SYLLABUS AND PROCEEDINGS OF

7th Board of Studies

As per

(Choice Based Credit System)
Of
Department of Civil Engineering
IUST

(I – VIII Semesters)

(Batch 2020 & onwards)

Department of Civil Engineering IUST
Awantipora, Pulwama -192122
30th December 2020

Contents

AGENDA OF MEETING

7th BOS Meeting Civil Engineering Department

IUST Awantipora

Dated: 31.12.2020

The Department of Civil Engineering has conducted three Pre-BOS Review meetings for achieving at this draft new scheme of courses. The internal committee conducted the revision of course structure and it was felt that there is a need of integrating skill based courses and software based courses in our curriculum at UG level. The introduction of certain advanced courses as electives was also felt need of the hour. The Department reviewed the proceedings of earlier 5th and 6th BOS meetings conducted in 2017 and 2018.

Subject-wise Internal Committees for Model Curriculum Development of Under Graduate B.Tech Civil Engineering

Departmental Academic Committee:

1. Er. Misba Gul Coordinator

2. Er. Mehnaza Akhter Member

3. Er. Vaqas Hussain Member

Following Departmental Committees were formulated to cross check the syllabus compiled for BOS 2020.

I. Structural Engineering Committee

1. Dr. Shujaat Hussain Buch Committee Coordinator
2. Er. Riyaz Ahmad Qasab Member
3. Er. M. Dilawar Bhat Member
4. Er. Vaqas Hussain Sheikh Member
5. Er. Suhail Ahmad Ahanger Member

II. Geotechnical Engineering Committee

1. Er. M.Iqbal Mirza Committee Coordinator
2. Er. Nitish Kumar Member

III Water Resource Engineering Committee

1. Er. Mehnaza Akhter Committee Coordinator
2. Er. Adnan Rashid Khan Member
3. Er. Fida Anjum Member

IV: Transportation Engineering Committee:

1. Er. Mir Aijaz Committee Coordinator
2. Er. Muzaffar Kuchchay Member
3. Er. Sabina Member

V: General Courses Committee

1. Er. Misba Gul Committee Coordinator

Agenda Point No. 1b:

To approve the Introduction of New Courses as per the requirements of NAAC accreditation.

This course Outline will include the introduction of New Courses in specific areas. New Course Outline will include focus on:

i. Skill Based Courses

ii. Software Based Courses

iii. Advanced Courses

S.No.	Course Title	Course Type	Preferred Semester	Course Category	Points of Discussion	Course Outcomes
1.	Repair & maintenance of structures	Departmental Centric Elective	4th	**Skill Based Courses**	**a.** Is there a need for this Course at UG Level? **b.** If Yes, Whether this course can be introduced at 4th Semester Level.	a. Recognizing the defects or deteriorations in Buildings. b.Understanding repairing methods for Structures.
2.	Industrial Training I	Professional Core Course	5th		a.Visiting Sites, Collecting information, writing a short technical report & demonstration before a committee. **To be Ratified.** **b.** Should review Committee have a member from Industry?	a.Enhance Practical Knowledge of the Manufacturing and Construction Sites. b. Building Professional Know-how. c.Refreshing the Theoretical Subject Knowledge.

3.	Industrial Training II	Professional Core Course	6th		**a.** Visiting Sites, collecting information, writing a short technical report and demonstration before a committee. **b.** Should review Committee have a member from Industry?	a. Enhance Practical Knowledge of the Manufacturing and Construction Sites. b. Building Professional Know-how. c. Refreshing the Theoretical Subject Knowledge.
S.No.	**Course Title**	**Course Type**	**Preferred Semester**	**Course Category**	**Points of Discussion**	**Course Outcomes**
4.	Construction Technology	Departmental Centric Elective	7th	**Skill Based Courses**	a. Is there a need for this Course at UG Level? b. If Yes, Whether this course can be introduced at 7th Semester Level or earlier?	a. To access how an Owner and designer may choose to exceed the requirements of code. b. Learn to develop new structural forms. c. Learn different facets/methods in construction d. To construct Environmental friendly structures. e. Learner should analyze the building materials using advanced softwares.
5.	Construction Management	Departmental Centric Elective	7th		**a.** Is there a need for this Course at UG Level? **b.** If Yes, Whether this course can be introduced at 7th Semester Level or earlier?	a. Give the Students an idea of construction management and its historical background. b. Learner would be capable enough to analyze the project resources. c. Learner would be able to make cost analysis with time variation. d. Learner should know the basics of construction accounts. e. Learner should asses and calculate the impact of construction on environment

6	Project Planning and Control	Departmental Centric Elective	7th		**a.** Is there a need for this Course at UG Level? **b.** If Yes, Whether this course can be introduced at 7th Semester Level or earlier?	a. Duration Estimation of Projects by various methods. b. Scheduling of Project. c. Determination of Quality Indices.
S.No.	**Course Title**	**Course Type**	**Preferred Semester**	**Course Category**	**Points of Discussion**	**Course Outcomes**
7.	Computer based drafting Lab	Professional Core Course	5th	**Software Based Courses**	Any general Comments	a. Recognizing the need for computer aided drafting of buildings. b. Understanding the method of Drafting in CAD and drafting 2D and 3D visualizations c. Gaining skill based knowledge of drafting tools.
8.	Design Software	Departmental Centric Elective	6th, 7th		Any general Comments	a. Recognizing the benefits of designing by Software. b. Understanding various design techniques of different components of a Building. c. Gaining Knowledge of Post Processed design data for understanding of design problems.

9.	Design of Masonry Structures	Departmental Centric Elective	7th	**Advanced Course**	Whether the Course is of Importance at UG Level?	1. Recognizing the various materials involved in construction of masonry structures and their properties. 2. Understanding the design concept of masonry structures. 3. Gaining Knowledge of various tests used in determining properties of masonry
S.No.	**Course Title**	**Course Type**	**Preferred Semester**	**Course Category**	**Points of Discussion**	**Course Outcomes**
10.	Environmental Engineering	Departmental Centric Elective		**Advanced Course**	Whether the Course is of Importance at UG Level?	a. Aware and sensitize about the present days environmental issues at global and local scale. b. Get acquainted with environmental and social impacts of any developmental activity. c. Awareness of pollution monitoring aspects of air, soil, water and noise pollution. d. Knowledge about environmental impact assessment with its objectives and procedure.
11	Ground Improvement techniques	Departmental Centric Elective	8th		Whether the Course is of Importance at UG Level?	a. The various aspects related to liquid, solid and gaseous waste b. Quantification and projection of waste produced by communities. c. Segregation and treatment of various types of wastes produced d. Environmental effects of various types of wastes

12.	Solid Waste Management	Departmental Centric Elective	6th		Whether the Course is of Importance at UG Level?	1. Explain municipal solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies 2. Outline sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste. 3. Select the appropriate method for solid waste collection, transportation and redistribution. 4. Describe methods of disposal of municipal solid waste.
S.No.	**Course Title**	**Course Type**	**Preferred Semester**	**Course Category**	**Points of Discussion**	**Course Outcomes**
13.	Waste Water Engineering	Professional Core Course	7th	**Advanced Course**	Whether the Course is of Importance at UG Level?	1. An ability to estimate sewage generation and design sewer system. 2. The required understanding on the characteristics and composition of sewage, self-purification of streams. 3. An ability to perform basic design of the unit operations and processes that are used in sewage treatment. 4. Understand the standard methods for disposal of sewage. 5. Gain knowledge on sludge treatment and disposal

14.	Transportation Engineering-II	Professional Core Course	7th		Whether the Course is of Importance at UG Level?	1. Use statistical concepts and applications in traffic engineering. 2. Identify traffic stream characteristics 3. Understand elements of highway safety and approaches to accident Studies. 4. Design a pre-timed signalized intersection, and determine the signal splits
S.No.	**Course Title**	**Course Type**	**Preferred Semester**	**Course Category**	**Points of Discussion**	**Course Outcomes**
15.	Sustainable Materials and Green Buildings;	Departmental Centric Elective	7th	**Advanced Course**	Whether the Course is of Importance at UG Level?	1 .Examine the properties of common construction materials and understand the transition towards sustainable materials, along with their behaviors under different environments. 2. Suggest materials and technologies to improve energy efficiency of buildings and identify embodied energy of materials. 3. Describe the concept of Green Building and justify the necessity of Green Buildings. 4. Assess a building on the norms available for green building and explain the concept of carbon footprint 5. Examine and identify the green building rating systems and their contribution to sustainability.

16.	Advanced Solid Mechanics	Departmental Centric Elective	4th		Whether the Course is of Importance at UG Level?	1. Apply concepts of stress and strain analyses on solids**.** **2** Solve basic 2D problems in elasticity under plane strain and stress conditions. **3** Solve the stress problems in polar coordinates. **4** Use stress functions to solve Lame's and, hole in a large plate problem

Agenda Point No. 2:

To approve Course Contents of all Courses as per proposed syllabus. The agenda Item will be reviewed post this meeting by further suggestions received by the expert committee within a period of One Month.

Agenda Point No. 3:

To approve introduction of objective & Outcome based Curriculum.

Programme Objectives recommended are:

PO1. Apply the knowledge of mathematics, science, civil engineering fundamentals in the five broad areas of civil engineering namely structures, water resources, geotechnical, transportation and environmental engineering for solution of complex problems in the Civil Engineering.

PO2. Use first principles of mathematics, physics/chemistry and civil engineering concepts to identify, formulate, research literature and analyze complex engineering problems.

PO3. Design solutions/processes for problems pertaining to Civil Engineering projects in sub- and superstructure construction, water treatment, highway alignment with due consideration for the structural stability and safety, durability with respect to environmental effects, cultural and societal needs of the public.

PO4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information for Civil Engineering problems that cannot be solved by straightforward application of theories/knowledge, may

not have a unique solution and that may need consideration of requirements not clearly defined, and may require mathematical modelling or the use of computational tools.

PO5. Create, select or apply appropriate IT / Engineering tools, software and techniques in order to manage Civil Engineering projects for planning, analysing, designing and drawing, costing, scheduling; and predicting/modelling with a clear understanding of the limitations of such an attempt.

PO6. Understand the role and responsibility of a Professional Civil Engineer in the societal, health, safety and cultural issues by applying to reason based on the contextual knowledge and within the legal framework for the welfare of society at large.

PO7. Understand the impact of the professional civil engineering solutions on the environment and the society and develop necessary knowledge in incorporating sustainability concepts in engineering solutions.

PO8. Apply humanitarian ethics as well as professional ethics as pertaining to norms of civil engineering practice.

PO9. Functioning effectively as an individual and applying the principle of 'unity in diversity' with a motivation/spirit of synergy and teamwork.

PO10. Communicate effectively by comprehending designs and drawings, including use of relevant codes, writing effective technical reports and make oral or written the presentation as per the need of the project.

PO11. Demonstrate knowledge and understanding of civil engineering and project management principles and apply them to manage/complete within the stipulated period and funds.

PO12. Recognize the need for and develop competencies necessary for life-long learning so as to offer enhanced knowledge and skill in the globally changing and challenging project environment.

The matter was put to discussion.

Minutes of 7th BoS Meeting- 30.12.2020

DEPARTMENT OF CIVIL ENGINEERING – IUST AWANTIPORA

The 7th Board of Studies (BoS) meeting of the Department of Civil Engineering (DoCE), IUST was held on 30th of December 2020. The following members attended the meeting in the capacities mentioned:

1. Prof. A. H. Moon,
   Chairman
   Dean SoE&T, IUST
2. Prof. Umesh Kumar Sharma
   Expert
   Professor & Dean Construction IIT Roorkee
3. Prof. M.S.Mir
   Expert
   Professor, Department of Civil Engineering, NIT Srinagar
4. Prof. Sanjay Kumar
   Expert
   HOD.NITTTR Chandigarh
5. Er.Ajaz Masood Bhat
   Field Expert
   A.E.E, R&B (Technical Officer)
   Formerly Research Officer- R&B Kashmir
6. Dr. Shujaat Hussain Buch
   Convener, I/C Head, Department of Civil Engineering IUST
7. Er. Mohd Iqbal Mirza
   Member
   Assistant Professor, Department of Civil Engineering IUST
8. Er.Misba Gul
   Member - Assistant Professor, Department of Civil Engineering IUST
9. Er. Mehnaza Akhter
   Member
   Assistant Professor, Department of Civil Engineering IUST
10. Er. Mir Aijaz Ahmad
    Member
    Assistant Professor, Department of Civil Engineering IUST
11. Er. Vaqas Hussain Sheikh
    Technical Support
    Assistant Professor, Department of Civil Engineering IUST

At the outset, Dr. Shujaat Hussain Buch, I C Head, Department of Civil Engineering, welcomed the Experts and the BoS members. After that Prof. A. H. Moon, Dean SoE&T, IUST, gave Welcome Address. Later, Dr. Shujaat Hussain Buch briefed the Experts and the members about the agenda of the meeting. The Members were briefed about the mandate for up gradation of the Curriculum as per All India Council for Technical Education (AICTE) model Curriculum and the conduct of BoS meeting. In this regard, it was informed that the revised AICTE syllabus for the 1st Year of B.Tech.

course covering 1st and 2nd Semesters shall be uniformly adopted by all the Engineering Departments of the University and has been already discussed and approved in the BoS meeting of other Departments of the School of Engineering and Technology. Dr. Shujaat Hussain Buch also highlighted the importance of designing the Curriculum as per the present Industry requirements. Dr. Shujaat Hussain discussed the Agenda points of the meeting with the Committee Members through a Power Point Presentation. After threadbare discussions, the following decisions were made:

Agenda Point No. 1a: To approve course outline of B.Tech Civil Engineering for Batches 2020 and onwards as per the requirements of AICTE/CBCS System 2018 Guidelines for Civil Engineering. 1st Year is common for all branches and no change in course structure is done for first Year.

Decisions taken during the BoS meeting:

1. *It was recommended by the Experts that after successful completion of 164 credits, student shall be eligible to get Under Graduate Degree in Civil Engineering. A student will be eligible to get Under Graduate Degree in Civil Engineering with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits) through MOOCs. These MOOCs courses (recommended by the University) may be cleared during the B. Tech degree program. After successful completion of these MOOCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University through the Department. The student shall be awarded Honours. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 8.0 or above CGPA and passed each subject of B.Tech Civil Engineering Programme in single attempt without any grace marks.*
2. *The Course Outline given below was approved with the changes/recommendations mentioned at end of Table's:*

Semester-I- First Year

S.No	Course Code	Course Title	Hours Per Week			Credits
			L	T	P	
1.	PHY101C	Physics	3	1	0	4
2.	CHM101C	Chemistry	3	1	0	4
3.	MTH103C	Mathematics-I	2	1	0	3
4.	SIO101F	Environmental Science	3	0	0	3
5.	MEC101C	Engineering Graphics and Design	1	0	6	3
6.	ENG101F	Communication Skills	2	0	2	3
					Total Credits	20

Semester-II- First Year

S.No	Course Code	Course Title	Hours Per Week			Credits
			L	T	P	
1	CIV150C	Engineering Mechanics	3	1	0	3
2.	MTH253C	Mathematics -II	3	1	0	4
3	CSE150C	Programming for Problem Solving	2	1	0	3
4.	MEC150C	Workshop Practices	0	0	4	3
5.	ELE150C	Basic Electrical Engineering	2	1	0	3
6.	CSE151C	Programming Lab	0	0	2	1
7	PHY150C	Physics Lab	0	0	2	1
8.	CHM150C	Chemistry Lab	0	0	2	1
Total Credits						19

Semester III- Second Year

S.No	Course Code	Course Title		Hours Per Week			Credits	Course Category
				L	T	P		
1.	CIV-311T	Structural Analysis I		2	1	0	3	PCC
2.	CIV-312T	Surveying Measurements & Adjustments		2	1	0	3	PCC
3.	CIV-313T	Fluid Mechanics I		2	1	0	3	PCC
4.	CIV-314T	Building Materials & Construction		2	1	0	3	PCC
5.	MTH-FxxT	Elective*	Probability & Statistics	2	0	0	2	OEC
			Numerical methods					
6.	CIV-315P	SOM Lab		0	0	2	1	PCC
7.	CIV-316P	Surveying Measurements & Adjustments Lab		0	0	2	1	PCC
8.	CIV-317P	Fluid Mechanics Lab I		0	0	2	1	PCC
9.	YYY-yyyT	Open Elective		*	*	*	X=2 to 4	OEC
10.	XXX-xxxTP	Generic Elective (SOT)		*	*	*	Y=2 to 4	PEC
Total Credits							17 +X+Y	

*50% of the class/say Group A1 will opt for Probability and statistics and rest 50% class Group B like Numerical Methods in 3rd semester

Semester IV- Second Year

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-411T	Structural Analysis II	2	1	0	3	PCC
2.	CIV-412T	Advanced Surveying Measurements	2	1	0	3	PCC
3.	CIV-413T	Fluid Mechanics II	2	1	0	3	PCC
4.	CIV-414T	Concrete Technology	2	1	0	3	PCC
5.	CIV-415T	Building Drawing	0	1	4	3	PCC
6	CIV-416P	Concrete Technology Lab	0	0	2	1	PCC
7.	CIV-417P	Fluid Mechanics Lab II	0	0	2	1	PCC
8.	CIV-418P	Advanced Surveying Measurements Lab	0	0	2	1	PCC
9.	YYY-yyyT	Elective (DCE)	2	0	0	2	DCE
10	CIV-419P	Structure Lab	0	0	2	1	PCC

11.	CIV-410P	Survey Camp	0	0	2	1	PCC
Total Credits						22	

Semester V-Third Year

S.No	Course Code	Course Title		Hours Per Week			Credits	Course Category
				L	T	P		
1.	CIV-511T	Design Of Concrete Structures-I		2	1	0	3	PCC
2.	CIV-512T	Geotechnical Engineering-I		2	1	0	3	PCC
3.	CIV-513T	Water Supply Engineering		2	1	0	3	PCC
4.	CIV-514T	Quantity Survey & Cost Estimation		2	1	0	3	PCC
5.	CIV-515T	Structural Analysis III		2	1	0	3	PCC
6	MTH-ExxT	Elective *	Probability & Statistics	2	0	0	2	OEC
			Numerical methods					
7.	CIV-517P	Geotechnical Engineering Lab I		0	0	2	1	PCC
8.	CIV-518P	Water Quality Lab		0	0	2	1	PCC
9.	CIV-519P	Computer based drafting Lsb		0	0	2	1	PCC
10	CV-5110P	Industrial Training I		0	0	*	1	PCC
Total Credits							21	

**[illegible] of the class i.e. Group A will opt for Numerical Methods and rest 50% i.e. Group B i.e. Probability and statistics in 5th semester

Semester VI-Third Year

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-611T	Design Of Steel Structures	2	1	0	3	PCC
2.	CIV-612T	Geotechnical Engineering-II	2	1	0	3	PCC
	CIV-613T	Transportation Engineering I	2	1	0	3	PCC
3.	CIV-614T	Engineering Hydrology	2	1	0	3	PCC
4.	XXX-xxxT	Elective II(DC)	2	0	0	2	DCE
5.	CIV-616P	Geotechnical Lab II	0	0	2	1	PCC
6.	CIV-617P	Transportation Lab	0	0	2	1	PCC
7.	CIV-618P	Engineering Geology Lab	0	0	2	1	PCC
8.	CIV-619P	Industrial Training II	0	0	2	1	PCC
9.	YYY-yyyT	Open Elective	*	*	*	X=2 to 4	OE C
Total Credits						18+X	

Semester VII-Fourth Year

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-711T	Design of Concrete Structures- II	2	1	0	3	PCC
2.	CIV-712T	Irrigation & Hydraulic Structures	2	1	0	3	PCC
3.	CIV-713T	Structural Dynamics	2	1	0	3	PCC
4	CIV-714 T	Waste Water Engineering	2	1	0	3	PCC
5	CIV 715T	Transportation Engineering-II	2	1	0	3	PCC
6	XXX-xxxT	Elective III(DC)	2	0	0	2	DCE
7	XXX-xxxT	Elective IV(DC)	2	0	0	2	DCE
8	CIV-716P	Seminar	0	0	2	1	PCC
9	CIV-717P	Dynamics Lab	0	0	2	1	PCC
10	CIV-718P	Pre Project	0	0	4	2	PCC
		Total Credits				23	

Semester VIII-Fourth Year

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-811T	Design Of Bridge Structures	2	1	0	3	PCC
2.	CIV-812T	Earthquake Resistant Design	2	1	0	3	PCC
3	CIV-813 P	Project	0	0	16	8	PCC
4	XXX-xxxT	Elective V (DC)	2	0	0	2	DCE
		Total Credits				16	

a. *It was recommended by the experts that the title of the course "Transportation Engineering-I" be changed to "Highway Engineering and Pavement Management System" as the course content included mainly Highway Material and Pavement Design. The content of the course needs to be re structured accordingly*

b. *It was recommended that in view of Point No. a above. The title of the Course "Transportation Engineering Lab-I" may also be changed to "Highway Material Lab". The content of the course needs to be re-structured accordingly.*

c. *It was recommended by the Experts that the title of the course "Transportation Engineering-II" be changed to "Traffic Engineering and Road facilities" as the course content included mainly traffic design. Also the suggestion was given by Expert member that "Traffic Engineering lab/Field Study" of 1 credit should be included in the syllabus at 7th semester level if it doesn't exceed the credit limit for the Programme.*

d. *It was recommended by the Field Expert that the courses like Irrigation and Hydraulic Structures and other design courses should include design as well as drawing. Knowing the drawing of various structures makes execution easy in the field. Hence course content of the*

design courses should be revised to include both design and drawing.

e. *It was recommended by the Experts that "Computer based Drafting Lab" may be shifted from 5th semester level to 6th or 7th semester level.*

f. There was a discussion regarding the Courses of "Probability & Statistics" and "Numerical Methods" floated as Elective at 3rd/5th semester levels. It was discussed with the Experts that in order to meet the requirement of 10 credits in Open Electives the above courses were floated as elective.

Agenda Point No. 1b: To approve the Introduction of New Courses as per the requirements of NAAC accreditation.

Following new Courses given in Table below were proposed before the Committee for ratification.

The decision taken is given in Last column of the Table.

