technologies Review, Noyes Data Corporation, London, 1990.
6. Michael D. Lagrega, Philip L. Buckingham, Jeffrey C. Evans, Hazardous Waste Management McGraw Hill, New York, 1994.

Course Code: 530113

Course Name: Advanced Treatment Process – I (Waste Water Engineering)

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To impart basic knowledge on sewerage system including estimation of sewage quantity & design of sewers.

2) To provide a broad knowledge on sewage composition & its characteristics.

3) To provide information on disposal standards of effluents & also about various methods of sewage disposal.

4) To provide broad knowledge on various techniques of sewage treatment including advanced processes.

Syllabus:

Unit I:

Estimation of sewage flow, fluctuations in flow, estimation of storm water quantity, self cleansing velocity, systems of sewerage, design of sanitary sewer & storm water sewer, sewer materials, sewer appurtenances, construction & maintenance of sewer lines, sewage characteristics.

Unit II:

Conventional municipal waste water treatment flow sheet, functions of different unit process, unit operations, treatment requirements. Preliminary treatment: screening, grit removal, design of screen, grit chamber. Primary Treatment: principles of sedimentation, design of sedimentation tanks and skimming tanks. Biological Treatment: principles & objectives of biological treatment, types of biological treatment, fundamentals of process kinetics, kinetics of biological growth, reactors – classification, selection, aspects of reactor design.

Unit III:

Attached & suspended growth biological treatment system, design of activated sludge process, trickling filters, oxidation ponds, septic tanks, imhoff tanks, rotating biological contactors, aerated lagoon, oxidation ditch, anaerobic treatment – UASB process, anaerobic filters, anaerobic digester, anaerobic lagoons.

Unit IV:

Advanced waste water treatment: requirement of tertiary treatment, disinfection, nitrogen removal, phosphorus removal, adsorption, removal of dissolved inorganic substances using various filtration techniques like R.O., ultra filtration etc, electrodialysis. Recent techniques of waste water treatment – MBBR, MBR, SBR, constructed wetlands.

Unit V:

Sludge treatment: sources of sludge, sludge quantity & quality, sludge thickening and digestion, various methods of sludge treatment, sludge drying beds, sludge disposal.
Sewage disposal: stream & effluent standards for various purposes, dilution methods, natural purification of stream, oxygen sag curve & its analysis, disposal of sewage on land, methods of sewage farming.

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Course Outcomes:

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

CO 1: **Explain** the concepts of waste water engineering & treatment.

CO 2: **Determine** the requirements of safe disposal of sewage.

CO 3: **Apply** various techniques for treatment of sewage.

CO 4: **Apply** various techniques of sludge treatment and disposal.

CO 5: **Design** sewage system for safe disposal of sewage.

Text Books:

1. Sewage Disposal & Air Pollution Engineering. S. K. Garg. Khanna Publishers, 2016

2. Metcalf & Eddy. Inc. Wastewater Engineering, Treatment and Reuse. 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.

Reference Books:

1. Waste Water Engineering. B.C. Punmia. Laxmi Publication.

2. Water & Waste Water Technology. Mark J Hammer, Prentice Hall of India. New Delhi

3. Wastewater Treatment Plant, Planning Design & Operation. S.R. Qasim, CRC Press, 1998

4. CPHEEO, Manual on Sewerage and Sewage Treatment, Ministry of Urban Development, Central Public Health and Environmental Engineering organization. Government of India, New Delhi, 2013.

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Course Code: 530114

Course Name: Industrial Waste Management

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To provide broad knowledge on various methods of sewage disposal, their effects on water pollution & also provide information on various disposal standards.

2) To learn the basics of sewage composition & its characteristics.

3) To provide knowledge on various waste water treatment techniques.

4) To provide broad knowledge on common effluent treatment plants, wastewater reuse, waste audit.

5) To provide information about various existing waste treatment & management techniques of various industries.

Syllabus:

Unit-I:

Effects of wastes on streams and sewage treatment plant, natural purification of streams, oxygen sag curve, allowable organic load on streams, classification of stream, stream standards and effluent standards requirement of water for different purposes.

Unit-II:

Sampling of waste waters. Grab, Composite and Integrated samples, analysis of waste water, Biochemical Oxygen Demand, Chemical Oxygen Demand and pH value of waste water, Toxicity of waste by Bioassay method.

Pre-treatment of Wastes: Volume and strength reduction, source reduction of wastes, salvage of materials, recovery of by products, reuse of waste water.

Unit-III:

Equalization, Neutralization, Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge treatment & disposal, Advance methods of treatment such as Adsorption, Reverse Osmosis, Ion Exchange Process, Electro Dialysis, etc.

Unit-IV:

Industrial Waste water and environmental impacts, Industrial waste survey, Industrial and common effluent treatment plants, zero effluent discharge systems, Waste management approach, Waste Audit – Evaluation of pollution prevention options.

Unit-V:

Brief study of industrial processes and treatment methods of waste water from common industries such as Textile, Dairy, Paper and pulp, Tannery, Distillery, petrochemicals, pharmaceuticals, fertilizers, cement & food processing.

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Course Outcomes:

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

CO1: Explain basic concepts of industrial waste management.

CO2: Evaluate the effects of industrial waste on streams as per the standards.

CO3: Determine the requirements for safe disposal of sewage.

CO4: Apply suitable techniques for reduction & treatment of industrial waste & sludge.

CO5: Explain waste management techniques of different industries.

Text Books:

1. Industrial Waste Water Treatment – A.D. Patwardhan, PHI, Delhi
2. Waste Water Engg. – Treatment Disposal & Reuse – Metcalf & Eddy – Tata Mc Graw Hill, New Delhi
3. Industrial Water Pollution Control – W.W. Eckenfelder, McGraw Hill, 1999.

Reference Books:

1. Wastewater Treatment – M.N. Rao & Dutta, Oxford & IBH Publishing House, New Delhi.
2. Waste Water Treatment – Arceivala – Tata Mc Graw Hill, New Delhi, 2006.
3. Industrial Waste Water Management hand book – N.S. Azad, Tata Mc Graw Hill, New Delhi
4. Pollution Control in Process Industries – Mahajan, Tata McGraw Hill, Delhi, 1984
5. Liquid Waste of Industries – Theories, Practice and Treatment – N.L. Nemerow, Wesley Publishing Co.

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Course Code: 530115

Course Title: Environmental Auditing & Management System

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To provide broad knowledge on various aspects of environmental management system.

2) To understand the principles of environmental auditing and complete process.

3) To apply the concepts of LCA in environmental management.

4) To understand the EMS approach and ISO.

5) To understand various concepts of social accountability.

Syllabus:

Unit I: Concepts of Environmental Audit, objectives of audit, types of audit, features of effective auditing, audit criteria, elements of audit process, planning and organizing audits, pre-visit data collection, audit protocol, onsite audit, data sampling, inspection, evaluation and presentation, exit interview, audit report, action plan, management of audits, waste management contractor audits, environmental statement.

Unit II: Environmental audit in Industrial projects, case studies of environmental audits. Life cycle assessment approach (LCA), life cycle costing, eco labeling, stages in LCA of product, procedures for LCA, applications of LCA, sustainable approach towards environment management, green building & green energy concepts and management.

Unit III: Environmental Management Systems Approach (EMS): Introduction, principles & elements of successful environmental management, basic concepts of EMS approach, ISO principles, essential elements of an EMS & ISO 14001, benefits of an environmental management system, creating an EMS in line with ISO 14000.

Unit IV: Environmental Management Planning, EMS development and implementation project and plan, measurement and evaluations required for an EMS, environmental management reviews and improvements, legal and regulatory concerns, Integrating ISO 9000 & ISO14000, EMAS.

Unit V: Social Accountability: requirements, social accountability (SA) 8000 certification, elements of social management system, social policy, planning, implementation, business benefits, corporate social responsibility (CSR), different models.

Course Outcomes:

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

CO1: Illustrate the process of environmental auditing.

CO2: Demonstrate the environmental audit process in industry and other projects.

CO3: Explain the concepts of environmental management system approach through ISO guidelines.

CO4: Apply various environment management methodologies like LCA, social accountability.

CO5: Develop EMS in organizations and improve the existing EMS system.

Text Books:

1) A. K. Shrivastava, Environmental Auditing, APH Publishing, 2003.

2) T.V. Ramachandra, Vijay Kulkarni, Environmental Management, TERI Press, 2009

3) Richard Welford, Corporate Environmental Management, Universities Press (India), 1996

4) Christopher Sheldon, Environmental Management Systems, Routledge Edition, 2006

5) Milon P Dentch, ISO 14001:2015 Implementation Handbook, ASQ, 2017

Reference Books:

1) R. D. Tripathi, An Introduction to Environmental Audit, Alfa Publication.