S.No.	Course Title	Course Type	Ratified/Not Ratified with Comments
1.	Repair & maintenance of structures	Departmental Centric Elective	***Approved.*** *It was suggested by the experts that course namely "Repair and Maintenance of structures" should be taken as elective at final year level and the name should be changed either to "Assessment and Repair of Structures" or " Investigation/Evaluation & Repair of Structures".*
2.	Industrial Training I	Professional Core Course	***Approved.*** *"Industrial training" was kept in two parts as "Industrial training-I" and "Industrial training-II" of 1 credit each at 6th and 7th semester level as suggested by the Experts. It was recommended by the Experts that there should be proper monitoring of Industrial Training by the Institute. The students should be evaluated at the end of Industrial Training.*
3.	Industrial Training II	Professional Core Course	
4.	Construction Technology	Departmental Centric Elective	***Approved.*** *Experts suggested that the course of "Construction Technology" should be renamed as "Advanced Construction Technology". The coments should be revised and should include topics like construction techniques for high rise buildings, special types of frameworks, prefabricated structures, and modern ground improvement techniques. It should include modern construction techniques of all the specializations of Civil Engineering.*
5.	Construction Management	Departmental Centric Elective	***Approved.*** *The above recommendations were made for the course "Construction Management" and hence the name was changed to "Advanced Construction Management".*
6.	Project Planning and Control	Departmental Centric Elective	***Approved.*** *The title of the course "Project Planning and quality control" should be changed to "Quality Control" only. Its course content should include*

			Quality Control involved in various fields of Civil Engineering
7.	Computer based drafting Lab	Professional Core Course	***Approved.***
8.	Design Software	Departmental Centric Elective	***Approved.*** *It was also recommended that in the course of "Design Software" the students should learn Basics of all the softwares at 6th semester level and should learn the specific software in 7th semester level in detail. The contents of the course should be formulated accordingly*
9.	Design of Masonry Structures	Departmental Centric Elective	***Approved.*** *Regarding the Course of "Design of Masonry Structures" all the experts agreed to importance of floating the course as Department Centric Elective at UG level.*
10.	Environmental Engineering	Departmental Centric Elective	***Approved.*** *It was recommended by the experts that the title of the elective course "Environmental Engineering" be changed to "Environmental Impact Assessment and Audit". The contents of the course should include Auditing portion.*
11.	Ground Improvement techniques	Departmental Centric Elective	***Approved.*** *Regarding the Courses of "Ground improvement Techniques", "Solid Waste Management" and "Waste Water Engineering" all the experts agreed to importance of floating the courses as Department Centric Elective at UG level.*
12.	Solid Waste Management	Departmental Centric Elective	***Approved.***
13.	Waste Water Engineering	Professional Core Course	***Approved.***
14.	Transportation Engineering-II	Professional Core Course	***Approved.*** *It was recommended by the Experts that the title of the course "Transportation Engineering-II" be changed to "Traffic Engineering and Road facilities" as the course content included mainly traffic design. Also the suggestion was given by Expert member that "Traffic Engineering lab/Field Study" of 1 credit should be included in the syllabus at 7th semester level if it doesn't exceed the credit limit for the Programme.*
15.	Sustainable Materials and Green Buildings.	Departmental Centric Elective	***Approved.*** *It was recommended by the experts that the title of the elective course "Sustainable Materials and Green Buildings" be changed to "Green Buildings". The course content should involve Green Buildings as well as Sustainable Materials.*
16.	Advanced Solid Mechanics	Departmental Centric Elective	***Not Approved.*** *It was also suggested that the Elective Course "Advanced Solid Mechanics" may not be kept in the Undergraduate Programme and should be suggested for PG Programme in the future*

Agenda Point No. 2: To approve Course Contents of all Courses as per proposed syllabus. The agenda Item will be reviewed post this meeting by further suggestions received by the expert committee within a period of One Month.

Decision: The course content of all the courses will be reviewed by the respective Subject Experts. The draft syllabus will be gazette after incorporation of recommendations from experts.

Agenda Point No. 3: To approve introduction of Objective & Outcome based Curriculum

Decision: Objective and Outcome based Curriculum was approved.

This is introduced for the first time in the B.Tech Civil Engineering Curriculum and it will also serve the purpose of NBA accreditation process. The course Objectives and Outcomes were framed for each course separately. Also 12 Programme Outcomes were framed for B.Tech Civil Engineering Programme.

The meeting ended with Vote of Thanks by Er.Mohammad Iqbal Mirza to all the Experts and members of the BoS Committee.

Signatures:

Er. Mir Aijaz Ahmad Member	Er. Mehnaza Akhter Member	Er. Misba Gul Member	Er. M.I.Mirza Member
Dr. Mujtaba Hussain Convenor Assistant Professor Civil IUST	Er. Aijaz Masood Bhat Expert Member (Field) Tech. Officer (R&B) Div.-IInd Sgr.	Prof. Sanjay Sharma Expert Member Dr. Sanjay Sharma Professor & Head Civil Engineering Department NITTTR, Sector 26, Chandigarh	
Prof. M.S. Mir Expert Member	Prof. Umesh Kumar Sharma Expert Member Dr. UMESH KUMAR SHARMA Professor Department of Civil Engineering Indian Institute of Technology Roorkee Roorkee-247 667, Uttarakhand (INDIA)	Prof. A.H.Moon Chairman	

Annexure I

Credit definition, range, distribution, and Course codes

A. Definition of Credit:

1 hr. Lecture (L) per week	1 credit
1 hr. Tutorial (T) per week	1 credit
1 hr. Practical (P) per week	0.5 credit
2 hrs. Practical (P) per week	1 credit

B. Range of Credits:

Credits earned in the range of 163 and above shall be required for a student to be eligible to get Under Graduate Degree in Civil Engineering. A student will be eligible to get Under Graduate Degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could also be acquired through MOOCs.

C. Distribution of Credits:

TOTAL CREDITS = 163

Course Category	**Credits**
Humanities & Social Science Course	3
Basic Science Course	20
Engineering Science Course	16
Professional Core Course	104
Open Elective	8
Generic Elective	2
Elective (Displine Centric)	10

NOTE:

1. In case of Departmental centric (DC) Electives, the student has to opt between the choices in the electives provided by the Department of Civil Engineering.

2. In case of Generic Elective floated at III Semester level the students have to opt between the Electives circulated for them within the Departments of School of Engineering and Technology.

3. In case of Open Electives, the students will have to register for any course floated as Open Electives by any Department within the University

D. Course Code and Definition:

All courses (except Open Electives) are denoted by a seven digit alphanumeric code (XXXXXXX)

For Courses other than Electives the Seven digit Alpha Numeric code consists of three alphabets followed by three numerals, followed by one alphabet.

1. The first three alphabets designate the department teaching the course, i.e., the discipline to which the course belongs, e.g., CIV for Civil Engineering.
2. First year courses being common in all branches of SOET, the first numeral following the three alphabets indicate the level of the course i.e., 1 for first year . Courses running in 1st semester are labeled from 01 to 49 and courses running in 2nd semester are labeled from 50 to 99. The next two numerals are the unique identification numbers for the course. The last alphabet indicates the nature of the course. It is one amongst four choices, C (Core Course), E (Elective (Discipline Centric)), G (Elective (Generic)), F (Foundation Course).
3. For courses floated from 3rd to 8th semester in B.Tech Civil Engineering, the first numeral following the three alphabets indicate the level of the course varying from 3 to 8 for 3rd to 8th Semester respectively. The next two numerals are the unique identification numbers for the course. The last alphabet indicates the nature of the course it is T for Theory Course & P for Practical/ Lab Course.

For Discipline Centric Electives the Seven digit Alpha Numeric code consists of three alphabets(designating the Department) followed by alphabet E (Elective) , followed by two numerals(starting from 01 onwards), followed by one alphabet (T for Theory Course or P for Practical/ Lab Course).

For Generic Electives the Seven digit Alpha Numeric code consists of three alphabets(designating the Department) followed by alphabet G (Generic Elective) , followed by two numerals(starting from 01 onwards), followed by one alphabet (T for Theory Course or P for Practical/ Lab Course).

E. Abbreviations:

HSC: Humanities & Social Science Course

PCC: Professional Core Course

OEC: Open Elective Course

ESC: Engineering Science Course

BSC: Basic Science Course

PEC: Professional Elective Course

DCE: Department Centric Elective

Annexure II

Structure of the Undergraduate program in Civil Engineering

1. *Humanities and Social Science Courses:*

S. No.	Course Code	Course Title	Hours Per Week			Semester	Credits
			L	T	P		
1.	ENG101F	Communication Skills	**2**	**0**	**2**	**I**	**3**

2. *Basic Science Courses:*

S. No.	Course Code	Course Title	Hours Per Week			Semester	Credits
			L	**T**	**P**		
1.	PHY101C	Physics	**4**	**0**	**0**	**I**	**4**
2.	CHM101C	Chemistry	**4**	**0**	**0**	**I**	**4**
3.	MTH103C	Mathematics-I	**3**	**0**	**0**	**I**	**3**
4.	BIO101F	Environmental Science	**3**	**0**	**0**	**I**	**3**
5.	MTH153C	Mathematics –II	**4**	**0**	**0**	**II**	**4**
6.	PHY150C	Physics Lab	**0**	**0**	**2**	**II**	**1**
7.	CHM150C	Chemistry Lab	**0**	**0**	**2**	**II**	**1**
Total Credits							**20**

3. *Engineering Science Courses:*

S. No	Course Code	Course Title	Hours Per Week			Semester	Credits
			L	T	P		
1.	MEC101C	Engineering Graphics and Design	**1**	**0**	**4**	**I**	**3**
2.	CIV150C	Engineering Mechanics	**3**	**0**	**0**	**II**	**3**
3.	CSE150F	Programming for Problem Solving	**3**	**0**	**0**	**II**	**3**
4.	MEC150C	Workshop Practice	**1**	**0**	**4**	**II**	**3**
5.	CSE151F	Programming Lab	**0**	**0**	**2**	**II**	**1**
6.	ELE150C	Basic Electrical Engineering	**3**	**0**	**0**	**II**	**3**
Total Credits							**16**

4.*Professional Core Courses*

S. No	Course Code	Course Title	Hours Per Week			Semester	Credits
			L	T	P	3rd	
1.	CIV-311T	Structural Analysis I	2	1	0		3
2.	CIV-312T	Surveying Measurements & Adjustments	2	1	0		3
3.	CIV-313T	Fluid Mechanics I	2	1	0		3
4.	CIV-314T	Building Materials & Construction	2	1	0		3
5.	CIV-315P	SOM Lab	0	0	2		1
6.	CIV-316P	Surveying Measurements & Adjustments Lab	0	0	2		1
7.	CIV-317P	Fluid Mechanics Lab I	0	0	2		1
8.	CIV-411T	Structural Analysis II	2	1	0	4th	3
9.	CIV-412T	Advanced Surveying Measurements	2	1	0		3
10.	CIV-413T	Fluid Mechanics II	2	1	0		3
11.	CIV-414T	Concrete Technology	2	1	0		3
12.	CIV-415T	Building Drawing	0	1	4		3
13.	CIV-416P	Concrete Technology Lab	0	0	2		1
14.	CIV-417P	Fluid Mechanics Lab II	0	0	2		1
15.	CIV-418P	Advanced Surveying Measurements Lab	0	0	2		1
16.	CIV-419P	Structure Lab	0	0	2		1
17.	CIV-410P	Survey Camp	0	0	2		1
18.	CIV-511T	Design Of Concrete Structures-I	2	1	0	5th	3
19.	CIV-512T	Geotechnical Engineering-I	2	1	0		3
20.	CIV-513T	Water Supply Engineering	2	1	0		3
21.	CIV-514T	Quantity Survey & Cost Estimation	3	1	0		3
22.	CIV-515T	Structural Analysis III	2	1	0		3
23.	CIV-516P	Water Quality Lab	0	0	2		1
24.	CIV-517P	Geotechnical Engineering Lab I	0	0	2		1
25.	CIV-611T	Design Of Steel Structures	2	1	0	6th	3
26.	CIV-612T	Geotechnical Engineering-II	2	1	0		3
27.	CIV-613T	Highway Engineering and Pavement Management System	2	1	0		3
28.	CIV-614T	Engineering Hydrology	2	1	0		3
29.	CIV-615P	Computer **B**ased Drafting Lab	0	0	2		1
30.	CIV-616P	Geotechnical Lab II	0	0	2		1
31.	CIV-617P	Highway Material Lab	0	0	2		1
32.	CIV-618P	Engineering Geology Lab	0	0	2		1
33.	CIV-619P	Industrial Training I	0	0	2		1
34.	CIV-711T	Design of Concrete Structures- II	2	1	0	7th	3
35.	CIV-712T	Irrigation & Hydraulic Structures	2	1	0		3
36.	CIV-713T	Structural Dynamics	2	1	0		3
37.	CIV-714 T	Waste Water Engineering	2	1	0		3
38.	CIV 715T	Traffic Engineering and Road facilities	2	1	0		3
39.	CIV-716P	Seminar	0	0	2		1
40.	CIV-717P	Dynamics Lab	0	0	2		1
41.	CIV-718P	Traffic Engineering lab/Field Study	0	0	2		1
42.	CIV-719P	Pre Project	0	0	4		2
43.	CIV-720P	Industrial Training II	0	0	*		1
44.	CIV-811T	Design Of Bridge Structures	2	1	0	8th	3
45.	CIV-812T	Earthquake Resistant Design	2	1	0		3
46.	CIV- 813 P	Project	0	0	16		8
Total Credits							**104**

5.. *Electives (Discipline Centric)*

S.No.	Course Code		Course Name	Credits	Preferred Semester	Pre requisites
1.	DC-I	CIV-E01T	Engineering Geology & Seismology	2	4th	Civil Engineering Student
2.		CIV-E02T	Advanced Construction Management	2		Civil Engineering Student
3.	DC-II	CIV-E03T	Rock Mechanics & Tunneling Technology	2	6th	Geotechnical Engineering I
4.		CIV-E04T	Design Software (Basic)	2		DOCS I, Structural Analysis I,II,III
5.		CIV-E05T	Solid Waste Management	2		Civil Engineering Student
6.	DC-III	CIV-E06T	Green Buildings	2	7th	Civil Engineering Student
7.		CIV-E07T	*Assessment and Repair of Structures*	2		Civil Engineering Student
8.		CIV-E09T	Advanced Construction Technology	2		Civil Engineering Student
9.		CIV-E10T	Advanced Structural Analysis	2		Structural Analysis I,II,III
10.		CIV-E11T	Transportation Planning and Economics	2		Transportation Engineering I ,II
11.		CIV-E12P	Design Software (Advanced)	2		DOCS I, Structural Analysis I,II,III
12	DC-IV	MTH-E03 T	Operation Research & Optimisation	2	7th	Mathematics I & Mathematics II
13		CIV-E13T	Quality Control	2		Civil Engineering Student
14		CIVE114T	Design of Masonry Structures	2		DOCS I
15		CIV-E15T	Railway & Airport Engineering	2		Transportation Engineering I ,II
16	DC-V	CIV-E16T	Hydropower Engineering	2	8th	Water Resources Engineering, Fluid Mechanics I & II
17		CIV-E17T	Pre-stressed Concrete	2		DOCS I, II
18		CIV-E18T	Environmental Impact Assessment and Audit	2		Civil Engineering Student
19		CIV-E19T	Ground Improvement Techniques	2		Geoterchnical Engineering I & II

Note:

1. *Discipline Centric electives are offered to the students of the Department of Electrical Engineering only.*

2. *The students of the Department of Electrical Engineering have to choose Discipline Centric electives from the above list.*

6. *Open Electives (Generic)*

S. No	Course Code	Course Title	Hours Per Week			Semester	Credits	Prerequisites
			L	T	P			
1.	CIV-G01T	Civil Engineering Materials and Construction Techniques	**2**	**1**	**0**	**3rd /5th /7th**	**3**	All Departments of SOET (Except Civil Engineering)
2.	CIV-G01T	Disaster Management	**2**	**1**	**0**		**3**	
Total Credits							**6**	

Note:

1. *Generic Electives are School Level electives and are offered to the students of the School of Engineering and Technology.*
2. *The students of the Department of Civil Engineering have to choose Generic Electives from the list of Generic Electives offered by other Departments of School of Engineering and Technology.*

Annexure III

Course Outline for B. Tech. Civil Engineering, Batch 2020 Onwards

COURSE OUTLINE FOR B.TECH CIVIL ENGINEERING

(2020 & ONWARDS)

Semester-I **First Year**

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	PHY101C	Physics	3	1	0	4	BSC
2.	CHM101C	Chemistry	3	1	0	4	BSC
3.	MTH103C	Mathematics-I	2	1	0	3	BSC
4.	BIO101F	Environmental Science	3	0	0	3	BSC
5.	MEC101C	Engineering Graphics and Design	1	0	4	3	ESC
6.	ENG101F	Communication Skills	2	0	2	3	HSC
Total Credits						**20**	

Semester-II **First Year**

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV150C	Engineering Mechanics	3	1	0	3	ESC
2.	MTH153C	Mathematics-II	3	1	0	4	BSC
3.	CSE150C	Programming for Problem Solving	2	1	0	3	ESC
4.	MEC150C	Workshop Practices	1	0	4	3	ESC
5.	ELE150C	Basic Electrical Engineering	2	1	0	3	ESC
6.	CSE151C	Programming Lab	0	0	2	1	ESC
7.	PHY150C	Physics Lab	0	0	2	1	BSC
8.	CHM150C	Chemistry Lab	0	0	2	1	BSC
Total Credits						19	

Semester III

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-311T	Structural Analysis I	2	1	0	3	PCC
2.	CIV-312T	Surveying Measurements & Adjustments	2	1	0	3	PCC
3.	CIV-313T	Fluid Mechanics I	2	1	0	3	PCC
4.	CIV-314T	Building Materials & Construction	2	1	0	3	PCC
5.	MTH-ExxT	Elective* Probability & Statistics / Numerical methods	2	0	0	2	OEC
6.	CIV-315P	SOM Lab	0	0	2	1	PCC
7.	CIV-316P	Surveying Measurements & Adjustments Lab	0	0	2	1	PCC
8.	CIV-317P	Fluid Mechanics Lab I	0	0	2	1	PCC
9.	YYY-yyyT	Open Elective	*	*	*	X=2 to 4	OEC
10.	XXX-xxxTP	Generic Elective (SOT)	*	*	*	Y=2 to 4	PEC
Total Credits						17 +X+Y	

*50% of the class(say Group A) will opt for Probability and statistics and rest 50% (say Group B)for Numerical Methods in 3rd semester

Semester IV

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-411T	Structural Analysis II	2	1	0	3	PCC
2.	CIV-412T	Advanced Surveying Measurements	2	1	0	3	PCC
3.	CIV-413T	Fluid Mechanics II	2	1	0	3	PCC
4.	CIV-414T	Concrete Technology	2	1	0	3	PCC
5.	CIV-415T	Building Drawing	0	1	4	3	PCC
6	CIV-416P	Concrete Technology Lab	0	0	2	1	PCC
7.	CIV-417P	Fluid Mechanics Lab II	0	0	2	1	PCC
8.	CIV-418P	Advanced Surveying Measurements Lab	0	0	2	1	PCC
9.	YYY-yyyT	Elective I(DC)	2	0	0	2	DCE
10.	CIV-419P	Structure Lab	0	0	2	1	PCC
11.	CIV-410P	Survey Camp	0	0	2	1	PCC
Total Credits						**22**	

Semester V

S.No	Course Code	Course Title		Hours Per Week			Credits	Course Category
				L	T	P		
1.	CIV-511T	Design Of Concrete Structures-I		2	1	0	3	PCC
2.	CIV-512T	Geotechnical Engineering-I		2	1	0	3	PCC
3.	CIV-513T	Water Supply Engineering		2	1	0	3	PCC
4.	CIV-514T	Quantity Survey & Cost Estimation		3	1	0	3	PCC
5.	CIV-515T	Structural Analysis III		2	1	0	3	PCC
6	MTH-ExxT	Elective *	Probability & Statistics	2	0	0	2	OEC
			Numerical methods					
7.	CIV-516P	Water Quality Lab		0	0	2	1	PCC
8.	CIV-517P	Geotechnical Engineering Lab I		0	0	2	1	PCC
Total Credits							**19**	

*50% of the class(say **Group A**) will opt for **Numerical Methods** and rest 50% (say **Group B**)for **Probability and statistics** in 5th semester

.