2) Vasanthakumar, N.Bhat, Total Quality Environmental Management : An ISO 14000 Approach, Praeger publishers, 1998

3) Alan S. Morris, ISO 14000, Environmental Management Standards, Wiley International, 2003.

4) Syed Imtiaz Haider, Environmental Management System ISO 14001:2004, CRC Press, 2010

5) Deborah Leipziger, Social Accountability SA8000, Viva Books Private Limited, 2010

6) B Banerjee, Corporate Environmental Management, PHI Publications, 2009.

Course Code: 530116

Course Name: Environmental Hydraulics

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To understand the concepts of fluid mechanics and apply them in pipe flow calculations.

2) To understand the principles of open channel flow and apply them in sewer system design.

3) To apply concepts of hydrology in estimation of storm water and its design.

4) To understand concepts of ground water hydraulics.

5) To understand concepts of pollutant transfer and estimation of pollution load in water bodies.

Syllabus:

Unit I:

Introduction to concepts of fluid flow – continuity equation, energy principle, momentum principle, frictional head loss, flow through pipes, major and minor energy losses in pipes, hydraulic gradient and total energy line, flow through pipe in series, parallel, equivalent pipe, water hammer pressure, design of water distribution pipe network using hardy cross method and equivalent pipe method.

Unit II:

Open channel flow and its classifications, critical flow computations, sub critical flow, super critical flow, uniform flow, gradually varied flow, most efficient/economical sections in channel, specific energy, hydraulic jump, hydraulic elements of sewer & design of sewers.

Unit III:

Introduction to Hydrology, Hydrological cycle, Precipitation measurement and analysis of data, runoff and its estimation, hydrograph – unit hydrograph, s-curve hydrograph, synthetic hydrograph, rational method, estimation of storm water quantity and design of storm water sewers.

Unit IV:

Ground water estimation & well hydraulics – confined & unconfined aquifers, governing equations for yield of well (Thiem's & Dupuit's), well loss & specific capacity, ground water recharge. Transport & transformation of contaminants in groundwater: processes, governing equations, and initial and boundary conditions, solution of simple cases.

Pumps and their classification, pump performance curves, selection of pumps, head, power & efficiency of pumps, economical diameter of rising main, pumping station and their designs.

Unit V:

Introduction to Pollutant transport process in surface water, standards for pollutant disposal in surface water, factors affecting pollutant transport and mixing in river – dilution, dispersion, oxidation, reduction etc., zone of pollution in river, mixing mechanism in river, sag curve, streeter phelps equation. Introduction to various software's for design of pipe networks & sewer lines.

Course Outcomes:

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

CO 1: Apply fluid mechanics principles in analysis and design of pipe flow.

CO 2: Apply principles of hydraulics for design of sewer lines.

CO 3: Apply principles of surface water hydrology for design of storm water sewer.

CO 4: Estimate groundwater quantity and pollution load on groundwater and surface water.

CO 5: Apply the principles of hydraulics in design of pumping stations and estimation of pollution load on rivers.

Text Books:

1. Sewage Disposal & Air Pollution Engineering, S. K. Garg, Khanna Publishers, 2016

2. Water Supply Engineering, S.K. Garg, Khanna Publishers, 2016

3. Hydraulics & Fluid Mechanics, P.N. Modi & S.M. Seth, Standard Publishers, 2017

Reference Books:

1. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, New Delhi

2. CPHEEO, Manual on Sewerage and Sewage Treatment, Ministry of Urban Development, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2013.

3. CPHEEO, Manual on Water Supply and Treatment, Ministry of Urban Development, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 1999.

4. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2004.

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Course Code: 800110

Course Name: Sustainable Waste Management System

L	T	P	Credit
3	0	0	3

Course Objectives:

1) To develop an understanding about the concepts of sustainability & sustainable development.

2) To understand the concepts of water conservation techniques.

3) To understand the concepts of wetlands & other natural wastewater treatment system.

4) To provide knowledge on various low cost sanitation methods & other sustainable waste management techniques.

5) To provide an insight into sustainable design of buildings.

Syllabus:

Unit I:

Introduction: Concept of sustainability in water and waste management, sustainable development, guidelines and strategies for implementing sustainable development. Pollution prevention & Cleaner production in achieving sustainability. Environmental indices - Bio remediation.