Semester VI

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-611T	Design Of Steel Structures	2	1	0	3	PCC
2.	CIV-612T	Geotechnical Engineering-II	2	1	0	3	PCC
3.	CIV-613T	Highway Engineering and Pavement Management System	2	1	0	3	PCC
4.	CIV-614T	Engineering Hydrology	2	1	0	3	PCC
5.	XXX-xxxT	Elective II(DC)	2	0	0	2	DCE
6.	CIV-615P	Computer Based Drafting Lab	0	0	2	1	PCC
7.	CIV-616P	Geotechnical Lab II	0	0	2	1	PCC
8.	CIV-617P	Highway Material Lab	0	0	2	1	PCC
9.	CIV-618P	Engineering Geology Lab	0	0	2	1	PCC
10	CIV-619P	Industrial Training I	0	0	2	1	PCC
11	YYY-yyyT	Open Elective	*	*	*	X=2 to 4	OE C
Total Credits						**19+X**	

Semester VII

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-711T	Design of Concrete Structures- II	2	1	0	3	PCC
2.	CIV-712T	Irrigation & Hydraulic Structures	2	1	0	3	PCC
3.	CIV-713T	Structural Dynamics	2	1	0	3	PCC
4	CIV-714 T	Waste Water Engineering	2	1	0	3	PCC
5	CIV 715T	Traffic Engineering and Road facilities	2	1	0	3	PCC
6	XXX-xxxT	Elective III(DC)	2	0	0	2	DCE
7	XXX-xxxT	Elective IV(DC)	2	0	0	2	DCE
8	CIV-716P	Seminar	0	0	2	1	PCC
9	CIV-717P	Dynamics Lab	0	0	2	1	PCC
10	CIV-718P	Traffic Engineering lab/Field Study	0	0	2	1	PCC
11	CIV-719P	Pre Project	0	0	4	2	PCC
12.	CIV-720P	Industrial Training II	0	0	*	1	PCC
Total Credits						**25**	

Semester VIII

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-811T	Design Of Bridge Structures	2	1	0	3	PCC
2.	CIV-812T	Earthquake Resistant Design	2	1	0	3	PCC
3.	CIV- 813 P	Project	0	0	16	8	PCC
4.	XXX-xxxT	Elective V (DC)	2	0	0	2	DCE
Total Credits						16	

List of Electives

S.No.	Course Code		Course Name	Credits	Preferred Semester	Pre requisites
1.	MTH-E 01 T		Probability & Statistics	2	3rd /5th	Mathematics I & Mathematics II
2.	MTH-E 02 T		Numerical methods	2		
3.	DC-I	CIV-E01T	Engineering Geology & Seismology	2	4th	Civil Engineering Student
4.		CIV-E02T	Advanced Construction Management	2		Civil Engineering Student
5.	DC-II	CIV-E03T	Rock Mechanics & Tunneling Technology	2	6th	Geotechnical Engineering I
6.		CIV-E04T	Design Software (Basic)	2		DOCS I, Structural Analysis I,II,III
7.		CIV-E05T	Solid Waste Management	2		Civil Engineering Student
8.	DC-III	CIV-E06T	Green Buildings	2	7th	Civil Engineering Student
9.		CIV-E07T	*Assessment and Repair of Structures*	2		Civil Engineering Student
10.		CIV-E09T	Advanced Construction Technology	2		Civil Engineering Student
11.		CIV-E10T	Advanced Structural Analysis	2		Structural Analysis I,II,III
12		CIV-E11T	Transportation Planning and Economics	2		Transportation Engineering I ,II
13		CIV-E12P	Design Software (Advanced)	2		DOCS I, Structural Analysis I,II,III
14	DC-IV	MTH-E03 T	Operation Research & Optimisation	2	7th	Mathematics I & Mathematics II
15		CIV-E13T	Quality Control	2		Civil Engineering Student
16		CIVE114T	Design of Masonry Structures	2		DOCS I
17		CIV-E15T	Railway & Airport Engineering	2		Transportation Engineering I ,II
18	DC-V	CIV-E16T	Hydropower Engineering	2	8th	Water Resources Engineering, Fluid Mechanics I & II
19		CIV-E17T	Pre-stressed Concrete	2		DOCS I, II
20		CIV-E18T	Environmental Impact Assessment and Audit	2		Civil Engineering Student
21		CIV-E19T	Ground Improvement Techniques	2		Geoterchnical Engineering I & II

Note:

1. *Discipline Centric electives are offered to the students of the Department of Civil Engineering only.*

2. *The students of the Department of Civil Engineering have to choose Discipline Centric electives from the above list.*

TOTAL CREDITS = 163

Course Category	**Credits**
Humanities & Social Science Course	3
Basic Science Course	20
Engineering Science Course	16
Professional Core Course	104
Open Elective	8
Generic Elective	2
Elective (Displine Centric)	10

NOTE:

1. In case of Departmental centric (DC) Electives, the student has to opt between the choices in the electives provided by the Department of Civil Engineering.
2. In case of Generic Elective floated at III Semester level the students have to opt between the Electives circulated for them within the Departments of School of Engineering and Technology.
3. In case of Open Electives, the students will have to register for any course floated as Open Electives by any Department within the University.

Annexure IV

Syllabus for B. Tech. Civil Engineering, Batch 2020 onwards.

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester-I **First Year**

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	PHY101C	Physics	3	1	0	4	BSC
2.	CHM101C	Chemistry	3	1	0	4	BSC
3.	MTH103C	Mathematics-I	2	1	0	3	BSC
4.	BIO101F	Environmental Science	3	0	0	3	BSC
5.	MEC101C	Engineering Graphics and Design	1	0	4	3	ESC
6.	ENG101F	Communication Skills	2	0	2	3	HSC
Total Credits						**20**	

Semester-II **First Year**

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV150C	Engineering Mechanics	3	1	0	3	ESC
2.	MTH153C	Mathematics-II	3	1	0	4	BSC
3.	CSE150C	Programming for Problem Solving	2	1	0	3	ESC
4.	MEC150C	Workshop Practices	1	0	4	3	ESC
5.	ELE150C	Basic Electrical Engineering	2	1	0	3	ESC
6.	CSE151C	Programming Lab	0	0	2	1	ESC
7.	PHY150C	Physics Lab	0	0	2	1	BSC
8.	CHM150C	Chemistry Lab	0	0	2	1	BSC
Total Credits						19	

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
PHY101C	**Physics**	**4**	**0**	**0**	**4**

Syllabus:

Vectors: Vector Analysis, Rotation of coordinate axis and Transformation of vectors, Gradient of a scalar field, divergence and curl of vector field in Cartesians, Spherical polar and Cylindrical Coordinate systems, line, surface & volume integrals, Gauss's divergence theorem, Stokes's theorem.

Mechanics: Newton's laws of motion**,** rigid body, centre of mass, conservation of linear momentum, moment of inertia, conservation of angular momentum, Central forces, Kepler's laws for planetary motion. SHM, Damped, undamped and forced Oscillations (no derivation): Equation of motion, solution, amplitude resonance, velocity resonance, quality factor.

The special theory of Relativity: Frame of reference, Michelson-Morley experiment, Galilean transformations, basic postulates of special relativity, Lorentz transformations, length contraction, and time dilation, mass-energy relation.

Optics: Electromagnetic theory of light, Interference**:** Conditions for Interference of light, Young's double-slit experiment, Newton's rings, diffraction**:** Single Slit diffraction pattern, Diffraction grating, Grating

spectra, Polarization: Malus Law, Phenomena of double refraction.

Lasers: Properties of laser light**,** Main components of laser, absorption, spontaneous and stimulated emmission, CW and pulsed lasers, Examples, and applications: He-Ne laser, Ruby laser.

Quantum Theory: Need of Quantum theory, Photoelectric effect, Compton effect, Heisenberg's uncertainty principle, de Broglie's hypothesis. Basic postulates of quantum mechanics, Wave function and its properties, Schrodinger's equation and its application to a particle in 1-D box.

Nuclear physics: Structure of nucleus. Basic properties of a nucleus (size, charge, density), Binding energy, Nuclear fission & fusion, Radioactivity, Gas detectors: GM counter.

Elementary Solid State Physics: Crystal lattice, Crystal structure, Unit cells, Miller Indices, Bravais lattice, Bragg's Law, Photographic crystal X-ray diffraction techniques, Laue's method. Free electron theory of metals, Classification of solids, formation of energy bands in metals, semiconductors, and insulators, intrinsic and extrinsic semiconductors.

Text Books/References:

1. Griffiths D. J., Introduction to electrodynamics, *Pearson Education (India).*

2. Murray R. Speigel, Schaum's Outline on Vector Analysis, *McGraw Hill Education India.*

3. Upadhaya J. C., Classical Mechanics, *Himalaya Publishing House.*

4. Ghatak A., Optics, *McGraw Hill Education India.*

5. Besier A., Mahajan S., Choudhary S. R., Concepts of Modern Physics, *McGraw Hill Education India.*

6. Omar M. A., Elementary Solid State Physics, *Prentice Hall of India*.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CHM101C	**Chemistry**	**4**	**0**	**0**	**4**

Syllabus:

Chemical Thermodynamics: Introduction and Importance, First Law of Thermodynamics, Work done in Isothermal and Adiabatic Conditions, Heat capacities, Relation between C_p and C_v relations, Second Law of Thermodynamics, Concept of Entropy, Carnot engine, Gibbs free energy. Free Energy Changes as Criteria of Reversible and Irreversible process, Gibbs-Helmholtz's equation, Clausius–Clapeyron equation

Electro-Chemistry and Corrosion: Introduction, Conductivity of Electrolytes, Kohlrausch's Law of Independent Migration of Ions and its Application, Debye Huckel Theory of Strong Electrolytes. Electrochemical cells, Electrode-Potential, Standard Electrode Potential, Fuel Cells, Batteries, Introduction, Effects of Corrosion, Dry Corrosion, and Wet Corrosion, mechanisms, Types of Corrosion (Pitting Corrosion, Crevice Corrosion, Galvanic Corrosion, and Stress corrosion), Factors Affecting Corrosion (Nature of the Metal and Nature of the Environment), Corrosion Protection and Inhibition (Cathodic Protection, Anodic Protection, Protective Coatings)

Nano-Technolgy and Polymers: Nanoscale and Its Significance, Properties at Nanoscale: Optical, Electrical, and Magnetic. General Methods of Preparation of Nanomaterials viz Top Down (Ball Milling, Lithography) and Bottom-up Methods (Sol-Gel, Solution Based Method), Advantages of Polymers over other Engineering Materials, Functionality, Degree of Polymerization, Concept of Molecular Weight, Polymerization (Addition, Condensation, and Copolymerization), Polymerization Techniques (Bulk, Solution, Suspension and Emulsion polymerizations), Preparation, Properties and Engineering application of some Important Polymers, Polythene (LDPE and HDPE), Polyvinyl Chloride, Polystyrene, Teflon, Phenol-Formaldehyde, urea-formaldehyde resin

Lubricants: Introduction, Function of Lubricants, Mechanism of Lubrication, Classification of Lubricants (Liquid, Semisolid, Solid), Properties of Lubricants (Flash Point and Fire Point, Viscosity, Aniline Point Acid value)

Instrumental Techniques: Introduction, Advantages, and Disadvantages of Instrumental and Non-Instrumental Methods, Electromagnetic Radiation, Electromagnetic Spectrum, Light Absorption (Beers-Lambert Law) UV-Vis spectroscopy (Types of Transition, Chromophores, Auxo-chromes, and Applications), Infrared Spectroscopy (Modes of vibration, IR bands corresponding to different functional groups and Applications), Nuclear Magnetic Resonance: Principle, shielding mechanism, chemical shift, number of Signals, Application of Nuclear Magnetic Resonance to Simple Organic Molecules.

Text Books/References:

1. Chemistry in Engineering and Technology Volumes I & II, J. Kuriacose, R. Rajaram, 2001, TMH publishing company Limited, New Delhi.
2. Engineering Chemistry, P.C. Jain, 16th Edition, Dhanpat Rai & Sons, Nai Sarak; New Delhi.
3. Chemistry of Engineering Materials, C.V. Agarwal, 9th Edition.
4. Chemistry in Engineering, L. A. Munro, 1964, Prentice Hall, New York.
5. Applied Chemistry for Engineers, R. M. E. Diamant, 3rd Revised Edition, Pitman Publishing.
6. Principles of Physical Chemistry – Puri, Sharma and Pathania, 2017, 4th Edition, Vishal Publishing Co.
7. Physical Chemistry by Peter Atkins, Julio de Paula, 8th Edition, 2006, WH Freeman.
8. Concise Inorganic Chemistry by J.D. Lee, 5th Edition, 2008, Oxford University Press
9. Electrochemistry and Corrosion Science by N. Perez, 2nd Edition, 2016, Springer.
10. Polymer Science, V.R. Goowriker, N.V Viswanathan and Jayadev Sreedhar, 2nd Edition, 2015, new Age International Publishers.
11. Nanotechnology Fundamentals and Applications, Manasi Karkare, Rajni Bahuguna, 2013, I K international.
12. Nanotechnology Importance And Application, Fulekar, 2010, K International Publishing House.
13. Physics for Engineers by N. K. Verma, 2013, PHI

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
MTH103C	**Mathematics-I**	**3**	**0**	**0**	**3**

Syllabus:

Brief Review of Differential Calculus: Limit, continuity and differentiability of functions of several variables, Chain rule, Jacobi theorem. Taylor's theorem of one and two variables, extrema of functions, two or more variables using method of Lagrange's multipliers.

Ordinary Differential Equations: Exact ordinary differential equations and Ordinary differential equations reducible to exact differential equations. Linear differential equations and equations reducible to linear form. Linear Differential equations of second and higher-order with constant and variable coefficients. Applications of ordinary differential equations. Series solution of differential equations.

Vector Spaces: Linear dependence of vectors, Basis and Dimensions; Linear Transformations(maps), Range and Kernel of a linear map, Rank, and Nullity, Inverse of a linear transformation, Rank-Nullity Theorem, Composition of Linear maps, Matrix associated with a linear map.

Algebraic Equations, Elements of the theory of polynomial equations. The fundamental theorem of Algebra, Relation between the roots and the coefficients of an equation, Solution of cubic & bi-quadratic equations.

Text Books/References:

1. James Stewart, Calculus, *Early Transcendentals*.
2. Shanti Narayan, Differential calculus, *S. Chand & Sons*.
3. Bali N. P., A text Book on Engineering Mathematics, *Luxmi Publications.*
4. J. W. Brown, R. V. Churchill, Complex variables and Applications, *McGraw Hill Education India.*

5. Raisinghania M. D., Ordinary and Partial Differential equation, *S. Chand & Sons*.
6. Jain R. K., Iyengar S. R. K., Advanced Engineering Mathematics, *Narosa Publications.*
7. Kreyszig I., Advanced Engineering Mathematics, *John Wiley & Sons.*
8. Hoffmann & Kunze, Linear Algebra, *Prentice Hall of India.*
9. Piaggio H. T., Differential equations and its applications, H *Prentice Hall of India*.
10. Sastry, Engineering mathematics Vol I-II, *Prentice Hall of India*.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
BIO101F	**Environmental Science**	**3**	**0**	**0**	**3**

Syllabus:

Introduction to Environmental Science: Scope and importance, Public Environmental awareness and methods of its propagation, Consumerism and Green Consumerism. Environmental issues, Environmental Ethics-Anthropocentricism and Eco-centricism.

I**ntroduction to Ecosystem and Ecology**: Types of Ecosystems, Structure of an Eco system-biotic and abiotic components, Food chain and Food Web, Ecological Pyramids; Ecological Succession, Energy flow in an ecosystem, Major World Ecosystems and their characteristics.

Natural resources: Classification and their conservation; Biodiversity-Definition, values and threatsto biodiversity; Classification of species as per IUCN; Hot Spots of Biodiversity. Conservation approaches – In-Situ and Ex-Situ conservation; Alternatives to conventional developmental approaches – Sustainable Development.

Introduction to global climate change: Greenhouse effect, global warming, acid rain, ozone layer depletion. Definition, Cause, effects and control measures of Air pollution, water pollution, soil pollution, noise pollution, thermal pollution and Solid waste pollution.

Field work (Field work equal to 5 lecture hours): Visit to a local area to document environmental assets river/forest/grassland/hill/mountain. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

Text Books/References:

1. Ecology and Environment, P. D. Sharma, Rastogi Publications.
2. Environmental Science Towards a Sustainable Future, Nebel and Wright, Prentice Hall of India.
3. Environmental Studies, Erach Barucha, Oxford Publications.
4. Environmental Studies From Crises to Cure authored, R. Rajagopalan, Oxford University Press.
5. Environmental Management by Oberoi, Excel Books.
6. Principles of Environmental Science: Inquiry & Applications, William Cunningham & Mary Cunningham, Tata McGraw Hill.
7. Perspectives of environmental studies, A. P. Kaushik and C.P. Kaushik, New Age International Publications.
8. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
9. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
MEC101C	**Engineering Graphics and Design**	**1**	**0**	**4**	**3**

Syllabus:

Introduction: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance, Drawing instruments, lettering, Conic sections; Cycloid, Epicycloid, Hypocycloid, and Involute; Scales.

Orthographic Projections: Principles of Orthographic Projections, Conventions, Projections of Points and lines inclined to both planes; Projections of planes inclined Planes, Auxiliary Planes;

Projections of Solids: Auxiliary Views; Draw simple annotation, dimensioning, and scaling. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Sections of Solids: Prism, Cylinder, Pyramid, Cone, Auxiliary Views; Development of surfaces; sectional orthographic views, objects from industry and dwellings.

Isometric Projections: Principles of Isometric projection, Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics: Computer technologies, CAD software, the Menu System, Toolbars, Standard, Object Properties, Draw, Modify and Dimension, Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus, Different commands used in CAD, Isometric Views of lines, Planes, Simple and compound Solids.

Customisation & CAD Drawing: Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints.

Text Books/References:

1. Gill P. S., Engineering Drawing, *S. K. Kataria and sons.*
2. Bhatt N. D., Engineering Drawing, *Charotar Book Stall.*
3. James D. Bethune, Engineering Graphics with Auto CADD, *Pearson Education.*
4. Narayana, Kannaiya Engineering Drawing, *Scitech Publications, Chennai.*
5. B. C.Rana, M. B. Shah, Engineering Drawing, *Pearson Education.*
6. Shah M. B., Rana B. C., Engineering Drawing and Computer Graphics, *Pearson Education.*
7. Agrawal B., Agrawal C. M., Engineering Graphics, *TMH Publication.*

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
ENG101F	**Communication Skills**	**2**	**0**	**2**	**3**

Syllabus:

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

Basic Writing Skills, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.

Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés.

Nature and Style of sensible Writing: Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

Writing Practices: Comprehension, Précis Writing, Essay Writing.

Oral Communication: (This unit involves interactive practice sessions in Language Lab): Listening Comprehension, Pronunciation, Intonation, Stress, and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

Text Books/References:

1. Michael Swan, Practical English Usage, *OUP, 1995*.
2. Wood F. T., Remedial English Grammar, *Macmillan, 2007.*
3. William Zinsser, On Writing Well, *Harper Resource Book, 2001.*
4. Liz Hamp-Lyons and Ben Heasly, Study Writing, *Cambridge University Press, 2006.*
5. Sanjay Kumar and Pushp Lata, Communication Skills, *Oxford University Press, 2011*.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad, *Oxford University Press.*

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV150C	Engineering Mechanics	3	0	0	3

Course Objectives:

- To introduce the fundamentals of free body diagrams and equilibrium equations.
- To illustrate the concepts, center of gravity and moment of inertia
- To get brief concepts of fundamental structural analysis of bars, beams, and trusses
- To get a brief idea about torsion and its applications

Syllabus:

UNIT I: FORCE SYSTEMS

Basic concepts, equilibrium of rigid bodies, a system of forces, coplanar concurrent forces, components in space, resultants, moment of forces and its application, couples and resultant of force system, equilibrium of system of forces, free body diagrams, equations of equilibrium of coplanar systems and spatial systems, static indeterminacy.

UNIT II: CENTROID AND CENTRE OF GRAVITY

Centroid of simple figures from first principle, centroid of composite sections, Centre of gravity and its implications; Area moment of Inertia, Moment of Inertia of plane sections from first principles, theorems of moment of inertia, moment of inertia of standard sections and composite sections, mass moment inertia of Circular plate, Cylinder, Cone, Sphere.

UNIT III: AXIAL LOADS IN BARS

Equilibrium of deformable bodies, external and internal forces, Saint-Venant's Principle, Elastic Deformation of an Axially Loaded Member, Principle of Superposition, Statically Indeterminate Axially Loaded Member, The Force Method of Analysis for Axially Loaded Members, and Thermal Stress

UNIT IV: SHEAR FORCE AND BENDING MOMENT IN BEAMS

Shear and Moment Diagrams, Graphical Method for Constructing Shear and Moment Diagrams, Bending Deformation of a Straight Member, The Flexure Formula, Shear in Straight Members, The Shear Formula.

UNIT V: TRUSSES, AND TORSION

Introduction of trusses, Joint method of analysis of trusses, Method of sections of trusses.

Torsional Deformation of a Circular Shaft, The Torsion Formula. Power Transmission. Angle of Twist.

Course Outcomes:

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

CO1 Develop free body diagrams for analyzing different rigid body systems.

CO2 Determine the centroid and moment of inertia of basic geometric figures and their random configurations.

CO3 Determine axial forces in bars, shear force, and bending moment in beams and also estimate stresses and strains

CO4 Determine torsional stresses and angle of twist in shafts

Text Books/References:

1. Irving H. Shames, Engineering Mechanics, Prentice Hall India, New Delhi.
2. F. P. Beer, E. R. Johnston, Vector Mechanics for Engineers, Vol I & Vol II, McGraw Hill Education (India).
3. R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Education.
4. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, Oxford University Press.
5. Shanes and Rao, Engineering Mechanics, Pearson Education.
6. Hibler and Gupta, Engineering Mechanics (Statics, Dynamics), Pearson Education.
7. Bansal R. K., A Text Book of Engineering Mechanics, Laxmi Publications.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
MTH153C	Mathematics-II	3	0	0	3

Syllabus:

Integral Calculus: Definite Integrals and their properties, Differential under the sign of integration. Double and triple integrals, Change of variables, Beta and Gamma functions, Fourier series.

Non-linear differential equation of first order, Simultaneous differential equation, Simultaneous differential equation of the form dx/P = dy/Q = dz/R . Partial differential equations of first order, langrage linear equation, Standard form, Charpit`s Method to solve non-linear partial differential equation.

Partial differential equations of second and higher-order, Homogeneous Partial Differential equations with constant coefficients, Solutions by the method of separation of variables, heat flow equation, Wave equation.

Matrices: Eigenvalues and Eigenvectors of a matrix, Cayley-Hamilton Theorem, Symmetric, Skew-symmetric, Hermitian, skew- Hermitian, Orthogonal and unitary matrices and their properties, Diagonalization; Inner product spaces, Gram-Schmidt Orthogonalization.

Complex Variables: Differentiation, Cauchy-Riemann Equations, Analytic functions, Harmonic functions, elementary analytic functions(exponential, logarithmic, and trigonometric) and their properties, Taylor's series, and Laurent's series.

Text Books/References:

1. James Stewart, Calculus, *Early Transcendentals*.
2. Kreyszig I., Advanced Engineering Mathematics, *John Wiley & Sons.*
3. Piaggio H. T., Differential equations and its applications, H *Prentice Hall of India*.
4. Raisinghania M. D., Ordinary and Partial Differential equation, *S. Chand & Sons*.
5. Hoffmann & Kunze, Linear Algebra, *Prentice Hall of India.*
6. Shanti Narayan, Integral Calculus by Shanty Narayan, *S. Chand & Sons*.
7. Greenberg, Advanced Engineering Mathematics, *Pearson education.*
8. Sastry, Engineering mathematics Vol I-II, *Prentice Hall of India*.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CSE150C	**Programming for Problem Solving**	**3**	**0**	**0**	**3**

Syllabus:

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers, etc. The idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Branching, Loops, and Arrays: Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluating conditionals and consequent branching, Iteration, and loops. Arrays, Arrays (1-D, 2-D), Character arrays, and Strings.

Algorithms, Order complexity and Functions: Basic Algorithms, Searching, Basic Sorting Algorithms (Bubble, Insertion, and Selection), Finding roots of equations, the notion of order of complexity through example programs (no formal definition required), Function, Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference.

Recursion: Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quicksort or Merge sort, Structure, Structures, Defining structures, and Array of Structures.

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, the notion of linked list (no implementation), File handling.

Text Books/References:

1. Gottfried, Schaum's Outline of Programming with C, *McGraw Hill Education India.*
2. E. Balaguruswamy, Programming in ANSI C, *McGraw Hill Education India.*
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, *Prentice Hall of India.*

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
MEC150C	**Workshop Practices**	**1**	**0**	**4**	**3**

Syllabus:

(i) Lectures and Videos

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Electrical & Electronics.
5. Carpentry.
6. Plastic moulding, glass cutting.
7. Metal casting.
8. Welding (arc welding & gas welding), brazing.