Unit II:

Water Conservation: Rainwater Harvesting – Roof water harvesting – Technology – Quality – Health issues – Groundwater recharge – Techniques – Case studies – Wastewater reuse and reclamation.

Unit III:

Natural Wastewater Treatment Systems: Centralized Vs decentralized – Natural and constructed wetlands – Different types – Mechanisms – Performance – Design – Case studies – Land treatment systems.

Unit IV:

Low-Cost Sanitation: Dry sanitation methods – Pit latrines – VIP latrines – Aquaprivy – Septic tank.

Organic Solid Waste Management Techniques: Composting/ Vermicomposting – Biogas technology – Plasma technology

Unit V:

Green Design: Green buildings - benefits and challenges; public policies and market-driven initiatives; Effective green specifications; Energy efficient design; Passive solar design; Green power; Green materials and Leadership in Energy and Environmental Design (LEED)

Course Outcomes:

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

CO1: Illustrate the concepts of sustainability & sustainable development.

CO2: Apply various methodologies of water conservation in field.

CO3: Apply various natural methodologies of wastewater treatment like wetlands.

CO4: Apply various low cost sanitation & other waste management techniques.

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CO5: Plan for sustainable and green design of buildings.

Reference Books:

1. Cites R.W., Middlebrooks E.J., Reed S.C., Natural wastewater Treatment Systems, CRC Taylor and Francis, 2006.

2. Cairncross S., Feachem R. Environmental Health Engineering in the Tropics: John Wiley & Sons 1993.

3. Bajwa, G.S. Practical Handbook on Public Health Engineering, Deep Publishers, Simla, 2003.

4. White, I.D. Mottershed, D.N and Harrison, S.L., Environmental Systems – An Introductory Text, Chapman Hall, London, 1994.

5. Martin, A.M., Biological Degradation of Wastes, Elsevier Appl. Science, New York, 1991.

6. Mili Majumdar, Energy Efficient Buildings in India, TERI

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Course Code: 530118

Course Name: Environmental Engineering Lab

L	T	P	Credit
0	0	4	4

Course Objectives:

1) To acquire knowledge of various types of sampling, its procedure including its preservation.

2) To acquire skills to determine various physical, chemical & biological characteristics of water.

Syllabus:

Introduction to Sampling Procedure, Types of Sampling, Collection of Samples & Preservation of Sample.

List of Experiments:

1. Determination of physical characteristics of water sample (pH, Turbidity, Total Solids (Suspended & Dissolved Solids), Electrical Conductivity)

2. Determination of Acidity & Total Alkalinity of water sample.

3. Determination of Total Hardness, Calcium Hardness, Magnesium Hardness of water sample.

4. Determination of Chloride of water sample.

5. Determination of Sulphate of water sample.

6. Determination of Available Chlorine in bleaching powder & Residual Chlorine of water sample.

7. Determination of Nitrate & Phosphate of water sample.

8. Determination of Optimum Dosage of Coagulants using Jar Test.

9. Determination of MPN of water sample.

10. Application of Plate Count Method for bacterial growth.
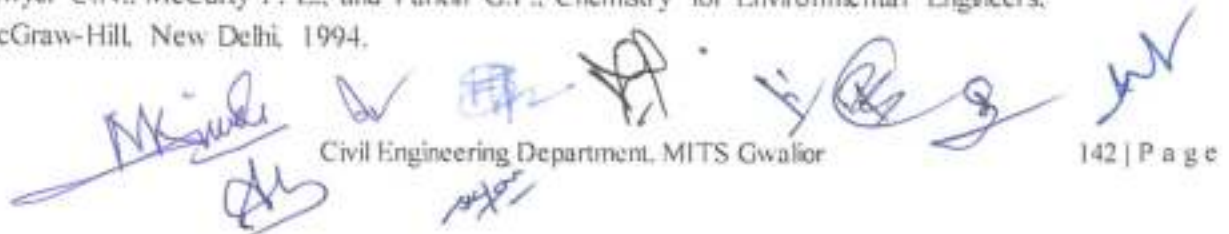
11. Study on Gram Staining Technique.

Course Outcomes:

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

CO 1: Follow sampling procedure & other guidelines for sampling & analysis of water samples.

CO 2: Check various water quality parameters.