(ii) Workshop Practice

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding, gas welding)
6. Casting
7. Smithy Shop

Text Books/References:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
ELE150C	**Basic Electrical Engineering**	**3**	**0**	**0**	**3**

Syllabus:

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

AC Circuits: Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits, resonance in series and parallel RLC circuits. Three phase balanced circuits, voltage and current relations in star and delta connections.

Transformers: Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Three-phase transformer connections.

Electrical Machines: Generation of rotating magnetic fields. Construction and working of a three-phase induction Motor. Significance of torque-slip characteristic. Starting of induction motor. Construction, working, torque-speed characteristic of separately excited dc motor. Construction and working of synchronous generators.

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB,MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.

Text Books/References:

1. D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, *Tata McGraw Hill, 2010.*
2. D. C. Kulshreshtha, Basic Electrical Engineering, *McGraw Hill, 2009.*
3. V. D. Toro, Electrical Engineering Fundamentals, *Prentice Hall India, 1989.*
4. E. Hughes, Electrical and Electronics Technology, *Pearson, 2010.*
5. Charles K. Alexender, Mathew N. O. Sadiku, Fundamentals of Electric circuits, *McGraw Hill,*
6. Jack E. Kemmerly William H. Hayt, Engineering Circuit Analysis,*McGraw Hill, 2012.*
7. L. S. Bobrow, Fundamentals of Electrical Engineering, *Oxford University Press, 2011.*

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CSE151C	**Programming Lab**	**0**	**0**	**2**	**1**

Syllabus:

List of Experiments

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems, e.g., the sum of series
5. 1D Array manipulation
6. Matrix problems, String operations
7. Simple functions
8. Programming for solving Numerical methods problems
9. Recursive functions
10. Pointers and structures
11. File operations

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Course Code	Course Name	L	T	P	Credits
PHY150C	Physics Lab	0	0	2	1

Syllabus:

List of Experiments

1. To determine the value of e/m of an Electron by Thompson Method
2. To determine the value of acceleration due to gravity(g) by using Bar Pendulum
3. To determine the value of acceleration due to gravity(g) by using Kater's Reversible Pendulum
4. To determine the Young's Modulus of the rigidity of rectangular Steel Bar by Bending of Beam Method.
5. To determine the Wavelength of Sodium Light by Newton's Rings.
6. To determine the Wavelength of Laser Source by Fresnel Biprism
7. To determine the frequency of AC by Melde's Method
8. To determine The Resolving Power of the Telescope.
9. To study the Moment of Inertia of a Fly Wheel
10. To determine the refractive index of Crown Glass Prism.
11. To determine the wavelength of Sodium Light by Plane diffraction Grating.
12. To study the characteristics of Zener Diode.
13. To determine the Wavelength of Prominent lines of Mercury Light by Plane Diffraction Grating.
14. To study the characteristics of PN Junction Diode (Forward Bias)
15. To verify Biot-Savart's Law by showing that the magnetic field produced is directly proportional to the current passed in a coil.
16. To study the characteristics of G.M. Tube.
17. To determine Planck's constant by LED Method.
18. To verify Stefan's Law by Electrical method.
19. Determination of Modulus of rigidity by Maxwell's Needle
20. Determination of velocity of Sound by Standing Wave Method.
21. To study the Hall Effect:
    (i) Determination of Hall Voltage and RH.
    (ii) Determination of mobility of charge carriers and carrier concentration

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Course Code	Course Name	L	T	P	Credits
CHM150C	Chemistry Lab	0	0	2	1

Syllabus:

List of Experiments

1. Basic Introduction on Solution Preparation, Concentration terms, Handling of Glassware, Chemicals, Instruments: Precautions.
2. Determination of strength of NaOH solution by standardization of sodium hydroxide using Oxalic acid
3. To determine the acid value of given mineral oil or vegetable oil.
4. To determine the moisture content of a given sample of coal.
5. To determine the degree of dissociation of a weak acid by Conductometry.
6. Determination of the strength and pK_a value of the weak acid by titration with an alkali.
7. To determine the Aniline point of the given sample of a Lubricating oil.
8. Synthesis of the phenol-formaldehyde resin.
9. To determine the temporary and permanent hardness of a sample of water by complexometric titration.
10. To determine the Alkalinity of the given sample of water.
11. Determination of the ion exchange capacity of cation exchange resin.

Demonstration Experiments

1. Determination of pH of different concentrations of acid and bases by pH meter.
2. Spectrophotometer (concentration determination, wavelength maximum)

Text Books/References:

1. Laboratory Manual On Engineering Chemistry by S. K. Bhasin, S. Rani, 2009, D R Publications.
2. Advanced Practical Physical Chemistry by J. B. Yadav.

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester III

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-311T	Structural Analysis I	2	1	0	3	PCC
2.	CIV-312T	Surveying Measurements & Adjustments	2	1	0	3	PCC
3.	CIV-313T	Fluid Mechanics I	2	1	0	3	PCC
4.	CIV-314T	Building Materials & Construction	2	1	0	3	PCC
5.	MTH-ExxT	Elective* Probability & Statistics / Numerical methods	2	0	0	2	OEC
6.	CIV-315P	SOM Lab	0	0	2	1	PCC
7.	CIV-316P	Surveying Measurements & Adjustments Lab	0	0	2	1	PCC
8.	CIV-317P	Fluid Mechanics Lab I	0	0	2	1	PCC
9.	YYY-yyyT	Open Elective	*	*	*	X=2 to 4	OEC
10.	XXX-xxxTP	Generic Elective (SOT)	*	*	*	Y=2 to 4	PEC
Total Credits						17 +X+Y	

*50% of the class(say Group A) will opt for Probability and statistics and the rest 50% (say Group B)for Numerical Methods in the 3rd semester.

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Course Code	Course Name	L	T	P	Credits
CIV-311T	Structural Analysis I	2	1	0	3

Course Objectives:

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

- To introduce the fundamentals of engineering mechanics (static)
- To understand the concept of the behavior and strength of materials in civil engineering.
- To understand the mechanics of materials under various loadings.

Syllabus:

UNIT I: BASIC CONCEPTS OF STRUCTURAL ANALYSIS

Structure, structural engineering, Types of loads (point, uniformly distributed and varying), Types of supports and support reactions, free body diagrams, Equations of equilibrium, Principle of Superposition, Axial force, Bending moment, and Shear force in determinate beams (Simply supported beams, cantilever, and overhanging beams) and diagram of shear force and bending moment.

UNIT II: BENDING AND SHEAR STRESS IN BEAMS

Theory of simple bending, Flexural formula; Bending Stress and Shear Stress Diagram for Homogeneous beam sections of various shapes, Composite sections and Applications to simpler problems, Shear center.

UNIT III: SLOPES AND DEFLECTIONS

Slope and Deflection of determinate beams by Double Integration Method; Moment Area Method and conjugate beam method.

UNIT IV: COMPOUND STRESSES

Normal and tangential stresses, Principal stresses and strains, Principal planes, Mohr's circle of stress, Evaluation by analytical and graphical method.

UNIT V: ANALYSIS OF COLUMNS

Types of columns - Short and long columns, Stresses in columns; Buckling phenomenon; Euler's and Rankine's theory of Crippling loads; Stresses in eccentrically loaded columns.

Course Outcome:

CO1: To learn the basic concepts of structural analysis and various stresses.

CO2: Determine Shear force and bending moment in beams and understand the concept of the theory of simple bending.

CO3: Calculate the deflection of beams by different methods and selection of method for determining slope or deflection
CO4: To understand the concepts of stress and strain, principal stresses, and principal planes.
CO5: To understand the buckling behavior of columns subjected to axial loads.

Text Books/References:

1. Introduction to Structural Engineering John M.Biggs
2. Determinate Structures: R.L.Jindal
3. Theory of Structures: Ramamurtham
4. Analysis of Structures: Thandavamoorthy
5. Strength of Materials: Singer and Pytel
6. Mechanics of materials: R C Hibbeler

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Course Code	Course Name	L	T	P	Credits
CIV-312T	Surveying Measurements and Adjustments	2	1	0	3

Course Objectives:

- To impart practical knowledge in the field- measuring distances, directions, angles and determining R.L.'s areas and volumes
- To set out Curves and to stake out points
- To traverse the area
- To draw Plans and Maps
- To develop skills to set out Curves in the field using both Total Station and Theodolite.

Syllabus:

Unit I: Fundamentals and Chain Surveying

Definition- Classifications - Basic principles-Equipment and accessories for ranging and chaining – Methods of ranging - well-conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting – applications- enlarging the reducing the figures – Areas enclosed by straight-line irregular figures- digital planimeter.

Unit II: Prismatic Compass and Plane Table Surveying

Compass – Basic principles - Types - Bearing - Systems and conversions- Sources of errors - Local attraction - Magnetic declination-Dip-Traversing - Plotting - Adjustment of closing error – applications - Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection – Traversing- sources of errors – applications. Temporary adjustments of a prismatic compass.

Unit III: Levelling

Level line - Horizontal line - Datum - Benchmarks -Levels and staves - temporary and permanent adjustments – Methods of leveling - Fly leveling - Check leveling - Procedure in leveling - Booking -Reduction - Curvature and refraction - Reciprocal leveling – Sources of Errors in leveling- Precise leveling - Types of instruments - Adjustments - Field procedure

Unit IV: Levelling Applications

Longitudinal and Cross-section-Plotting - Contouring - Methods - Characteristics and uses of contours – Plotting – Methods of interpolating contours – Computations of cross-sectional areas and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams.

Unit V: Theodolite Surveying

Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry –Subtense method - Stadia constants - Anallactic lens

Course Outcome:

Accomplish the abilities/skills for the following.

CO1: To understand the importance of Engineering Surveys, especially land surveying.

CO2: To know about the basic principles and types of land surveying.

CO3: To know the theory, working principles, and numerical aspects of various surveying methods: chain, compass, plane table, and leveling.

Text Books/References:

1.Surveying volume I by Dr.K.R.Arora

2.SurveyingVol.II by Dr. K. R. Arora

3.SurveyingVol.II by S.K Duggal, Tata McGraw Hill, N.Delhi. 4.Basak "Surveying and leveling."

4.Surveying Volume I by Duggal S.K.

5.Surveying and leveling by P.B. Shahni

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-313T	Fluid Mechanics-I	2	1	0	3

Course Objectives:

At the end of the course, students would be able :

- To develop the understanding of basic principles of mechanics of fluids at rest and in motion and their applications in solving the real engineering problems
- To imbibe basic laws and equations used for the analysis of static and dynamic fluids.
- To develop understanding of hydrostatic law, the principle of buoyancy and stability of a
- To teach the importance of fluid flow measurement and its applications in Industries.
- To be able to carry out dimensional analysis for various physical phenomenons occurring in nature.

Syllabus:

Unit I: Introduction

Physical properties of Fluids: mass density, viscosity, compressibility, vapour pressure, surface tension, capillarity, etc. Ideal Fluids and Real Fluids; Newtonian and non-Newtonian fluids.

Unit II: Fluid Statics

Pressure Intensity, Pascal's law; Pressure density-height relationships; manometers; pressure on plane and curved surfaces; centre of pressure; Buoyancy; stability of immersed and floating bodies, Metacentric height and its determination.

Unit III: Fluid Kinematics

Steady and unsteady; Uniform and non-uniform; laminar and turbulent flows; one, two and three dimensional flows; Streamlines, streak lines and path lines; Conservation of mass; velocity field and acceleration; continuity equation; rotation, circulation and vorticity; Elementary explanation of stream function and velocity potential; Graphical method of drawing flow nets.

Unit IV: Fluid Dynamics

Euler's equation of motion along a streamline and its integration to yield Bernoulli's equation; flow measurement; flow through orifice-meter; Venturimeter; orifices, mouth-

pieces, Pitot tube, various types of notches and weirs under free and submerged conditions, aeration of Nappe; momentum equation and its application to stationary and moving vanes.

Unit V: Dimensional Analysis and Hydraulic Similitude

Dimensional homogenity, Buckingham's theorem; Important Dimensionless numbers and their significance, geometric, kinematic and dynamic similarity; Model Analysis and similitude

Course Outcome:

CO1: To analyze various Physical properties of fluids

CO2: Analyse and perform calculations on Pressure Intensity, force on a plane and curved surfaces, the center of pressure, and metacentric height

CO3: Perform calculations to determine Steady and unsteady, uniform and non-uniform, laminar and turbulent flows; one, two, and three-dimensional flows; Streamlines, Streak lines, and path lines.

CO4: Determine Euler's equation of motion along a streamline and its integration to yield Bernoulli's equation.

CO5: To carry out dimensional analysis for a physical phenomenon occurring in nature by using Buckingham's theorem

Text Books/References:

1. Kumar, D.S. "Fluid Mechanics and Fluid Power Engineering". Seventh Ed. S.K. Kataria & Sons Publishers, New Delhi, 2008- 2009.

2. Garde R.J. "Engineering. Fluid Mechanics" 1988.

3. Kumar, K.L. "Engg. Fluid Mechanics", Eurasia Publishing House (P) Ltd. New Delhi, 1984.

4. Streter, V.L., Wylie, E.B. and Bedford, K.W. "Fluid Mechanics" McGraw Hill, New York, 2001.

5. Asawa, GL, Fluid Flow in Pipes & Cannels 2008? CBS Publishers, new Delhi, 2000.

6. Som, S.K. and Biswas, G., "Fluid Mechanics and Fluid Mechanics", Tata McGraw Hill 1998.

7. Fluid Mechanics by Frank .M. White, McGraw Hill Publishing Company Ltd, New Delhi, 4th Edition.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-314T	Building Materials and Construction	2	1	0	3

Course Objectives:

- To aid practicing engineers in materials selection and design by understanding the interplay among structure, processing, properties, and performance.
- Introduction about basic building units and their suitability.
- To assess and evaluate the differences in material composition.
- To provides a broad overview of the field and serves.
- To know the pattern of lying of building units.

Syllabus:

Unit I: Introduction to building materials.

Role of material in construction. Types of materials used in building construction.
Lime: classification/types and testing of lime.
Cement: classification/types and testing of cement.
Fly ash: classification and testing of fly ash.
Mortar: Classifications/types and their use.
Paints and varnish: classifications /types
Timber: classifications/types, seasoning of timber, defects in timber, testing of timber.
Steel: classifications and their tests
Introduction and advantages to advanced materials used in building construction with few case studies.

Unit-II: Stones, Bricks, and Concrete.

Stone as building material: Criteria for selecting stones, Tests of stones, Deterioration and Preservation of stonework.
Bricks as building material: Classification of bricks, introduction to Manufacturing of bricks, Special and advanced bricks, defects in bricks Tests on bricks as Per Indian standard
Concrete as building material: Classification /types of concrete, ingredients of concrete, tests of Concrete, Concrete blocks types of concrete blocks advantages and disadvantages of concrete blocks.

Unit-III: Properties of building materials.
Factors affecting properties of building materials, the importance of studying properties of building materials, introducing various properties of building materials e.g., structural properties, thermal, fire-related properties, and acoustic properties.

Unit-IV: Introduction of building and building elements.

Building codes and their objectives.Load-bearing structures and framed structures its suitability and importance. Types of loads Introduction to building elements also discuss their types.

Foundation, plinth, floors, DPC, walls, slab, stairs, columns, beams, lintel, roofs, plaster, doors, windows, and Ventilators.

Unit-V: Masonry Construction:

Definition and terms used in masonry. Brick masonry, characteristics, and requirements of good brick masonry, Bonds in brickwork, Stonemasonry, Requirements of good stone masonry, Classification, of different stone masonry.

Course Outcome:

CO1: Learner should differentiate the basic materials used in building construction.
CO2: Learner should analyze the requirements of modern material, our traditional one.
CO3: Learner should know building elements and their construction.

Textbooks/References:

1. Building materials by Parbin Singh.
2. Building materials and construction by Gurcharan Singh.
3. Building materials and construction by Ragawala.
4. Building construction by Sushil Kumar.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-315P	SOM lab	0	0	2	1

LIST OF EXPERIMENTS:

1. **Tensile Test of Steel**- To determine yield strength, ultimate tensile strength, percentage elongation, and modulus of elasticity of structural steel (Plot, stress-strain curve)
2. **Tensile Test of Steel**- To determine yield strength, ultimate tensile strength, percentage elongation, and modulus of elasticity of round steel bars (Plot, stress-strain curve)
3. **Tensile & Compressive strength of Timber-** a) Parallel to grains, b) Perpendicular to grains**.**
4. **Torsion test of Steel**:- To measure the angle of twist, ultimate Torsional Strength Stress-strain curve.
5. **Shear test of steel/Timber-** To measure ultimate shear strength, shear modulus, and Plot shear stress-strain curve.
6. **Impact test of Steel-** To determine the impact strength of notched mild steel test piece using Charpy Test and Izod Test
7. **Buckling load of columns with various end conditions-** To determine the crippling load of columns with different end conditions and compare theoretical values.
8**. Testing of Bricks and Stones as per IS specifications**.

Course Outcomes:

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

CO1: To determine the behavior of structural members/elements under loading.

CO2: To determine the crippling load of columns with different end conditions.

CO3: To measure the ultimate shear strength of various materials.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-316P	Surveying Measurements and Adjustments Lab	0	0	2	1

Course Objectives:

At the end of the course, students would be able:
To use the basic surveying equipments. Viz Chain, tape, Compass.
To layout different types of traverses using chain/tape and compass.
To handle & use Plane table with other accessories.
To handle & use various types of leveling instruments viz, Dumpy level, Tilting Level
To prepare L –sections and X-sections showing relative levels of various points
To prepare contour Maps

Syllabus:

LIST OF EXPERIMENTS:

1. Study of chains and their accessories.
2. Aligning, Ranging, and Chaining.
3. Chain Traversing.
4. Compass Traversing.
5. Plane table surveying: Radiation.
6. Plane table surveying: Intersection.
7. Plane table surveying: Traversing.
8. Plane table surveying: Resection – Three point problem.
9. Plane table surveying: Resection – Two point problem.
10. Study of levels and leveling staff.
11. Fly leveling using Dumpy level.
12. Fly leveling using tilting level.
13. Check leveling.
14. LS and CS.
15. Contouring.

Course Outcome:

To accomplish the abilities/skills for the following.
CO1: To handle and use basic surveying equipments.
CO2: To prepare layout plans
CO3: To measure angles and bearings
CO4: To prepare different traverses
CO5: To prepare L-sections, X sections, and contour Maps

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-317P	Fluid Mechanics Lab-I	0	0	2	1

Course Objectives:

At the end of the course, students would be able:

- To develop understanding of hydrostatic law, the principle of buoyancy and stability of a floating body, and application of mass, momentum, and energy equation in fluid flow.
- To imbibe basic laws and equations used for the analysis of static and dynamic fluids.
- To teach the importance of fluid flow measurement and its applications in Industries
- To give fundamental knowledge of fluid, its properties, and behavior under various Conditions of internal and external flows.

Syllabus:

1. To determine the metacentric height of a ship model experimentally.

2. To verify Bernoulli's equation experimentally.

3. To determine the coefficient of discharge, coefficient of velocity, and coefficient of Contraction of an orifice or a mouthpiece of a given shape.

4. To calibrate an orifice meter and to study the variation of coefficient of discharge with Reynold's number.

5. To calibrate a Venturimeter and to study the variation of coefficient of discharge with Reynold's Number.

6. To calibrate sharp-crested rectangular and triangular weir.

7. To verify the momentum equation experimentally.

Course Outcome:

The ability to conduct experiments for a given purpose.

CO1: The ability to analyze experimental data and develop empirical equations.

CO2: Verification of basic principles and equations of fluid mechanics.

CO3: The ability to use computers for data analysis, empirical equations, and presentation.

CO4: The ability to work individually and as a team

CO5: The ability to communicate in written reports and oral presentation.

CO6: Demonstrate a practical understanding of the various equations of Bernoulli.

Text Books/References:

1. "Fluid Mechanics with Laboratory Manual", Bireswar Majumdar, Prentice Hall India Learning Private Limited , January 2010.

2. "Fluid Mechanics & Machinery Laboratory Manual**",** Dr. N. Kumara Swamy, Charotar Books Dist.-Anand; 1st Edition, January 2014.

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester IV

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-411T	Structural Analysis II	2	1	0	3	PCC
2.	CIV-412T	Advanced Surveying Measurements	2	1	0	3	PCC
3.	CIV-413T	Fluid Mechanics II	2	1	0	3	PCC
4.	CIV-414T	Concrete Technology	2	1	0	3	PCC
5.	CIV-415T	Building Drawing	0	1	4	3	PCC
6	CIV-416P	Concrete Technology Lab	0	0	2	1	PCC
7.	CIV-417P	Fluid Mechanics Lab II	0	0	2	1	PCC
8.	CIV-418P	Advanced Surveying Measurements Lab	0	0	2	1	PCC
9.	YYY-yyyT	Elective I(DC)	2	0	0	2	DCE
10.	CIV-419P	Structure Lab	0	0	2	1	PCC
11.	CIV-410P	Survey Camp	0	0	2	1	PCC
Total Credits						**22**	

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-411T	Structural Analysis II	2	1	0	3

Course Objectives:

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

- To introduce the basic theory of structural analysis
- To understand the classical methods of structure analysis
- To determine the response of structures under various loadings.

Syllabus:

UNIT I: INTRODUCTION TO INDETERMINATE STRUCTURES

Introduction to Indeterminate structure, Degree of Freedom, Kinematic and Static indeterminacy of structures (Statically indeterminate structures, Redundant Frames, degree of indeterminacy), Equilibrium and stability conditions.

UNIT II: ENERGY METHODS OF ANALYSIS OF STRUCTURES

Strain Energy Method for analysis of Determinate and Indeterminate Structures; Strain Energy stored due to axial loading, bending, torsion; Principle of Virtual work, Unit load method, Betti-Maxwell's Reciprocal theorem, Castigliano's Ist and 2nd theorem of minimum energy and its application to the analysis of Internally and Externally indeterminate Beams, Frames and trusses

UNIT III: FORCE METHODS OF ANALYSIS OF STRUCTURES

Method of consistent deformation for analysis of indeterminate beams; Continuous beams; Analysis of fixed beams by integration and moment area method, Clepryon's Three-Moment equation.

UNIT IV: DISPLACEMENT METHODS OF ANALYSIS OF STRUCTURES BY SLOPE DEFLECTION METHOD

Analysis of indeterminate Beams and Frames (with and without Sway) by Displacement methods using slope deflection method.

UNIT V: DISPLACEMENT METHODS OF ANALYSIS OF STRUCTURES BY MOMENT DISTRIBUTION METHOD

Distribution factors, analysis of indeterminate Beams and Frames (with and without Sway) by moment distribution method yield support.

Course Outcome:

CO1. To determine the static and kinematic indeterminacy of various types of structures.

CO2. Determine the strain energy and compute the deflection of determinate beams, frames, and trusses using energy principles.

CO3 Analyze statically indeterminate structures by force methods.

CO4. Analyze statically indeterminate structures by the displacement method.

Text Books/References:

1. Indeterminate Structural Analysis by C.K.Wang

2. Indeterminate Structural Analysis by R.L.Jindal.

3. Structural mechanics by Norris and Wilbur.

4. Theory of Structures by S.Ramamrutham R.Narayan

5. Analysis of Structures: Thandavamoorthy

6. RC Hibbler- Analysis of Structures

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-412T	Advanced Surveying Measurements	2	1	0	3

Course Objectives:

- To impart a basic understanding of various aspects related to Geometrics and other physical measurements in Civil Engineering.
- To provide knowledge of Total Station & advanced surveying instruments.
- To develop skills to set out Curves in the field using both Total Station and Theodolite.

Syllabus:

Unit I: Control Surveying

Horizontal and vertical control, Methods, specifications, triangulation, baseline, instruments, and accessories ,corrections ,satellite stations , reduction to center, trigonometrical leveling , single and reciprocal observations , traversing , Gale's table.

Unit II: Survey Adjustment

Errors Sources, precautions and corrections , classification of errors , true and most probable values, weighed observations , method of equal shifts ,the principle of least squares ,0 normal equation, correlates, level nets, adjustment of simple triangulation networks.

Unit III: Total Station Surveying

Basic Principle , Classifications -Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave System. Care and maintenance of Total Station instruments. Modern positioning systems , Traversing and Trilateration.

Unit IV: GPS Surveying

Basic Concepts , Different segments , space, control, and user segments , satellite configuration , signal structure , Orbit determination and representation , Anti Spoofing and Selective Availability , Task of control segment , Hand-Held,and Geodetic receivers ,data processing , Traversing and triangulation.

Unit V: Advanced Topics in Surveying

Route Surveying , Reconnaissance ,Route surveys for highways, railways, and waterways , Simple curves , Compound and reverse curves , Setting out Methods , Transition curves , Functions and requirements , Setting out by offsets and angles , Vertical curves , Sight distances, hydrographic surveying , Tides

Course Outcome:

Accomplish the abilities/skills for the following.

CO1: To understand the importance of Engineering Surveys, especially land surveying.

CO2: To know about the basic principles and types of land surveying.

CO3: To understand the mechanics concerned with the response of the rock to the force Field of its physical environments.

CO4: To know the theory, working principles, and numerical aspects of various surveying methods viz., chain, compass, plane table, and leveling.

Text Books/References:

1) Surveying Vol. II by Dr. K. R. Arora
2) Surveying Vol. II by S.K Duggal, Tata McGraw Hill, N. Delhi.
3) Surveying and Leveling by Basak, Tata Mcg raw Hill, N. Delhi
4) Surveying Vol. II by B.C Punima, Vol 2, Laxmi Publications Pvt. Ltd. N. Delhi
5) Surveying & Levelling by P.B. Shahni

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-413T	Fluid Mechanics-II	2	1	0	3

Course Objectives:

At the end of the course, students would be able:

- To develop an understanding of basic principles of fluid flow through pressure and gravity type conduit systems.
- To gain proficiency in applying the conservation equations to open channel flow problems.
- To develop and apply relationships for hydraulic jumps, surges, and critical, uniform, and gradually-varying flows.
- To determine the losses in a flow system, flow through pipes, boundary layer flow, and flow past immersed bodies.

Syllabus:

Unit I:Boundary Layer Analysis

Boundary Layer Analysis-Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, Application of momentum equation, turbulent boundary layer, Laminar sub-layer, Hydrodynamically smooth and rough boundaries, local and average friction coefficients, separation of flow and its control.

Unit II: Flow in Open Channels

Physical Uniform flow, critical depth, Normal depth, Specific energy, Resistance formulae, gradually varied flow equations, Classification of water surface profiles, Computation of water surface profiles, step by step method and graphical integration method. Hydraulic jump, Momentum Principle for open channels, Evaluation of the jump elements. Hydraulically efficient channel sections.

Unit III: Flow through Pipes, Water Hammer and Surge tanks

Nature of turbulent flow in pipes, Hydraulic and energy grade lines. Equation for velocity distribution over smooth and rough pipes, Resistance coefficient and its variation, Nikuradse experiments, Moody diagram, Flow in sudden expansion, Contraction, diffusers, Bends, Valves and Siphons; Concept of equivalent length, branched pipes in series and parallels, Simple networks, Transmission of power.

Sequence of events after sudden valve closure, pressure diagrams, Gradual closure or opening of the valve, Instantaneous closure of valve in a rigid pipe, Instantaneous closure of valve in an Elastic pipe and compressible fluid, Methods of Analysis; Surge tanks, Location of surge

tank and types of surge tanks.

Unit IV: Fluid flow past Submerged bodies

Drag and lift, Drag on a sphere, cylinder and disc: Lift, Magnus effect and Circulation.

Unit V: Hydraulic Machines

Types of Turbines, Description and principles of impulse and reaction Turbines, Unit quantities and specific speed, Runaway speed, Turbine characteristics, Selection of Turbines, Cavitation; Draft tube, Draft tube dimensions, Types of Draft tubes; Centrifugal pumps, specific speed power requirements, Reciprocating pumps.

Course Outcome:

CO1: Analyze and perform calculations on open-channel flows, compute water surface profiles and hydraulic jump characteristics

CO2: Analyze and perform calculations on pipe flow problems involving turbulent flow, understand the concept of friction factor, head loss, and design of pipes, and analysis of pipe-networks.

CO3: Perform calculations for the determination of the drag and lift forces on submerged bodies.

CO4: Analyze the water hammer phenomenon in closed conduits and the concept of surge tanks.

CO5: Determine various hydraulic characteristics of turbines and pumps.

Text Books/References:

1.Kumar, D.S. “Fluid Mechanics and Fluid Power Engineering”. Seventh Ed. S.K. Kataria & Sons Publishers, New Delhi, 2008- 2009.
2. K. Subramanaya “Open channel Flow” 3rd.Tata McGraw Hill Pub. Co. New Delhi,1999.
3. Garde R.J. “Engineering. Fluid Mechanics” 1988.
4. RangaRaju, K.G., “Flow-Through Open Channels,” 2nd.Tata McGraw Hill Publishing Company Ltd., New Delhi,1986
5.Nigam “Handbook of Hydroelectric Engg.”, 2001.
6**.** Deshmukh, M.M, “ Water Power Engineering” Danpat Rai & Sons, Nai Sarak New Delhi, 1978.
7. Asawa, GL “Fluid Flow in Pipes and Channels” CBS Publishing.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-414T	Concrete Technology	2	1	0	3

Course Objectives:

To impart knowledge to the students on the properties of materials for concrete by suitable tests, mix design for concrete, and special concretes.

Syllabus:

UNIT I: CONSTITUENT MATERIALS

Cement , Different types , Chemical composition and Properties , Hydration of cement , Tests on cement , IS Specifications , Aggregates , Classification ,Mechanical properties and tests as per BIS , Grading requirements , Water , Quality of water for use in concrete. Concrete , Mixing, Placing, and curing of concrete.

UNIT II: CHEMICAL AND MINERAL ADMIXTURES

Introduction of shrinkage, Creep, and Maturity of concrete , Shrinkage Accelerators , Retarders , Plasticizers , Superplasticizers , Waterproofers , Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline , Effects on concrete properties.

UNIT III: PROPORTIONING OF CONCRETE MIX

Principles of Mix Proportioning , Properties of concrete related to Mix Design , Physical properties of materials required for Mix Design , Design Mix and Nominal Mix , BIS Method of Mix Design -Mix Design Examples

UNIT IV: FRESH AND HARDENED PROPERTIES OF CONCRETE

Workability , Tests for the workability of concrete , Segregation and Bleeding , Determination of strength Properties of Hardened concrete , Compressive strength , split tensile strength , Flexural strength , Stress-strain curve for concrete , Modulus of elasticity , durability of concrete ,water absorption , permeability , corrosion test , acid resistance.

UNIT V: SPECIAL CONCRETES

Lightweight concretes , foam concrete, self-compacting concrete , vacuum concrete , High strength concrete , Fiber-reinforced concrete , Ferro cement , Ready mix concrete, SIFCON - Shotcrete , Polymer concrete , High-performance concrete , Geopolymer Concrete.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy

CO2: Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete

CO3: Evaluate the effect of the environment on service life performance, properties, and failure modes of structural concrete and demonstrate techniques of measuring the Non-Destructive Testing of concrete structure

CO4: Develop an awareness of the utilization of waste materials as a novel, innovative materials for use in concrete

CO5: Design a concrete mix that fulfills the required properties for fresh and hardened concrete

Text Books/References:

1. T E French, C J Vierck and R J Foster, Graphic Science and Design, 4th edition, McGraw Hill, 1984.
2. W J Luzadder and J M Du, Fundamentals of Engineering Drawing, 11th edition, Prentice-Hall Of India, 1995.
3. K Venugpoal, Engineering Drawing and Graphics, 3rd edition, New Age International, 1998
4. Dhananjay A Jolhe, Engineering drawing, TMH, 2008
5. Textbooks of Concrete technology by M.S Shetty and Neville, Pearson Education; Second edition.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-415T	Building Drawing	0	1	4	3

Course Objectives:

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

- To introduce the fundamentals of Civil Engineering drawing.
- To understand the principles of planning.
- To learn to draft of buildings.
- To impart knowledge on drafting software such as AutoCAD

Syllabus:

Unit I:

Foundations: Principles of foundations, types, and suitability of foundations including strip, pad, raft, pile and pier foundation, details of spread footing foundation with the help of given data or rule of thumb, showing offsets, positions of DPC.

Unit II:

Drawing of Columns, Stair and Staircase, Various types and materials, drawing of various components of a Dog-legged staircase (section and Plan). Roofs & Roof Coverings: Classification of roofs with particular reference to pitched roofs; Drawing of various timber trusses.

Unit III:

Elevation, sectional plan, and sectional side elevation of Doors, windows, and ventilators. Location, size, and different types. Drawing of RCC slabs (One and two way); beams (including cantilever);

Unit IV:

Drawing of Building Plan, Sectional and foundation of a small building by measurement and foundation detail. Drawing of a detailed plan, elevation, and section of a two-room residential building from a given line plan, showing foundation, roof, and parapet details.

Unit V:

Introduction of CADD (Computer-Aided Drafting & Designing) Practice on Drawing Basics Drawing Elementary CADD commands.

Function keys, Shortcut keys, Paper size. Making Title Block, writing it & inserting it in any drawing file with scale, angle & explode options. Drafting of a building plan, Elevation, Section Views mentioning construction details of important building components, including foundation, plinth. DPC, lintels, slabs, and roofs; full specifications for each component.

Introduction to AutoCAD 3D.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: To understand the drawings of various components of buildings

CO2: Preparation of building drawings.

CO3: Interpretation of building drawings.

CO4: Use of drafting software.

Text Books/References:

1. AutoCADD software
2. Building Drawing by M.G.Shah
3. Civil Engineering Drawing by Chakorbarty
4. Civil Engineering Drawing by J.B.Mckay
5. Building Drawing by V.B.Sikka

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-416P	Concrete Technology Lab	0	0	2	1

Course Objectives:

- To know the concept and procedure of different types of tests conducted on cement, aggregate, and finished concrete.
- To understand the procedure of designing the concrete mix of given specification of its ingredients and appropriate water-cement ratio and admixtures.

LIST OF EXPERIMENTS:

A) FINE AGGREGATES:-

1. Grading and zoning of fine aggregates.
2. Specific gravity of fine aggregates.

B) COARSE AGGREGATES:-

1. Grading and zoning of Coarse aggregates.
2. Determination of water absorption of coarse aggregates.

C) CEMENT:-

1. Determination of standard consistency of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of fineness of cement.
4. Soundness test of concrete.

D) CONCRETE:-

1. Determination of consistency of fresh concrete by slump test.
2. Determination of workability of freshly mixed concrete by Compaction factor test.
3. Determination of cube strength of concrete for different mixes and different W/C ratio
4. Determination of tensile strength of concrete by cylinder splitting test.
5. Determination of flexural strength of concrete beam.

Course Outcome

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

CO1 : Perform different tests conducted on cement, aggregate, and concrete at the site.

CO 2: Perform a non-destructive test on concrete.

CO3: Design the concrete mix as per the site conditions and specification of materials available there.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-417P	Fluid Mechanics Lab-II	0	0	2	1

Course Objectives:

At the end of the course, students would be able:

- To compare the results of analytical models introduced in a lecture to the actual behavior of real fluid flows
- To discuss and practice standard measurement techniques of fluid mechanics and their applications
- To learn and practice writing technical reports;
- To work on small design projects.

Syllabus:

1. To find friction factors for pipes of different materials.
2. To determine the minor head loss coefficient for different pipe fittings.
3. To determine the surface profile and total head distribution of a vortex.
4. To determine the elements of a hydraulic jump in a rectangular channel.
5. To determine the Manning's rugosity coefficient of a laboratory flume.
6. To obtain the velocity distribution for an open channel and to determine the values of α, β and n.

Course Outcome:

CO1: Utilize basic measurement techniques of fluid mechanics.
CO2: Discuss the differences among measurement techniques,
CO3: Identify, name, and characterize flow patterns and regimes.
CO4: Understand basic units of measurement, convert units, and appreciate their magnitudes.
CO5: Demonstrate a practical understanding of friction losses in internal flows.

Text Books/References:

1. "Fluid Mechanics with Laboratory Manual," Bireswar Majumdar, Prentice Hall India Learning Private Limited, January 2010.

2. "Fluid Mechanics & Machinery Laboratory Manual," Dr. N. Kumara Swamy, Charotar Books Dist.-Anand; 1st Edition, January 2014.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-418P	Advanced Surveying Measurements Lab	0	0	2	1

Course Objectives:

At the end of the course, students would be able

- To handle and use Theodolite for measurement of horizontal angles & vertical angles.
- To layout different types of traverses using Theodolite.
- To handle and use Tacheometer
- To set out works- Foundation markings, simple curves, and Transition curves.
- To handle and use Total station for measurement of horizontal/vertical distances, traversing, and area calculation.

Syllabus:

LIST OF EXPERIMENTS:

1. Study of Theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles.
3. Theodolite survey traverse.
4. Heights and distances - Triangulation - Single plane method.
5. Tacheometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition Curve.
7. Measurement of Horizontal and Vertical distance using Total Station.
8. Traversing and Area Calculation using Total Station.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Measure Horizontal and vertical angles using Theodolite
CO2: Measure height of buildings using theodolite and Tacheometer

CO3: Measure horizontal and vertical distances using Tacheometry,

CO4: Setting out of works

CO5: Measure horizontal/vertical distances, horizontal/vertical angles, and area of sites

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-419P	Structure Lab	0	0	2	1

LIST OF EXPERIMENTS:

1. Deflection of curved beams.

2. Behavior of Portal Frame under different load combinations.

3. Deflection of Truss.

4. Behavior of a cantilever beam under symmetrical and unsymmetrical loading.

5. Analysis of an elastically coupled beam.

6. Analysis of a redundant joint.

7. Analysis of two hinged arches.

8. Verification of Maxwell's Theorem- To verify the Principle of Maxwell's Theorem.

9. Verification of Horizontal Thrust in a 3-Hinged Arch- To evaluate experimentally horizontal thrust in a 3-Hinged arch and draw an influence line diagram for the horizontal thrust.

Course Outcomes

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

CO1: To understand the behavior of structural members
CO2 : Ability to furnish and analyze designs and construct structural systems, produce related documents, drawings, and reports, and present objective estimates of the related quantities.
CO3: Practical application of principles and understanding various joints in different members.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-410P	Survey Camp	0	0	2	1

Description of workshop: survey camp using modern survey equipments e.g., Total Station. The camp must involve work in a large area. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations, and plots workshop will be conducted for every batch once in the degree it will be completed in 10 working days or equal hours.

Course Objectives:

- To impart intensive training in the use of surveying instruments
- To train the students to appreciate practical difficulties in surveying on the field
- Making the students conversant with the camp life
- Training the students to communicate with the local population
- Providing an opportunity to the students to develop team spirit
- To train the students for self-management

Syllabus:

Module 1: Introduction to survey, types of survey, the importance of survey in the field.
Module 2: Exposure to different types of survey projects carried out in the present day industry.

Module 3: introduction of leveling and handling of the total station.

Module 4: Methods of data collection using a total station.

Module 5: Methods to provide control points.

Module 6: Preparation of site plan and layout.

Module 7: Prepare L-Section and C-Section of the road not less than 3 Km

Module 8: Preparation of contour plan of land not less than 30 Kanal.

Module 9: Hand on practical session on plotting and mapping by using the software.

Module10: Report making.

Certification:

Certificate of completion will be issued after:

(a). Fulfilling attendance criteria i.e., it's compulsory to achieve 100% attendance in the workshop.

(b). Certificate of moral ethics during workshop issued by coordinator program.

(c). To pass the assessment.

Means of Assessment:

1. Practical work
2. Report Writing
3. Presentation
4. Drawing
5. Viva-voce

Award:
Best performance award will be given on the bases of performance of students:

Course Outcomes:

CO1: After undergoing the survey camp, students will be able to:
CO2: Interpret the contours.
CO3: Work in teamwork.
CO4: Mark a road alignment of (L-section, Cross-section) a given gradient connecting any two stations on the map
CO5: Calculate the earthwork.
CO6: Prepare a topographical plan of a given area.

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester V

S.No	Course Code	Course Title		Hours Per Week			Credits	Course Category
				L	T	P		
1.	CIV-511T	Design Of Concrete Structures-I		2	1	0	3	PCC
2.	CIV-512T	Geotechnical Engineering-I		2	1	0	3	PCC
3.	CIV-513T	Water Supply Engineering		2	1	0	3	PCC
4.	CIV-514T	Quantity Survey & Cost Estimation		3	1	0	3	PCC
5.	CIV-515T	Structural Analysis III		2	1	0	3	PCC
6	MTH-ExxT	Elective *	Probability & Statistics	2	0	0	2	OEC
			Numerical methods					
7.	CIV-516P	Water Quality Lab		0	0	2	1	PCC
8.	CIV-517P	Geotechnical Engineering Lab I		0	0	2	1	PCC
Total Credits							**19**	

*50% of the class(say **Group A**) will opt for **Numerical Methods,** and the rest 50% (say **Group B**)for **Probability and statistics** in 5th semester.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-511T	Design of Concrete Structures-I	2	1	0	3

Course Objectives:

At the end of the course, students would be able:

- To understand the properties of reinforced concrete as a construction material
- To develop an understanding of various design philosophies and their differences
- To understand the behaviour and design of RCC beams in flexure and shear.
- To understand behaviour and design of compression members.
- To understand behaviour and design of one way and two-way slabs.
- To understand behaviour and design of isolated footings.

Syllabus:

UNIT I: PROPERTIES OF CONCRETE AND REINFORCING STEEL AND GENERAL DESIGN PHILOSOPHIES

Characteristic strength, stress-strain curves for Concrete and steel, IS specifications. Design Philosophies-Working stress method, Ultimate load method & limit state method of design. Analysis & design of structures in flexure/torsion by limit state method.

UNIT II: ANALYSIS & DESIGN OF BEAMS

Flexural behaviour of reinforced concrete beams, Analysis &design of Rectangular, T & L Sections, Codal Provisions. Behaviour of RCC Beams in shear, Design for shear, Anchorage & slipping of Reinforcement. Torsion of Beams and design; Detailing of reinforcement as per Codal provisions with reference to IS:456. Serviceability limit state of deflection & cracking—calculation of deflection, Codal requirements.

UNIT III: DESIGN OF COLUMNS

Types RCC Columns- Short & long Columns, Analysis and design of Axially loaded RCC Columns, Design of RCC columns for uni-axial and bi-axial moments, Helical Reinforcement and Transverse Reinforcement.

UNIT IV: DESIGN OF SLABS

Design of one-way and two-way RCC slabs with and without corners held down. Introduction to design of slabs by Moment Coefficient Method. Introduction to Flat Slabs.

UNIT V: DESIGN OF FOOTINGS

Types of footings, Design of isolated RCC footings and wall footings, Effect of varying water table conditions on design of footings**.**

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: To understand the properties of reinforced concrete as a construction material.
CO2: To understand various design philosophies and their differences
CO3: To analyse and design RCC beams in flexure and shear.
CO4: To analyse and design various compression members.
CO5: To analyse and design one way and two way slabs
CO6: To design isolated RCC footings.

Text Books/References:

1. Design of Reinforced Concrete & Pre-Stressed Concrete Structures by Kong & Evans.
2. Design of Reinforced Concrete: Limit State Design by A.K.Jain.
3. Design of RCC Structures by Sinha.
4. Design of RCC Structures by Karve & Shah.
5. Reinforced Concrete Design by Pillia Menon.
6. Treasure of RCC Design by Sushil Kumar.
7. IS Code 456-2000

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-512T	Geotechnical Engineering-I	2	1	0	3

Course Objectives:

To develop analytical and experimental skills to determine various stresses acting on soil material.

Syllabus:

Unit I: Introduction

Soil and its formation, various processes and agencies for formation; Types of Soils. Three-phase soil Model, Index properties, and classification of soils.

Unit II: Soil Hydraulics

Flow-through soils, Darcy's Law. Permeability Factors and determination in the lab/Field. Steady-state Flow, seepage force, Laplace equation for steady-state flow, flow nets for homogenous embankments with & without toe filters.

Unit III: Soil Compressibility

One Dimensional Consolidation, Terzaghi's equation. Consolidation test, e log p curves. Consolidation settlement, time required for settlement. Compaction, laboratory compaction tests, proctor compaction, compaction curve, and control on field compaction.

Unit IV: Effective Stress & Stress Distribution

Total & effective stresses, Pore Water pressure, Stress distribution under concentrated load. Westergard's and Boussineq's method

Unit V: Soil Investigation & Clay Mineralogy

Laboratory & Field Investigation. Sub-soil exploration, Penetration methods, Geo-Physical methods, electromagnetic method, electric resistivity method, and Seismic method. Minerals Present in clay, dependence of behavior of clay on type of mineral.