CO 3: Improve the water quality by suggesting suitable corrective measures.

CO 4: Train others on various ways of improving the quality of water.

Reference Books:

1. Water Supply Engineering, S.K. Garg, Khanna Publishers, New Delhi, 2017.

2. Sawyer C.N., McCarty P. L., and Parkin G.F., Chemistry for Environmental Engineers, McGraw-Hill, New Delhi, 1994.

3. BIS 3025 Methods of Sampling & Test for Water & Waste Water, BIS 1622.

4. APHA Standard Methods for Examination of Water & Waste water, 2012.

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Course Code: 530119

Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	2

Course Objectives:

1) To encourage students to read, study & understand different topics of Environmental Engineering published in articles, literatures.

2) To help in presenting different topics of Environmental Engineering and related subjects to supplement theoretical knowledge gained in class.

3) To make student acquire good oral & written communication skills.

4) To promote the habit of lifelong learning.

5) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

Syllabus:

Any relevant topic related to Environmental Engineering from within or beyond the syllabus through Swayam / NPTEL/MOOC.

Course Outcomes:

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

CO 1: **Analyze** contemporary issues in Environmental Engineering & its allied areas through literature survey.

CO 2: **Distinguish** state of art & relevance of the topic in national & international arena.

CO 3: **Demonstrate** good oral & written communication skills.

CO 4: **Develop** poster and power point presentations for effective communication.

CO 5: **Display** lifelong learning.

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ANNEXURE – XVI

(Scheme & Syllabus Ph.D. Course Work (Scholars admitted in 2022-2023))

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Civil Engineering Department

Ph.D. Course Work (w.e.f. 2022-2023)

As per PhD New Ordinance:

Cl. No.7.1:- After having been admitted into the Ph.D. programme each candidate shall be required to undertake course work. For successful completion of the Ph.D. course work a candidate is required to earn a minimum of twelve credits through course work. The course work shall be of one/two semesters. The course work shall be treated as pre Ph.D. preparation.

Cl No. 7.2:- The duration of the course work shall be of one/two semesters. The course work shall be treated as pre Ph.D. preparation.

Cl. No. 7.9:- The Ph.D. scholar with the recommendation of RAC and due approval of University shall also have an option to earn credit of any one subject of the course work through Massive Open Online Courses (MOOC's) available on the 'SWAYAM' platform according to the provisions of UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016.

Subject wise distribution of marks and corresponding credits

S. No	Subject Name	Maximum Marks Allotted						Total Marks	Contact Periods/week			Total Credits	Remarks
		Theory Slot			Practical Slot				L	T	P		
		End Sem	Mid Sem	Quiz/ Assignment	End Sem	Lab Work/ Sessional							
1.	Research Methodology	70	20	10	—	—	100	3	1		4	
2.	Elective I	70	20	10	—	—	100	3	1		4	
3.	Elective III	70	20	10	—	—	100	3	1		4	
4.	Elective III *Swayam NPTEL course						100	3	1		4	

*As per the availability and supervisions recommendations.

Elective I:- Concrete Technology

Elective III:- Construction Materials Technology

Dr. Sanjay Tiwari
Research Supervisor

Dr. M. K. Trivedi
Professor & Head

Civil Engineering Department, MITS Gwalior

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Elective I – Concrete Technology

COURSE DESCRIPTION

Concrete is one of the most vital materials used in construction. Concrete is made up of cement, coarse aggregate; fine aggregate, water and admixtures. The strength of concrete is directly depends upon the properties of these materials and their proportion in the concrete. In this course students will learn the various properties of concrete ingredients and various properties of concrete itself and their testing including non-destructive testing such as ultrasonic pulse velocity test, rebound hammer test etc. They will also learn the various mix design methods to design the concrete for different construction works.

COURSE OBJECTIVES

1. To understand the properties of ingredients of concrete.
2. To study the behavior of concrete at its fresh and hardened state.
3. To study about the concrete design mix.
4. To know about the procedures in concrete at different stage.
5. To understand special concrete and their uses.

COURSE OUTCOMES

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

1. To identify suitable materials to be used in the cement concrete by conducting various tests as per BIS code.
2. Test all the concrete materials as per BIS code.
3. Design the concrete mix using ACI and BIS code methods.
4. Determine the properties of fresh and hardened of concrete.
5. Design special concretes and their specific applications and use of admixtures.
6. Ensure quality control while testing/ sampling and acceptance criteria for pre and post construction work.
7. Use of non-destructive testing equipment.