Course Outcomes:

CO1: To classify soils and understand their index properties.

CO2: To analyze flow through soils.

CO3: To perform/demonstrate soil compaction tests.

CO4: To determine stress distribution in soils.

CO5: To utilize various methods of soil investigation in field and laboratory.

Text Books/References:

1. Soil Mechanics by Alam Singh
2. Theoretical Mechanics by Terzaghi& Peck
3. Soil Mechanics by S.B. Saighal
4. Geotechnical Engineering by Purushotama Raj
5. Geotechnical Engineering by C.Venkataramiah
6. Geotechnical Engineering by K.R.Arora.
7. Geotechnical Engineering by S.K.Garg

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-513T	Water Supply Engineering	2	1	0	3

Course Objectives:

At the end of the course, students would be able:

- To impart various aspects of the supply of pure and safe drinking water to communities and the conservation of water.
- To make technology choices to deal with water quality issues, operate and maintain working treatment systems, and troubleshoot the problems in these systems.
- To design, construct, operate and maintain a water conveyance system.
- To acquire sufficient knowledge on the basic design of conventional and advanced water treatment processes.

Syllabus:

Unit I: Water Quality

Introduction and scope, Various sources of water, Water Quality Parameters, significance, and codal recommendations of limits for various uses

Unit II: Water Consumption and Water Distribution

Water Consumption for various uses, variation in Demand & Supply. Population forecasting methods, storage capacities of reservoirs, Systems of distribution, distribution networks

Unit III: Water Transportation

Pipe designs, network analysis by various methods, pipe materials and joints, leakage prevention.

Unit IV: Treatment Process

Water treatment: Conventional treatments like screening, sedimentation, Coagulation, Filteration, Disinfection. Advanced treatments like Ozonation and Activated carbon adsorption, etc**.**

Unit V: Sanitation

Water supply in buildings, Plumbing, and fixtures, Sanitation of buildings

Course Outcome:

CO1: Select appropriate treatment for raw water useful for domestic as well as construction purpose.

CO2: Maintain the pipe-network for the water supply system effectively.

CO3: Calculate and Estimate the impurities present in water used for domestic as well as construction works.

CO4: Prepare layout plan and maintain water distribution and sewer networks.

CO5: Test raw water as per the standard practices

CO6: Plan and implement house plumbing work effectively.

Text Books/References:

1. A textbook of "Water Supply and Sanitary Engineering" S.K.Hussain, Oxford & IBH publishers, 2017.

2.Hammer, M.J. and Hammer, M.J., "Water and Wastewater Technology", 4th Ed., Prentice Hall of India, 2000.

3.Davis, M.L. and Cornwell, D.A., "Introduction to Environmental Engineering", McGraw Hill, 1998.

4. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., "Environmental Engineering", McGraw Hill, 1986.

5. "Water Supply And Sanitary Engineering" , Rangwala ; Charotar Publishing House Pvt. Ltd.;Edition : 29th Revised and Enlarged Edition : 2016.

6. A textbook of "Water Supply and Sanitary Engineering" S.K.Garg, Khanna Publishers, Revised Edition,2010.

7. Metcalf and Eddy, "Wastewater Engineering", 4th edition, McGraw-Hill, 2003.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-514T	Quantity Survey and Cost Estimation	2	1	0	3

Course Objectives:

- To produce a forecast of the probable cost of a future project.
- Identify and prioritize cost-saving opportunities.
- To determine the true (full) costs of each item of the project.
- To evaluate the target of *road* construction project
- To assess and evaluate the differences in the value of the assets.

Syllabus:

UNIT I: Introduction to Estimation.

Definition and importance of Quantity Surveying and Cost estimation .Definition of items of a work and their units. Data required for the preparation of an estimate. Types of preliminary Estimate and Detailed estimate. Forms used in estimating.

UNIT II: Analysis of Rates

Definition and importance of analyses of rates. Introduction to Preparing of rates, Labour schedule, material schedule, and rate schedule. Analysis of rates for item of work of buildings e.g., Earthwork in the foundation, lime concrete in Foundation, concrete in foundation and superstructure, Brickwork in foundation and superstructure, stone masonry, RCC masonry, RCC work, Plastering, color washing, woodwork, DPC, and steelwork, etc.

UNIT III: Detailed Estimation.

Introduction to estimates of different types of buildings. Estimates of walls. Methods of building estimate; Longwall and short wall method, centerline methods. Estimate of masonry platform. Estimate of a masonry tank. Estimate of a single room building. Estimate of two room building with CGI roof over wooden trusses /over steel /R.C.C slab. Estimate of a RCC Beams. RCC Column. Bar bending schedule.

UNIT IV: Estimation of Roads.

Methods of estimating earthwork: (a) Mid Sectional Area Method.(b) Mean Sectional Area Method(c) Prismoidal Formula Method. (d) Graphical Method.

Estimate of a metallic road: Estimation of 3-layer metallic road .introduction about influence of Material variation and cost in layered metallic road.

UNIT V:Valuation & Specifications

Introduction of Valuation. Purpose and importance of valuation of building.Termes used in valuation. Methods of Valuation.

Specifications: General specifications & detailed specifications . Book of specifications. Importance of specifications . cost variation with specifications few examples.

Course Outcomes:

CO1: Give the Students a reasonable idea of the project's cost to help them decide whether the work can be undertaken as proposed or not.

CO2: Learner should be capable enough to analyze the project resources.

CO3: Learner should be able to make DPR of buildings.

CO4: Learner should know the cost variation due to material change in road construction.

CO5: Learner should assess and calculates the property value.

Text books/References:

1. Estimating & Costing by Datta.
2. Estimating & Costing by Mahajan.
3. Cost Estimation: Methods and Tools by Gregory K. Mislick, Daniel A. Nussbaum.
4. Civil Estimating and Costing by A.K.Upadhyay.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-515T	Structural Analysis III	2	1	0	3

Course Objectives:

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

- To learn the concept of drawing influence lines for determinate and indeterminate structures.
- To analyze the arches, cables, and suspension bridges.
- Understand the concept of plastic analysis of beams.

Syllabus:

UNIT I: INFLUENCE LINE DIAGRAMS FOR DETERMINATE STRUCTURES:
Influence line for reactions in statically determinate beams, Principles of influence lines, and application to determinate structures (Beams, Trusses, Arches).Criteria for absolute maximum moment and shear under a series of moving loads. Muller Breslau's Principle.

UNIT II: INFLUENCE LINE DIAGRAMS FOR INDETERMINATE STRUCTURES:
Influence line for shear force, bending moment, and support reaction components of indeterminate beams and arches**.**

UNIT III: ARCHES
Types of Arches, Analysis of Three Hinged Arches, Two Hinged and Fixed Arches-Parabolic Arches and circular arches, Rib Shortening and temperature Effects.

UNIT IV: CABLES AND SUSPENSION BRIDGE
Statics of suspension cable, Cables supported at different levels, Temperature effect, Analysis of suspension bridge with and without stiffening girders.

UNIT V: PLASTIC METHOD:
Concept, Assumptions, Shape Factor for different cross-section, Collapse Load, Load Factor, Plastic modulus of a section, Plastic moment of resistance, Theorems of plastic analysis, Methods of analysis, Computation of Collapse load for a fixed beam and continuous beam

Course Outcome:

CO1: Draw influence lines for statically determinate structures and calculate critical stress resultants.

CO2: Understand the Muller-Breslau principle and draw the influence lines for statically indeterminate beams.

CO3: Analyze three-hinged, two hinged, and fixed arches.

CO4: Analyze the suspension bridges with stiffening girders.

CO5: Understand the concept of Plastic Analysis and the method of analyzing beams.

Text Books/References:

1. Indeterminate Structural Analysis by C.K.Wang

2. Indeterminate Structural Analysis by R.L.Jindal.

3. Structural mechanics by Norris and Wilbur.

4. Theory of Structures by S.RamamruthamR.Narayan

5. Analysis of Structures: Thandavamoorthy

6. RC Hibbler- Analysis of Structures

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-516P	Water Quality Lab	0	0	2	1

Course Objectives:

At the end of the course, students would be able:

- To introduce students to how the standard environmental experiments relating to water and wastewater quality are performed.
- To know which tests are appropriate for given environmental problems, statistically interpret laboratorial results and write technical reports, and apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions.
- To Understand how to classify and analyze various quality parameters of raw water.
- To make the students as to suggest a required type of treatment to purify raw water.
- To make the students as analysts to differ quality requirements for industrial waters and domestic waters.

Syllabus:

1. To measure the dissolved oxygen concentration of a water sample.
2. To determine the pH of the given wastewater sample
3. To determine the turbidity of the given sample of wastewater using nephelo turbidity meter.
4. Determination of Total, Suspended and Dissolved Solids in a given water sample.
5. Determination of Alkalinity of a given water sample.
6. Determination of Chlorides of a given water sample.
7. Determination of Acidity of a given water sample.
8. Determination of Total Hardness (Soda-Reagent Method.) of a given water sample.
9. Determination of Colour/Odour of a given water sample.
10. Determination of Dissolved Oxygen content of a given water sample.
11. Determination of C.O.D.
12. Determination of optimum dose of coagulant

Course Outcome:

CO1: Perform standard environmental experiments relating to water quality, and know which tests are appropriate for environmental problems.

CO2: Statistically analyze and interpret laboratory results.

CO3: Analyse various physico-chemical and biological parameters of water in case of quality requirements.

CO4: Understand and use the water and wastewater sampling procedures and sample preservations.

CO5: Demonstrate the ability to write clear technical laboratory reports.

Text Books/References:

1. A text book of "Water supply Engineering", by Santhosh Kumar Garg, Khanna publishers.
2. A text book of "Chemical analysis of water and soil", by Dr. KVSG Murali Krishna, Reem.
3. "Practical Manual of Water Quality Analysis", zu zhi bian xie, Chemical Industry Press, January 2012.
4. "Laboratory Manual for the Examination of Water, Waste Water, and Soil," Hans Hermann Rump, Wiley-VCH; 3 edition, January 2000.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-517P	Geotechnical Engineering Lab-I	0	0	2	1

Course Objectives:

To understand the laboratory tests used for the determination of physical, index, and Engineering properties of soil.

LIST OF EXPERIMENTS:

1. Soil Identification Tests
2. Water Content Determination Test
3. Field Density Measurement
4. Specific Gravity Test
5. Sieve Analysis Test
6. Sedimentation Analysis Test
7. Atterberg and Shrinkage Limits
8. IS Light Heavy Compaction Tests
9. Permeability Tests

Course Outcomes:

CO1: To determine basic soil properties and consistency limits.

CO2: Draw the complete particle size distribution curve of a given soil.

CO3: Determine the Compaction characteristic of a given soil.

CO4: Determine the Permeability of any given soil specimen.

Text Books/References:

1. IS codes relevant to each test.

2. C. Venkatramaiah, Geotechnical Engineering, New Age International publishers, 2012.

3. Gopal Ranjan and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International Publishers, 2012

4. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers, 2011.

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester VI

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-611T	Design Of Steel Structures	2	1	0	3	PCC
2.	CIV-612T	Geotechnical Engineering-II	2	1	0	3	PCC
3.	CIV-613T	Highway Engineering and Pavement Management System	2	1	0	3	PCC
4.	CIV-614T	Engineering Hydrology	2	1	0	3	PCC
5.	XXX-xxxT	Elective II(DC)	2	0	0	2	DCE
6.	CIV-615P	Computer based Drafting Lab	0	0	2	1	PCC
7.	CIV-616P	Geotechnical Lab II	0	0	2	1	PCC
8.	CIV-617P	Highway Material Lab	0	0	2	1	PCC
9.	CIV-618P	Engineering Geology Lab	0	0	2	1	PCC
10	CIV-619P	Industrial Training I	0	0	2	1	PCC
11	YYY-yyyT	Open Elective	*	*	*	X=2 to 4	OE C
Total Credits						**19+X**	

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-611T	Design of Steel Structures	2	1	0	3

Course Objectives:

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

- To study structural steel properties and understand the behavior & design of welded and bolted connections.
- To understand the behavior and design of tension members.
- To understand the behavior and design of laterally supported & unsupported flexural members.
- To understand the behavior and design of Compression members.
- To learn about the behavior and design of various components of the plate girder.

Syllabus:

UNIT I: CONCEPTS OF DESIGN OF STEEL STRUCTURES

Introduction to Structural steel and its properties. Design Philosophies. Riveted, bolted, and welded connections and their design.

UNIT II: DESIGN OF TENSION MEMBERS

Limit State design of tension members, Rolled and Built- up sections.; Codal Provisions.

UNIT III: DESIGN OF FLEXURAL MEMBERS

Design of flexural member, laterally supported, laterally unsupported, and built- up beams

UNIT IV: DESIGN OF COMPRESSION MEMBERS

Buckling phenomenon of compression members, Design of compression members; Rolled and Built- up sec. design of column bases

UNIT V: DESIGN OF PLATE GIRDERS

Design of plate Girder: General: Components of Plate Girder-optimum depth, Bending strength, Shear strength, Shear Buckling, stiffeners, Bearings, Transverse stiffeners.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: To understand the behavior of structural steel and design of bolted & welded connections.

CO2: Design of rolled and built-up tension members.

CO3: Design of laterally supported and unsupported flexural members

CO4: Design of rolled and built-up compression members.

CO5: Design of various components of Plate girder.

Text Books/References:

1) Design of steel structures By Subramanian

2) Steel structures – Design & Behaviour By Salmon & Johnson

3) Design of steel structures By SK Duggal.

4) Design of steel structures By Vizrani and Ratwani

5) IS 800 (2007)- General Construction in Steel –Code of Practice

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-612T	Geotechnical Engineering-II	2	1	0	3

Course Objectives:

- To understand various properties of soil And understand the concept of earth pressure and slope stability .

Syllabus:

UNIT I:

SHEAR STRENGTH: Shear strength concept. Mohr's Coulumb equation. Laboratory determination. Triaxial compression test under different Drainage conditions ,viz undrained, drained and consolidated, direct shear test. Unconfined compression test. Strength envelope

UNIT II:

BEARING CAPACITY AND FOUNDATIONS:

Basic definitions and methods of determination, Prandtl's solution. Terzaghi's solution for ultimate bearing capacity. Size effects. Effects of rigidity of footings. Plate load test. Design principles for footing and rafts. Foundations on clay sand sands Foundations types and applications, Pile foundation types, classification and determination of load-carrying capacity, dynamic and static methods. Pile load test, pile groups efficiency of pile groups.

UNIT III:

EARTH PRESSURE:

Lateral earth pressure. Rankine's theory Active and Passive States. Lateral earth pressure under various conditions, like surcharge, sloping backfill, and high water table behind the wall. Earth pressure diagrams. Total thrust. Tension Cracks.

UNIT IV:

STABILISATION:

Methods of stabilization. Brief introduction to each of the methods of stabilization such as shotcrete, geo reinforcement

UNIT V:

STABILITY OF SLOPES:

Infinite slopes, conjugate stresses, stability number Swedish and Friction circle methods. Submergence case, complete drawdown case, Steady seepage case.

Course Outcome:

CO1: To equip the knowledge of strength and mechanical behaviour of soils.
CO2: To understand the concepts of bearing capacity and foundations.
CO3: To understand the practical aspects of earth pressure and retaining structures.
CO4: To understand the concepts of slope stability along with its practical application

Text Books/References

1. Ranjan, G and Rao, P.,"Basic and Applied Soil Mechanics", New Age International Pvt. Limited, New Delhi, 2002.

2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, Delhi, 1987.

3. Singh, A., "Basic Soil Mechanics & Foundations", CBS Publishers & Distributors, 2004.

4. Taylor, D.W., "Fundamentals of Soil Mechanics", Wiley, New York, 1948.

5. Bowles, J.E., "Physical and Geotechnical properties of Soils", McGraw Hill Publishers, 1979.

6. Terzaghi, K., "Theoretical Soil Mechanics", Wiley, New York, 1943.

7. Terzaghi, K., Peck, R.B. and Mesri, G., "Soil Mechanics in Engineering Practice", 1996.

8. Jumikis, A.R. "Soil Mechanics", R.E. Krieger Pub. Co., Florida, US, 1984.

9. Purushothama, P. "Geotechnical Engineering", McG00raw Hill Education, 1995.

10. Venkataramaiah, C., "Geotechnical Engineering", New Age International Publishers, Daryagunj, New Delhi, 1995

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-613T	Highway Engineering & Pavement Management System	2	1	0	3

Course Objectives:

To provide basic knowledge in transportation so that students can understand and solve transportation-related problems and design for highway mode of transportation, focusing on highway users' characteristics, geometric and pavement design, traffic engineering, and transportation planning.

SYLLABUS

UNIT-I: Introduction

History of roads, Classification of roads, Introduction to Modes of transportation & its socio-economic impact

UNIT-II: Alignment design

Route survey and highway location. Geometric design: crosssection elements; sight distances, horizontal and vertical alignment

UNIT-III: Pavement design

Types of pavement, Factors affecting pavement design, Methods of flexible pavement design, Introduction to the design of rigid pavement.

UNIT-IV: Highway materials and construction

Properties of flexible pavement materials, Bituminous of concrete mix design (Marshall Method), Introduction to advanced & recycled road materials.

UNIT–V: Pavement management system

Introduction to Pavement Management system (PMS). Concept of PMS. Importance of PMS in modern road construction. Data requirement & collection methods.

COURSE OUTCOME

Students who complete this course will be able to:

CO1: Give necessary information, prepare a horizontal and vertical alignment, including superelevation, which complies with AASHTO standards.

CO2: Understand the relationship between the environment and transportation infrastructure and its importance in project development of transportation projects.

CO3: Utilize CAD software to prepare a plan, profile, and x-sections depicting a typical roadway design.

CO4: Prepare well-written design narratives documenting the various parameters and standards used in the design process so another individual could review the work and understand what decisions and assumptions were used and why.

CO5: Understand the mathematics behind the development of tables and charts for determining highway design criteria.

CO6: Familiar with professional and ethical issues related to liability and conduct.

TEXTBOOK/REFERENCES

1. Khanna, S.K. and Justo, C.E.G. 2002. "Highway Engineering". Nem Chand Brothers, Roorkee.

2.Bhanot, K.L.1990. "Highway Engineering", S. Chand and Company (P) Ltd., New Delhi.

3.Rao, G.V. 1996." Principles of Transportation and Highway Engin0eering", Tata McGraw Hill, New Delhi

4.Pavement Design and Management Guide by Transportation Association of Canada, Ottawa, Ontario, Edn. Dr. Ralph Haas,

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-614T	Engineering Hydrology	2	1	0	3

Course Objectives:

At the end of the course, students would be able:

- To impart the knowledge for understanding elementary aspects of hydrology.
- To know diverse methods of collecting the hydrological information, which is essential to understand surface and groundwater hydrology.
- To know the basic principles and movement of groundwater and properties of groundwater flow.
- To impart the knowledge of Fluvial Hydraulics for use in the planning, design, and management of water resources projects.

Syllabus:

Unit I: Hydrology

Scope and applications of Hydrological cycle; precipitation measurement by rain Guages, gauge network adequacy, missing data determination, and consistency. Hyetographs and methods of determining mean rainfall. Hydrological Abstractions: Evaporation, Transportation, Interception, Depression storage, Infiltration. Water Budget Equation.

Unit II: Streamflow

Streamflow measurement: Direct and indirect methods, stage- discharge relationship. Factors affecting Runoff. Rainfall-Runoff relationships. Unit Hydrograph, Peak Flow, velocity & Discharge measurements. Hydrographs: Definition, components, base flow separation, effective rainfall, unit hydrograph, derivation, applications, and limitations.

Unit III: Flood Estimation and Groundwater

Occurrence and distribution of floods; various flood estimation methods; viz Rational method, empirical methods, U.H. method, Design flood definition. Flood routing: Reservoir and channel routing.

Occurrence and distribution of groundwater, types of aquifers, aquifer properties, Darcy's law, steady one- dimensional aquifer flow, Well Hydraulics: Steady flow to wells in confined and unconfined aquifers

Unit IV: Reservior Design Studies

Types of reservoirs, storage capacity, Mass-curve technique, fixation of capacity, safe yield, reservoir sedimentation: trap efficiency, capacity- inflow ratio, life of reservoirs

Unit V: Fluvial Hydraulics

Principles of sediment transport, critical tractive force, Shield's plot, Bed, and suspended load. Bed movement, White's Theory, Rigid and loose Boundaries.

Course Outcome:

CO1: To perform multiple analyses on precipitation data.

CO2: To estimate various components of the hydrological cycle such as streamflow, runoff, Evapotranspiration and infiltration.

CO3: To measure components of hydrological water balance in the field.

CO4: To perform hydrograph analysis and estimate the magnitude of flood.

CO5: To determine reservoir capacity and sedimentation.

CO6: To perform steady-state analysis of groundwater movement.

Text Books/References:

1. Subramanaya, K. "Engineering Hydrology" Tata McGraw Hill, New Delhi, 2001.
2. Linsely, K., Kohler, A. and Paulhus L.H. "Hydrology for Engineers" McGraw Hill Book Company Inc. New York, 1975.
3. Ragunath, H.M. "Hydrology Principles Analysis and Design" New Age International (P) Ltd Publishers., New Delhi, 2005.
4. Garde, R.J. and RangaRaju K.G. "Mechanics of sediment transportation and alluvial stream problems". New Age International (P) Ltd. Publishers, New Delhi, 1994
5. Arora, K.R. "Irrigation Water power and water Resources Engineering". Standard Publishers Distributors, Delhi, 2002.
6. Wilson, E.M. "Engineering Hydrology" ELBS, English Language book Society/ Macmillam Education Ltd., London, 1999.
7. Asawa, G.L. Irrigation and Water Resources Engineering, New age International Publishers,2005.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-615P	Computer based drafting lab	0	0	2	1

Course Objectives:

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

- To learn how to deal with the different AutoCAD Windows and their contents. To become aware of different modeling, drafting, analysis, and design software.
- To gain knowledge in drawing of various building components and structural drawings of a building
- To obtain knowledge of modeling of various building components and special sections of a building

Syllabus:

Unit I: INTRODUCTION TO COMPUTER AIDED DRAWING:

Introduction, Auto-Cadd Window, Starting, Opening and Saving a Drawing, Prototype Drawing and closing of drawing.Different forms of Projections and plotting in Cadd, Geometrical construction in Cadd.

Unit II: SOFTWARE FOR CAD and PRACTICE EXERCISES ON CAD:

Drawing cross sections (I, C, T, angles, solid and hollow sections), To draw horizontal and vertical lines keep ortho on; To draw inclined lines keep the ortho off; Draw the alphabets as per the given dimensions. Practice exercises on simple drawing areas and sections, surfaces, etc.

Unit III: DRAWING OF PLANS OF BUILDINGS:

Development of Working of Building. Drawing of different plans for single and Multi-storey Buildings; Drawing in different layouts. Reinforcement detailing's and structural drawings.

Unit IV: DRAWING OF SECTIONS AND ELEVATIONS OF BUILDINGS:

Drawing of different sections and elevations of buildings.Drawing of single and multi-storey buildings, their sections ,and their elevations. Reinforcement detailing's and structural drawings. 3D drafting of Building.

Unit V: DRAWING OF BUILDING COMPONENTS:

Detailing of Building components like Doors, Windows, Ventilator, Lift, Stairs, Elevators. Drawing of Plumbing and electrical drawings of buildings.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Recognizing the need for computer aided drafting of buildings.

CO2: Understanding the method of Drafting in CAD and drafting 2D and 3D visualizations

CO3: Gaining skill based knowledge of drafting tools.

Text Books/References:

1. K.Venugopal, V. Prabhu Raja, "Engineering Drawing + AutoCAD," New Age International Publishers, 2011.
2. Nighat Yasmin, "Introduction to AutoCAD 2015 for Civil Engineering Applications", SDC Publishers, 2014.
3. Sham Tickoo, "Exploring AutoCAD Civil 3D 2018", CADCIM, 2018.

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-616P	Geotechnical Engineering Lab II	0	0	2	1

Course Objectives

- To understand different characteristics of the soil.

List of Experiments:

Expt. No.	Name of the Experiment
1	Consolidation Test
2	Direct Shear Test
3	Unconfined Compression Test
4	Unconsolidated Undrained Triaxial Test
5	Vane Shear Test
6	Consolidated Undrained Triaxial Test
7	Standard Penetration Test
8	Plate Load Test

COURSE OUTCOMES

CO1: Determine consolidation characteristics of a given soil sample.
CO2: Obtain shear strength parameters of different types and consistencies of soils and under different drainage conditions.
CO3: Perform a Standard Penetration test of soil to obtain SPT (N) – value.
CO4: Determine allowable soil pressure of soil foundation system by vertical plate load test

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-617P	**Highway Material Lab**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES

The objectives of this course are to learn the transportation lab fundamentals of :

- Bitumen and & its engineering behavior.
- Aggregate & its engineering behavior.

LIST OF EXPERIMENTS:

1. TESTS ON AGGREGATE-

a) Aggregate grading
b) Specific Gravity
c) Crushing
d) Abrasion
e) Impact
f) Soundness
g) Flakiness
h) Shape
i) Fineness Modulus
j) Silica content
k) Silt content,
l) Alkalinity.

2. TESTS ON BITUMEN-

a) Viscosity
b) Penetration,
c) Softening point
d) Flash & Fire Point.
e) Ductility, Specific gravity,

COURSE OUTCOME

Students who complete this course will be able to:

CO1: Identify engineering properties of aggregate.

CO2: Identify the grade & properties of bitumen.

TEXTBOOK/REFERENCES

1. Khanna, S.K. and Justo, C.E.G. 2002. "Highway Engineering". Nem Chand Brothers, Roorkee

2. Highway Materials and Pavement Testing by Khanna, Justo &Veeraragavan, Nem Chand Brothers, Roorkee

3. Material Testing Laboratory Manual by Kukreja, Kishore &Chawla, Standard Publishers, NaiSarak, Delhi

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-617P	Engineering Geology Lab	0	0	2	1

Course Objectives:

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

- Acquire practical knowledge of geology and various types of rocks and minerals.
- Acquire practical Knowledge on the measurement of dip and strike of earth.

Syllabus:

LIST OF EXPERIMENTS:

1. The study of Physical Properties of Minerals.
2. Determination of specific Gravity by:
   a. Jolly's Spring Balance
   b. Walker's Steel Yard Balance
   c. Beam Balance
3. Study of Rocks and their characteristics.
4. Study & Sketching of various types of Geological structures.
5. Determination of Dip and Strike with a clinometer Compass.

Course Outcome:

After performing the experiments listed in the syllabus, the students will have:

CO1: Ability to categorize rocks and minerals by their origin and engineering properties.

CO2: Ability to apply geological principles to rock masses and discontinuities for use in engineering design e.g., rock slopes, foundation.

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Course Code	Course Name	L	T	P	Credits
CIV 619P	Industrial Training-I	0	0	2	1

Course Objectives:

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

- Gain Knowledge of Various Types of Field Projects
- Recognise the importance of material manufacturing in Civil Engineering
- Recognise the methods of Construction
- Gain knowledge of Quality checks at Construction sites

Syllabus:

The Training is composed of Two Parts:

1. Visiting various material manufacturing plants/sites and Project Sites and collecting information about the Project, its cost, duration, methods of manufacturing, analysis, design, and construction of the site. Also, to gain knowledge on Quality evaluation at different plants or sites.
2. Collecting all data, writing a Short technical report, and demonstrating for evaluation before a committee.

The composition of the committee consists of three Faculty members of the Department.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Enhance Practical Knowledge of the Manufacturing and Construction Sites.

CO2: Building Professional Know-how.

CO3: Refreshing the Theoretical Subject Knowledge.

Text Books/References:

1. Engineering Training Manuals by US Army
2. Dennis Lemaitre, Training Engineers for Innovation. 2018
3. M. MacDonald Steels, Effective Training for Civil Engineers. 1994

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester VII

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-711T	Design of Concrete Structures- II	2	1	0	3	PCC
2.	CIV-712T	Irrigation & Hydraulic Structures	2	1	0	3	PCC
3.	CIV-713T	Structural Dynamics	2	1	0	3	PCC
4	CIV-714 T	Waste Water Engineering	2	1	0	3	PCC
5	CIV 715T	Traffic Engineering and Road facilities	2	1	0	3	PCC
6	XXX-xxxT	Elective III(DC)	2	0	0	2	DCE
7	XXX-xxxT	Elective IV(DC)	2	0	0	2	DCE
8	CIV-716P	Seminar	0	0	2	1	PCC
9	CIV-717P	Dynamics Lab	0	0	2	1	PCC
10	CIV-718P	Traffic Engineering lab/Field Study	0	0	2	1	PCC
11	CIV-719P	Pre Project	0	0	4	2	PCC
12.	CIV-720P	Industrial Training II	0	0	*	1	PCC
Total Credits						**25**	

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Course Code	Course Name	L	T	P	Credits
CIV-711T	Design of Concrete Structures II	2	1	0	3

Course Objectives:

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

- To understand behaviour & design of various types RCC footings
- To understand the behaviour & design of cantilever & Counter fort Retaining wall.
- To understand the behaviour & design of liquid retaining Structures
- To understand the behaviour & design of shell Structures
- To understand the basics of prestressed concrete.

Syllabus:

UNIT I: FOUNDATIONS

Introduction, Various types of RCC footings, the design of RCC footings, isolated footings and various types of combined footings.

UNIT II:RETAININGWALLS

Stability analysis of retaining walls, design of cantilever and counter-fort type RCC retaining walls.

UNIT III: LIQUID RETAINING STRUCTURES

Design of circular & rectangular water tanks with reference to IS: 3370.

UNIT IV: SHELL STRUCTURES

Membrane analysis of spherical & conical domes by statical methods. Design of domes & ring beams.

UNIT V: PRE-STRESSED CONCRETE

General principles, methods of pre-stressing, pre-tensioning & post-tensioning, losses in pre-stress. Design of rectangular beams.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Design RCC footings (Isolated footings and various types of combined footings)
CO2: Design cantilever and counterfort type RCC retaining walls.
CO3: Design circular and rectangular water tanks with reference to IS: 3370.

CO4: Design of domes and ring beams
CO5: Have basic knowledge of prestressed concrete

Text Books/References

1. Design of footings by Kurien
2. Design of RCC structures by Jain & Jai Krishan
3. Pre-stressed concrete structures by Krishna Raju
4. IS 456 (2000) Plain and Reinforced Concrete- Code of Practice
5. IS 3370 Part (I-IV) -Code of Practice
6. IS 1343- Prestressed Concrete- Code of Practice

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Course Code	Course Name	L	T	P	Credits
CIV-712T	Irrigation & Hydraulic Structures	2	1	0	3

Course Objectives:

This course is intended

- To introduce the basic concepts relevant to Irrigation.
- To understand the principles of Design of Irrigation & Hydraulic Structures.
- To study the causes and the preventive measures for water logging and flooding.

Syllabus:

Unit I: GENERAL INTRODUCTION

The necessity of Irrigation in India, Advantages, and Disadvantages of Irrigation, Techniques of water distribution in farms, Soil moisture & Crop water requirements; Duty, Delta, Base period, Crop period, Consumptive use, Irrigation requirements

Unit II: CANAL IRRIGATION

Types of canals, parts of a canal irrigation system with diagram, channel alignment, assessment of water requirements, distribution system of canal irrigation, estimation of channel losses; design of channels by regime & semi-theoretical approaches. Canal lining

Unit III: CROSS DRAINAGE WORKS

The necessity of Cross Drainage works, their types & selection; Design of various types of Cross Types of Drainage works- Aqueduct, Syphon Aqueduct, Super passage, siphon, siphon super passage, Level Crossing, Detailed design of Aqueduct and Cross sections

Unit IV: DIVERSION HEADWORKS

Parts of diversion headworks, types of weirs and barrages, introduction to design of weirs on permeable foundations, control of silt entry into a canal, silt excluders,Silt ejectors and their drawing. A basic introduction to Bligh's theory. A detailed study of khosla's theory.

Unit V: WATER LOGGING & FLOOD CONTROL

Causes & Preventive measures of waterlogging, Drainage of irrigated lands, saline & alkaline lands. Flood problems, types of floods, Flood control measures

Course Outcome:

After completion of this course, the student will be able:

CO1: To optimize the effective usage of water resources for irrigation purposes.
CO2: To comprehend the basic design principles for the development of an efficient irrigation system.
CO3: To design channels and other irrigation structures required for irrigation, drainage, flood control, and other water-management projects.
CO4: To identify a suitable method of irrigation and drainage of the waterlogged area.

Text Books/References:

1.Arora, K.R., "*Irrigation Water power & Water Resources Engineering*", Standard Publishers Distributors, Delhi, 2002.

2. B. Singh, *Irrigation Engineering*, Nem Chand and Sons, Roorkee

3.Varshney & Gupta, *Theory and Design of Irrigation Structures*, Nem Chand and Bros, Roorkee

4. I. E. Hook, *Irrigation Engineering*, John Wiley and Sons, New York

5. J. D. Zimmerman, *Irrigation*, John Wiley and Sons, New York

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-713T	Structural Dynamics	2	1	0	3

Course Objectives:

The following are the course objectives of the subject:

- To Provide Fundamental Understanding of Basics of Structural Dynamics.
- To impart knowledge of dynamic behavior of various structural systems using analytical and Experimental Methods.
- To Provide Fundamental Understanding of free and Forced Vibration in structures.
- To Provide basics for problem-solving ability for dynamic response in civil engineering analysis and design.
- Apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response

Syllabus:

Unit I:

Introduction to dynamic load (earthquake and blast loading), types of dynamic loads, the basic background of dynamic methods available (D'Alembert's principle, Newton's IInd law), a basic review of the stiffness of structures, development of equation of motion (problem statement and solution method).

Unit II:

Dynamics equation of equilibrium, components of a basic dynamic system, Free vibration of SDOF (damped and undamped case), Models for energy loss, logarithmic decrement, Coulomb's Damping in structures.

Unit III:

Dynamic equation of equilibrium, forced vibration of SDOF(undamped and damped case), response to harmonic and periodic loads, pulse loadings, SDOF response to arbitrary functions, duhamel's integral, dynamic response factors.

Unit IV:

Dynamic equation of equilibrium for MDOF systems (undamped case), solution of free vibration response for undamped systems, eigenvalue problems, natural modes, and properties. Introduction to Systems with Distributed mass (Continuous Systems).

Unit V:

Dynamic response of MDOF systems by mode superposition method, Modal Participation Factors , orthogonality relationships of principal modes , general approach of linear systems ,static condensation method. Introduction to Pushover Analysis.

Course Outcome:

After this course, the students will have an understanding of:

CO1: Basics of Behaviour of Structures subjected to Dynamic Excitation.

CO2: Fundamental theory of dynamic equation of motion

CO3: Fundamental analysis methods for dynamic systems

CO4: Dynamic properties and behaviour of civil structures

CO5: Ability to apply structural dynamics theory to real-world problems like seismic analysis and design of structures.

Text Books/References:

1. Dynamics of structures by Anil K. Chopra

2. Dynamics of structures by Clough &Penzien

3. Structural Dynamics by Mario Paz

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Course Code	Course Name	L	T	P	Credits
CIV-714T	Waste Water Engineering	2	1	0	3

Course Objectives:

At the end of the course, students would be able:

- To get knowledge on the working principles and design of various physical, chemical, and biological treatment systems for water and wastewater, including sludge.
- To get knowledge about the various modes of conveyance of wastewater from the source of its generation to the treatment plant.

Syllabus:

Unit I: Environmental Pollution

Importance of clean environment, Sources of pollution to land, water & air, General effects of pollution, pollution by sewage, calculation of stormwater & sewage, Time of concentration, and storm.

Unit II: Sewage Disposal

Methods of sewage disposal, effects of disposal on land & in water bodies, self-purification of streams, BOD calculations, Types & design of sewers.

Unit III: Sewage Treatment

Unit operations in sewage treatment, Screening, sedimentation, grit removal etc., septic and Imhoff tanks, soakage's for isolated systems, Filtration, activated sludge process, Oxidation ponds, Methods of aeration.

Unit IV: Air Pollution and its Preventive Measures

Air Pollution & its effects on human health, factors responsible for air pollution, air pollution measurement, air quality standards, and Engineering interventions to check air pollution, case studies relating to the topic.

Unit V: Solid Waste management

Solid waste problems, constituents of solid waste; Collection, transport, and disposal of Solid waste sanitary landfilling, composting, incineration.

Course Outcome:

CO1: An ability to estimate sewage generation and design sewer systems.

CO2: The required understanding of the characteristics and composition of sewage, self-purification of streams.

CO3: An ability to perform the basic design of the unit operations and processes used in sewage treatment.

CO4: Understand the standard methods for the disposal of sewage.

CO5: Gain knowledge on sludge treatment and disposal.

Text Books/References:

1. "Sewage Treatment & Disposal & Waste Water Engineering. Vol. II', Dr.P.N. Modi Standard Book House Since 1960; 17TH edition (1 January 2020).

2. "Water supply & sanitary Engineering", B.C.Punmia , Laxmi Publications; Second edition (January 2016).

3. "Environmental engineering & management", Suresh K Dhameja S K Kataria and Sons (January 2010).

4. T. J. McGhee, E. W. Steel, "Water Supply and Sewerage", McGraw-Hill College; 6th edition, 1991.

5. Metcalf and Eddy, "Wastewater Engineering: Treatment and Reuse" McGraw Hill Education; 4 edition (July 2017).

6."Water Supply and Waste Water Engineering" D Lal and A K Upadhyay S.K. Kataria & Sons; Reprint 2013 edition (January 2013).

7. "Environmental Engineering Sewage Waste Disposal and Air Pollution" S.K.Garg Khanna Publishers; Thirty Seventh edition (January 1979).

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-715T	Traffic Engineering and Road Facilities	2	1	0	3

COURSE OBJECTIVES

The objectives of this course are:

- To learn the fundamentals of transportation Engineering .
- To introduce fundamental knowledge of traffic engineering so that students can understand and deal with traffic issues, including safety, planning, design, operation, and control.
- Students will learn and use software such as Highway Capacity Software and Synchro in traffic engineering projects.

SYLLABUS

UNIT I:

Components of traffic system- vehicle characteristics; human characteristics, road characteristics & traffic-control devices.

UNIT II:

Intersections- signalized intersections, channelization and roundabouts, interchanges- requirement & design, flyovers, and grade separators.

UNIT III:

Traffic signs- role and types, signalized intersections, signal timing design, signal coordination.

UNIT IV:

Traffic flow theory-flow parameters; fundamental relation of traffic flow, road capacity, and level of service concept.

UNIT V:

Parking facilities- parking demand, on-street parking, off-street parking.
Traffic Safety: Accident Analysis, Traffic safety issues, countermeasures

COURSE OUTCOME

Students who complete this course will be able to:

CO1: Use statistical concepts and applications in traffic engineering.
CO2: Identify traffic stream characteristics
CO3: Understand elements of highway safety and approaches to accident Studies.
CO4: Design a pre-timed signalized intersection, and determine the signal splits.

CO5: Design an actuated signalized intersection
CO6: Identify the level of services for arterials.

TEXTBOOK/REFERENCES

1. Transport New York; Toronto. Planning and Traffic Engineering by CA O'Flaherty, John Wiley & Sons, Inc.,
2. Traffic Engineering by Mc Shane & Roess, Prentice-Hall of India Private Ltd, New Delhi-110001.
3. Principles and Practices of Highway Engineering by Kadiyali & Lal, Khanna Publishers, Delhi-6
4. Principles of Transportation Engineering by Chakarborty & Das, PrenticeHall of India Private Ltd, New Delhi-110001
5. Traffic Engineering and Transport Planning by L. R. Kadiyali, Khanna Publishers, 2-B , NaiSarak, Delhi-110006

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Course Code	Course Name	L	T	P	Credits
CIV-716P	Seminar	0	0	2	1

COURSE OBJECTIVES

The objectives of this course are:

To encourage and motivate the students to read and collect recent and relevant information from their area of interest confined to the relevant discipline from technical publications including peer-reviewed journals, conferences, books, project reports, etc., prepare a report based on a central theme and present it before a peer audience.

A seminar shall be organized at the 7^{th} semester of the Civil Engineering curriculum leading to the Degree of B.Tech in Civil Engineering. The students shall research a topic of their choice, either library research and laboratory research. The students shall be guided in their research work by the staff members of the department. The students shall make a power-point presentation of 15-20 minutes duration on the research work in front of their fellow students under the department's supervision. A discussion on the same topic follows the seminar presentation.

The students shall make a hard-copy of their seminar report & submit it in the Seminar coordinator's office before the intended date of the presentation.

COURSE OUTCOME

On completion of this course, a student will be able to:

CO1: Identify and familiarize with some of the good publications and journals in their field of study.

CO2: Acquaint oneself with the preparation of independent reports, name them based on a central theme, and write abstracts, main body, conclusions, and references to identify their intended meaning and style.

CO3: Understand effective use of presentation tools, generate confidence in presenting a report before an audience and improve their skills in the same.

CO4: Develop skills like time management, leadership quality, and bond with an audience.

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Course Code	Course Name	L	T	P	Credits
CIV-717P	Dynamics Lab	0	0	2	1

Course Objectives:

The following are the course objectives of the subject:

- To equip students with an understanding of the fundamental principles and techniques for identifying different types of dynamic systems and classify them by their governing equations.
- Introduce fundamentals of vibrations of SDOF system.
- Introduce damped and undamped systems in civil engineering.
- Introduce free and forced vibration in structures.
- Introduce free and forced vibration of SDOF system.

Syllabus:

1. To study undamped free oscillations of a simple pendulum and determine the natural frequency of oscillations.
2. To study undamped free vibrations of a spring-mass system and to determine the natural frequency of vibrations.
3. To study the free vibration of a damped second order system and determine the frequency of damped vibrations. Also, draw the decay curve and determine the logarithmic decrement.
4. To study the vibrations of different types of beams.
5. To study various parts and operations of Shake Table.
6. Basic Introduction and working of the data acquisition system.

Course Outcome:

After this course:

CO1: The student will understand free and forced vibrations in structures.

CO2: The student will have ample knowledge about the working of the spring-mass system.

CO3: The student will have a first-hand experience of resonance problems in structural dynamics.

CO4: The student will be able to differentiate the vibratory mechanisms of SDOF and continuous systems.

Text Books/References:

1. Dynamics of structures by Anil K Chopra
2. Dynamics of structures by Clough & Penzien

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Course Code	Course Name	L	T	P	Credits
CIV-718P	Traffic Engineering Lab/ Field Study	0	0	2	1

Course Objectives:

The following are the course objectives of the subject:

- Collection and analysis through Driver Test
- Check minimum eye sight standards of drivers
- To analyse the speed distribution of Traffic Streams
- Determine average travel time
- Study of traffic stream modelling

Syllabus:

1. Study of Driver Testing unit
2. Study of Driver Vision Screen Tester
3. Spot Speed Study
4. Measurement of Travel Time and Delay for Congested Corridor
5. Moving Observer Method Study

.

Course Outcome:

On completion of this course:

CO 1. Students will gain knowledge of Driver test and will be able to analyse the data.

CO 2. Students will gain knowledge about checking eye sight standards of driver

CO 3. Students will be able to analyse the speed distribution of Traffic streams.

CO 4. Students will be able to determine average travel time.

CO 5. Students will study traffic stream modelling.

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Course Code	Course Name	L	T	P	Credits
CIV-719P	**Pre-Project**	**0**	**0**	**4**	**2**

Course Objectives:

- To identify a research/industry related problem for the undergraduate project work with the respective faculty's guidance, and prepare a design and work plan.

Syllabus:

Each group comprising of around 5 students shall identify a project related to the curriculum of study. At the end of the semester, a preliminary synopsis report on the project shall be submitted to the Department for assessment. The students are required to appear for viva voce, which shall be conducted in the department, in the faculty members' presence under the supervision of the HOD.

Guidelines For Evaluation:		
1.	Attendance and regularity	10
2.	Theoretical knowledge and individual involvement	40
3.	Quality and contents of project synopsis	30
4.	Presentation	20
	Total	100 Marks

Course Outcome:

On completion of this course, a student will be able to:

CO 1. Conduct a literature survey in a relevant area of one's course of study and finally identify and concentrate on a particular problem in the field of civil engineering.

CO 2. Formulate a project proposal through extensive literature and/or discussion with learned resource persons in the industry and around.

CO 3. Generate a proper execution plan of the project work to be carried out in phase second in the 8th semester through deliberations and improve presentation skills.

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Course Code	Course Name	L	T	P	Credits
CIV 720P	**Industrial Training-II**	**0**	**0**	**2**	**1**

Course Objectives:

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

- Gain Knowledge of Various Types of Field Projects
- Recognise the importance of material manufacturing in Civil Engineering
- Recognise the methods of Construction
- Gain knowledge of Quality checks at Construction sites

Syllabus:

The Training is composed of Two Parts:

1. Visiting various material manufacturing plants/sites and Project Sites and collect information about the Project, its cost, duration, methods of manufacturing, analysis, and design and construction of the site. Also, to gain knowledge on Quality evaluation at different plants or sites.
2. Collecting all the data, writing a Short technical report, and demonstrating for evaluation before a committee.