COURSE CONTENT

Section A

Unit I: Introduction

Concrete materials. Cement: Field and laboratory tests on cement, Types of cement and their uses, different tests for aggregates. Methods for manufacturing of cement- Wet and dry process, Hydration of cement, Bogue's compound.

Unit II: Admixtures

Accelerating admixtures, Retarding admixtures, water reducing admixtures, Air entraining admixtures, colouring agent, Plasticizers. Batching, Mixing, Transportation, Placing of concrete, curing of Concrete

Section B

Unit III: Behaviour of Concrete

Strength of concrete, Shrinkage and temperature effects, creep of concrete, permeability of concrete, durability of concrete, Corrosion, Causes and effects, remedial measures. Thermal properties of concrete, Micro cracking of concrete.

Section C

Unit IV: Mix Design

Factors influencing mix proportion, Mix design by ACI method and I.S. code method, Design of high strength concrete.

Section D

Unit V: Special Concrete

Light-weight concrete, Fibre reinforced concrete, Polymer modified concrete, Ferro cement. Mass concrete, Ready-mix concrete, Self-compacting concrete, Quality control, Sampling and testing, Acceptance criteria.

Text Books

1. Shetty, M.S., Concrete Technology, Theory & Practice, S.Chand and Co.
2. Gambhir, M.L., Concrete Technology, Tata McGraw Hill.
3. Santakumar A.R., Concrete Technology, Oxford University Press, New Delhi.

References

1. Nevile, Properties of Concrete, Longman Publishers.

Elective III – Construction Materials Technology

Unit-I: Basic Building Materials I Aggregate: Classification, Physical and mechanical properties, soundness, alkali-aggregate reaction, thermal properties of aggregate Bricks and Masonry Blocks: Types, properties and field and laboratory tests to evaluate quality Lime: classification, properties Cement: types, Portland cement: chemical composition of raw material, bogue compounds, hydration of cement, role of water in hydration, testing of cements, fly ash: properties and use in manufacturing of bricks and cement.

Unit-II Mortar: Types and tests on mortars. Concrete: Production, mix proportions and grades of concrete, fresh, mechanical and durability properties of concrete, factors affecting properties of concrete, tests on concrete, admixtures, Special concrete: light weight concrete, high density concrete, vacuum concrete, shotcrete, steel fiber reinforced concrete, polymer concrete, Ferro cement, high performance concrete, self-compacting concrete.

Unit-III Basic Building Materials II Building stone: classifications, properties and structural requirements; Wood and Wood products: Introduction to wood macrostructure, sap wood and heart wood, defects and decay of timber, seasoning and preservation of timber, fire resisting treatment, introduction to wood products- veneers, plywoods, fibre board, particle board, block board, batten boards, Metals: Steel: Important properties and uses of Iron (Cast iron, wroght iron and steel), Important tests on steel rebar, aluminum and copper. Glass: types and uses, gypsum: source, properties, uses; plastic: properties and uses, paint: types, distemper, varnish, Adhesive: Types, Bitumen: types, properties and tests.

Unit-IV Basic Building Constructions Foundation: purpose, types of foundation- shallow, deep, pile, raft, grillage foundation. Masonry: Brick Masonry: types of bonds, relative merits and demerits of English, Single Flemish and Double Flemish bond. Stone Masonry: General principles, classification of stone masonry and their relative merits and demerits, Cavity wall: components and construction, Arches: Terminology and classifications Doors and Windows: Types, materials used Module-V Finishing, Services and Special constructions Wall Finishes: Plastering, pointing, distempering and painting: Purpose, methods, defects and their solutions. Vertical communication: Stairs: Terminology, requirements of good staircase, classification; ramps, lifts and escalators. Damp proofing: causes, effects, prevention and treatments. Fire resistant construction: Fire resistant properties of common building materials, requirements for various building components.

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Reference Books:

1. A Text-Book of Building Construction, S.P.Bindra and S.P.Arora, Dhanpat Rai Publications

2. Building Materials and Construction, Jena and Sahu, Mc. Graw Hill.

3. Materials for Civil and Construction Engineers, Mamlouk and Zaniewski, Pearson

4. Building Materials and Building Construction, by P C Verghese

5. Building Construction, by B. C. Punmia, , Laxmi Publicaton