The composition of the committee consists of Three Faculty members of the Department.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Enhance Practical Knowledge of the Manufacturing and Construction Sites.

CO2: Building Professional Know-how.

CO3: Refreshing the Theoretical Subject Knowledge.

Text Books/References:

1. Engineering Training Manuals by US Army
2. Dennis Lemaitre, Training Engineers for Innovation. 2018
3. M. MacDonald Steels, Effective Training for Civil Engineers. 1994

OVERVIEW FOR B. TECH COURSE CIVIL ENGINEERING

Semester VIII

S.No	Course Code	Course Title	Hours Per Week			Credits	Course Category
			L	T	P		
1.	CIV-811T	Design Of Bridge Structures	2	1	0	3	PCC
2.	CIV-812T	Earthquake Resistant Design	2	1	0	3	PCC
3.	CIV- 813 P	Project	0	0	16	8	PCC
4.	XXX-xxxT	Elective V (DC)	2	0	0	2	DCE
	Total Credits					16	

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Course Code	Course Name	L	T	P	Credits
CIV-811T	Design of Bridge Structures	2	1	0	3

Course Objectives:

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

- To Classify different types of bridges and demonstrate fundamental knowledge of design of bridges and understand hydrologic and hydraulic aspects of waterway bridges
- Use influence lines to calculate maximum effects (forces) due to standard moving vehicle loads prescribed in IRC Codes. Select an appropriate load system as per IRC-6 and evaluate design forces and moments in bridges.
- To design the RCC slab culvert and Bridge deck slab.
- To design Plate Girder Bridges and Truss type bridges

Syllabus:

UNIT I: INTRODUCTION TO BRIDGES

Introduction to bridges and types of bridges, History, and development of bridges, Bridge components; Various types of Loads on bridges, Standard loadings for highway; Introduction to Hydraulic Design of Bridges, Scour depth, Afflux, streamflow (discharges) measurements; Introduction to Sub-structure of Bridge and types of loads on sub-structure.

UNIT II: DESIGN OF RCC CULVERTS

Introduction to culverts, Types of culverts, components of culverts, Design principles for culverts, Design of solid slab culvert.

UNIT III: DESIGN OF BRIDGE DECK SLABS

Analysis and Design of RCC bridge deck slabs; Courbon's Method of Bridge Deck Analysis.

UNIT IV: DESIGN OF PLATE GIRDER BRIDGES

Analysis and Design of Plate Girder Bridges, Composite bridges.

UNIT V: DESIGN OF TRUSS BRIDGES

Various forms of steel trussed bridges, Analysis and Design of trussed bridges based on standard IRC loading; Design of Stringers and Cross Girders for single & multi-lane bridges for standard IRC loadings.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: To Classify different types of bridges.
CO2: To understand hydrologic and hydraulic aspects of waterway bridges.
CO3: To evaluate design forces and moments in bridges.
CO4: To design the RCC slab culvert and Bridge deck slab.
CO5: To design Plate Girder Bridges and Truss type bridges

Text Books/References

1. Design of Bridges by Johnson victor
2. Design of Bridges by Krishna Raju
3. Relevant IRC/IS codes & specifications

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Course Code	Course Name	L	T	P	Credits
CIV-812T	Earthquake Resistant Design	2	1	0	3

Course Objectives:

The following are the course objectives of the subject:

- To provide a coherent development to the students for the courses in earthquake engineering.
- To present the foundations of many basic engineering concepts related to earthquake engineering.
- To give experience in the implementation of engineering concepts that are applied in the field of earthquake engineering.
- To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

Syllabus:

Unit I:

Introduction to Earthquake excitation, Equation of Motion, Response Quantities, Response Spectrum (Elastic and Design), Velocity, and Acceleration Response Spectra.

Unit II:

Introduction to methods of Earthquake Load Analysis (Linear Static, Linear Dynamic, Non-Linear Static, Non-Linear Dynamic).

Unit III:

Response of buildings subjected to ground motion based on modal analysis.

Unit IV:

Seismic design of R.C.C. structures (up to 2-story Buildings) based on Codal provisions IS: 1893. Detailing of RCC Elements as per IS: 13920: 2016.

Unit V:

Seismic Codal provisions of brick masonry structures.

Repair & seismic strengthening of buildings as per IS: 13935.

Course Outcome:

After this course,

CO1: The students will gain experience in the implementation of Earthquake Engineering on engineering concepts that are applied in the field of Civil Engineering.

CO2: The students will get a diverse knowledge of earthquake engineering practices applied to real-life problems.

CO3: The students will learn to understand the theoretical and practical aspects of earthquake engineering and the planning and design aspects.

CO4: The Student will be able to analyze and design framed structures for any type of earthquake excitation based on IS 1893:1984 for Earthquake resistant design of structures.

Text Books/References:

1. Dynamics of structures by Anil K Chopra
2. Seismic design of structures by Pankaj Aggarwal, Shrikhande.
3. Seismic design of RCC & Masonry structures by Pauley, T & Priestley.
4. Fundamental Concepts of Earthquake Engineering by Roberto Villavarde.

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Course Code	Course Name	L	T	P	Credits
CIV 813P	Project	0	0	16	8

Course Objectives:

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

- Understand Team Work and attain Professional attitude
- Recognize and analyze Problem/s
- Attain result/s and demonstrate those results before expert/s
- Gain knowledge in report writing

Syllabus:

The Project Work is composed of Two Parts:

1. Collecting Literature. Doing Experimental Work, fieldwork, analyzing and designing, taking case studies, or building demonstrative models.
2. I am collecting all data, writing a technical report and demonstrating for evaluation before a committee.

The composition of the committee is:

a. Three faculty members of the Department, including the Supervisor concerned.
b. An External Expert as approved by Competent Authority.

The Committee mandate of evaluation will be:

1. 40% to Supervisor.
2. 60% to Committee out of which external expert will evaluate 50%.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Enhance the technical capacities.

CO2: Building Professional Know-how.

CO3: Refreshing the Subject Knowledge.

Text Books/References:

1. Diana L.Friad, Project Work. Oxford University Press. 2002
2. Anders Siing Anderson, Simon B. Heilesen, The Roskilde Model: Problem-Oriented Learning and Project Work. Springer International Publishing. 2014

Annexure V

List of Electives

List of Electives

S.No.	Course Code		Course Name	Credits	Preferred Semester	Pre requisites
1.	MTH-E 01 T		Probability & Statistics	2	3rd /5th	Mathematics I & Mathematics II
2.	MTH-E 02 T		Numerical methods	2		
3.	DC-I	CIV-E01T	Engineering Geology & Seismology	2	4th	Civil Engineering Student
4.	DC-I	CIV-E02T	Advanced Construction Management	2		Civil Engineering Student
5.	DC-II	CIV-E03T	Rock Mechanics & Tunneling Technology	2	6th	Geotechnical Engineering I
6.	DC-II	CIV-E04P	Design Software (Basic)	2		DOCS I, Structural Analysis I,II,III
7.	DC-II	CIV-E05T	Solid Waste Management	2		Civil Engineering Student
8.	DC-III	CIV-E06T	Green Buildings	2	7th	Civil Engineering Student
9.	DC-III	CIV-E07T	*Assessment and Repair of Structures*	2		Civil Engineering Student
10.	DC-III	CIV-E09T	Advanced Construction Technology	2		Civil Engineering Student
11.	DC-III	CIV-E10T	Advanced Structural Analysis	2		Structural Analysis I,II,III
12	DC-III	CIV-E11T	Transportation Planning and Economics	2		Transportation Engineering I ,II
13	DC-III	CIV-E12P	Design Software (Advanced)	2		DOCS I, Structural Analysis I,II,III
14	DC-IV	MTH-E03 T	Operation Research & Optimisation	2	7th	Mathematics I & Mathematics II
15	DC-IV	CIV-E13T	Quality Control	2		Civil Engineering Student
16	DC-IV	CIVE114T	Design of Masonry Structures	2		DOCS I
17	DC-IV	CIV-E15T	Railway & Airport Engineering	2		Transportation Engineering I ,II
18	DC-V	CIV-E16T	Hydropower Engineering	2	8th	Water Resources Engineering, Fluid Mechanics I & II
19	DC-V	CIV-E17T	Pre-stressed Concrete	2		DOCS I, II
20	DC-V	CIV-E18T	Environmental Impact Assessment and Audit	2		Civil Engineering Student
21	DC-V	CIV-E19T	Ground Improvement Techniques	2		Geoterchnical Engineering I & II

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Course Code	Course Name	L	T	P	Credits
MTH-E01T	Probability & Statistics	2	0	0	2

Course Objectives:

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

- Understanding of the basic concepts in statistics, probability, conditional probability, and independent events.
- It is inevitable to have the knowledge of hypothesis testing for any research work. The course will provide an opportunity to learn R programming to a substantial extent.
- Focus on the random variable, mathematical expectation, and different types of distributions.
- Design a statistical hypothesis about the real-world problem and conduct an appropriate test to draw valid inferences about the population characteristics.

Syllabus:

Unit I:

Statistics: Measures of central tendency and Measures of variations (Dispersions), Moments, Measures of Skewness and Kurtosis, problems.

Unit II:

Probability: Random experiment, sample space, events, classical, statistical and axiomatic definitions of probability. Statement and proof of addition theorem on probability, Conditional probability and multiplication theorem of probability, problems.

Unit III:

Bayes theorem on conditional probability. Random variables, Derivation of formulae for mean, variance, and moments of random variables for discrete and continuous cases. Bivariate random variable, Joint distribution function, Marginal function, the Expected value of a random variable, Laws of expectation, Problems.

Unit IV:

Standard Distributions: Binomial, Poisson and Normal Distributions, Beta and Gamma Distribution, t Distribution, F-Distribution, Chi-square Distribution, and their applications.

Unit V:

Method of Least Squares & Correlation: Methods of least squares, fitting of straight line and parabola of degree 'p'. Regression and Correlation. Multiple and Partial Correlation. Problems.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1. Understand the meaning of Mean, Variance, and Moments.

CO2. Understand the concept of Normal distribution and its properties.

CO3. Inter-relate between t, F & Chi-Square distributions with applications.

CO4. To understand the concept of chances and their applications in real-life world.

CO5. Utilizing the method of least squares and fitting of curves.

Text Books/References:

1. Fundamentals of Mathematical Statistic by S. C. Gupta and V.K. Kapoor, Sulltan Chand & Sons New Delhi, Latest edition.
2. Statistical Theory and Methodology in Science & Engineering by Brownlee, John Wiley &Sons.
3. Introduction to Mathematical Statistics by R. E. Walpole 3rd edition New York Macmillan publication.
4. Data Analysis for Scientists & Engineers by Meyer, John Wiley & Sons.
5. Sheldon Ross, A First Course In Probability, Pearson Publications, 8th edi. 2010.

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Course Code	Course Name	L	T	P	Credits
MTH-E02T	Numerical Methods	2	0	0	2

Course Objectives:

This course introduces a broad range of numerical methods for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods and a rudimentary knowledge of finite precision arithmetic and the conditioning and stability of the various problems and methods. This will help you choose, develop and apply the appropriate numerical techniques for your problem, interpret the results, and assess accuracy. The problems cover (i) systems of linear equations, linear least-squares problems, and eigenvalue calculation; (ii) interpolation, approximation, and integration of functions; (iii) initial values problems governed by ordinary differential equations; (iv) nonlinear scalar equations.

Syllabus:

Unit I:

Finite Difference: Difference Table and its usage. The difference operators and the operator 'E,' Interpolation: Interpolation with equal intervals, Newton's advancing difference formula Newton's backward difference formula Interpolation with unequal intervals Newton's divided difference formula Lagrange's interpolation formula.

Unit II:

Inverse interpolation: Inverse interpolation by (i) Lagrange's Method (ii) Methods of successive 'E' approximation (iii) Methods of elimination of third differences Numerical solution of algebraic and Transcendental Equations.

Unit III:

Numerical Integration: Numerical Integration, General Quadrature Formula, Simpson's One third and Three-Eighth rules, Weddles' rule, Hardy's rule, Trapezoidal rule. Numerical Differentiation.

Unit IV:

Difference Equations: Linear-homogeneous and Non-homogeneous difference equations of order 'n' with constant co-efficient, and their solution, Method of undetermined coefficients.

Unit V:

Numerical Solution of ordinary differential equations: Numerical solution of ordinary differential equations, Picard's method. Taylor's series method, Euler's method, Runge-Kutta Method

Course Outcome:

To accomplish the abilities/skills for the following.

CO1. Demonstrate the understanding of common numerical methods and how they are used to approximate solutions to otherwise intractable mathematical problems.

CO2. Apply numerical methods to obtain approximate solutions to mathematical problems.

CO3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.

CO4. Analyze and evaluate the accuracy of common numerical methods.

Text Books/References:

1. Numerical Methods for Scientists and Engineering, M.K. Jain, S.R. Iyengar & R. K. Jain, Wiley Eastern Ltd.
2. Mathematical Numerical Analysis by S.C. Scarborough, Oxford and IBH Publishing Company.
3. Introductory methods in Numerical Analysis by S.S. Sastry, Prentice Hall of India.
4. Numerical Solution of Differential equations, M.K. Jain.
5. Numerical Methods for Science & Engineering by R. G. Stanton.

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Course Code	Course Name	L	T	P	Credits
CIV-E01T	Engineering Geology and Seismology	2	0	0	2

Course Objectives:

The objectives of this course are to learn engineering, geological, and seismological fundamentals of:

- Origin, Internal and surface structures of the earth.
- Geological structures (Joint, veins, crack, faults, and fold), reasons of formation for each type, and their side effects on the engineering projects.
- Geological considerations in the design of tunnels, dams, and buildings
- To provide a coherent development to the students for the courses in the sector of earthquake engineering
- To present the foundations of many basic engineering concepts related to earthquake Engineering
- To give experience in the implementation of engineering concepts that are applied in the field of earthquake engineering
- To learn about the various instruments used in the recording of earthquakes.

Syllabus:

UNIT I:

Geology and its relevance to civil engineering, Structural Geology; Folds, Faults and Mechanism of Faulting, Joints, Unconformities.

UNIT II:

Engineering Geology; geological considerations in tunnels, dams, bridges, building sites; landslides.

UNIT III:

Earthquakes; types and causes, distribution in the world, basic definitions, seismic zones.

UNIT IV:

Engineering Seismology (Definitions), Introduction to Seismic Hazards and Earthquake Phenomenon. Geographical Distribution of Earthquakes and Seismo-techtonics.

UNIT V:

Earthquake recording instruments, Warning systems, Global network, Monitoring of Earthquakes.

Course Outcome:

Upon completion of this course, the student will be able to:

CO1: Show an understanding of the physical properties used to identify Earth materials.

CO2: Show an understanding of the geomorphic processes that modify the Earth's surface.

CO3: Examine the various geological engineering problems faced in the design of dams, tunnels, and buildings.

CO4: Gain experience in Earthquake Engineering's implementation of engineering concepts applied in the field of Structural Engineering.

CO5: Learn to understand the theoretical and practical aspects of earthquake engineering.

Text Books/References:

1) Engineering Geology by Parbin Singh
2) Physical Geology by Arthur Holmes
3) Engineering Geology by F.G. Bell
4) Engineering Seismology by PN Aggarwal.
5) An introduction to Seismology, Earthquakes & Earth Structures by Sethstein & Michael Wysession

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Course Code	Course Name	L	T	P	Credits
CIV-E02T	Advanced Construction Management	2	0	0	2

COURSE OBJECTIVES:

To know the basics and history of construction management.

- Prioritization of construction resources.
- To know time cost analysis in construction projects.
- To asses and evaluate the effects of construction industry .
- To assess and evaluate the problems in field related to management

SYLLABUS:

UNIT I: Introduction and History of management thoughts.

Definition, importance, objectives and functions of construction management. History of construction management. Contributions made by (i) Taylor (ii) Gantt (iii) Henry Fayol (iv) Elton Mayo (v) chesterun barnard (vi) Mc.Gregor (vii) Herzberg (viii) Linkert (viiii) Maslow (x) Gilbreth (xi) Weber.

UNIT II: Network Techniques.

Introduction to network. Network terminology.Classification of networks, and objectives of network Technique. Development of network. PERT and CPM networks (with examples).

UNIT III: Cost Time Analysis in Network Planning.

Introduction to cost control. Importance and objectives of cost control. Introduction to methods of cost analysis. Project cost and its variation with time. Cost optimization (with examples).

UNIT IV: Environmental Management.

Introduction to the environmental management system. Preparation for EMS certification. Introduction to environmental legislation and its objective and importance. Introduction to environmental audit.

UNIT V: Field Task

Performing Field Engineering Task in order to maintain feasible solutions for project. Field engineering tasks for observing causes and measures of defect in roads and buildings with elaborative reports .Effect of planning and management on civil engineering projects

COURSE OUT COME:

CO1: Give the Students an idea of construction management and its historical background.

CO2: Learner should be capable enough to analyze the project resources.
CO3: Learner should be able to make cost analysis with time variation.
CO4: Learner should have the information of advanced construction management .
CO5: Learner should assess and calculates the impacts of construction on the environment.

BOOKS RECOMMENDED:

1.Construction Planning and Management by P.S.Gahlot and B.M.Dhir.
2.Construction Management and Accounts by Jagroop Sing.
3. Environmental Engineering and Management by Dr.Suresh K. Dhameja.

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Course Code	Course Name	L	T	P	Credits
CIV-E03T	Rock Mechanics and Tunneling Technology	2	0	0	2

Course Objectives:

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

- To understand the formation of Rock, Classification, characterization, etc.
- To learn about the stability of rock slopes.
- To understand the factors governing the selection of type and location of the tunnels.
- To gain a comprehensive understanding of the planning and design of Tunnels
- To learn the construction practices and the associated challenges

Syllabus:

UNIT I: INTRODUCTION TO ROCK MECHANICS

Introduction, terminology, Rock classification systems, physical & mechanical properties of rocks, laboratory testing, stability of rock slopes, Rock bolting.

UNIT II: INTRODUCTION TO TUNNELS

Introduction, Classification of tunnels. Survey for a tunnel project

UNIT III: METHODS OF TUNNELING

Methods of Tunneling in soft & hard rock.Methods of rock blasting in tunnels.

UNIT IV: TUNNEL SERVICES

Tunnel services in rock tunnels; ventilation, drainage, and lighting.

UNIT V: TUNNEL LINING & SUPPORTS

Lining of tunnels in soft grounds methods and types, tunnel supports for weak rocks including rock bolting.

Course Outcome:

CO-1- Competence in Rock Mass Characterization

CO-2 - Competence in deciding the location of tunnels, type of tunnels and method of **tunneling.**

CO-3 - Ability to analyse different components of the Tunnels and tunnel support systems.

Text Books/References:

1. Brown, E.T. "Analytical & computational Methods in Engineering Rock Mechanic, CBS Publishers & Distributors, New Delhi.

2. Godman, P.E. "Introduction to Rock Mechanics", John Wiley, 1989.

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Course Code	Course Name	L	T	P	Credits
CIV-E04T	Design Software (Basic)	2	0	0	2

Course Objectives:

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

- Know various techniques of modeling building structures
- To obtain knowledge of analyzing and designing various structural elements
- To gain knowledge of modeling and design of masonry buildings
- To obtain post-processing analysis and design report and to compare with manual calculations for validation of results

Syllabus:

Unit I: Introduction to ETABS Software:

File Menu, Defining material properties, Definition and Sizing of elements, Supports, Loading and Load Combinations, Analysis options, Post Analysis checks.

Unit II: Multi-Story Residential Modelling by ETABS Software:

Study of the design of various building elements; Planning various components of a building with column positioning; Introduction of /ETABS/; Modelling of the building in the /ETABS is giving all boundary conditions (supports, loading etc.).

Unit III: Multi-Story Residential Design by ETABS Software:

Analysis and Design of various structural components of the modal building; Study of analysis Data of the software; Detailing of beams, columns, slab with section proportioning and reinforcement.

Unit IV: Design of Footings by a ETABS Software:

Modeling and designing various types of footings- Isolated, Combined, Strap, Strip, and Mat in ETABS/ software.

Unit V: Post Processing of Design Data:

Building Post-Processing Data related to bending, shear, Torsion, and displacements. Comparing different manual charts and software-based data.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Recognizing the benefits of designing by Software.

CO2: Understanding various design techniques of different components of a Building.

CO3: Gaining Knowledge of Post Processed design data for understanding of design problems.

Text Books/References:

1. Etabs tutorial, Computers and Structures USA

2.. U.H.Varyani. Structural Design of Multi Storeyed Building. 2014

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Course Code	Course Name	L	T	P	Credits
CIV-E05T	Solid Waste Management	2	0	0	2

Course Objectives:

- To develop required skills in the students to acquire the following competency: Plan segregation, collection, transportation, recycling, and disposal of municipal solid waste so that its impact is minimal on the environment, economy and community.

Syllabus:

Unit I: Sources and Composition of Municipal Solid Waste

Sources of solid waste. Types of solid waste. Characteristics of Solid Waste, Composition of solid waste and its determination.

Unit II: Properties of Municipal Solid Waste

Physical properties of Municipal Solid Waste, Chemical properties of Municipal Solid Waste, Biological properties of Municipal Solid Waste and Transformation of Municipal Solid Waste

Unit III: Solid Waste Generation and Collection

Quantities of Solid Waste, Measurements, and methods to measure solid waste quantities. Solid waste generation and collection, Factors affecting solid waste generation rate, Quantities of materials recovered from MSW

Unit IV: Handling, Separation, and Storage of Solid Waste

Handling and separation of solid waste at site. Material separation by pick in, screens, float and separator magnets, and electromechanical separator, and other latest devices for material separation. Waste handling and separation at Commercial and industrial facilities.Storage of solid waste at the sources.

Unit V: Processing and disposal of Solid Waste

Processing of solid waste at residence e.g. Storage, conveying, compacting, Shredding, pulping, granulating etc. Combustion and energy recovery of municipal solid waste, effects of combustion, undesirable effects of Combustion, Landfill: Classification, planning, sitting, permitting, landfill processes, landfill design, landfill operation, use Of old landfill, Differentiate sanitary land fill and incineration as final disposal system for solid waste, Biochemical processes: Methane generation by anaerobic digestion, composting and other biochemical Processes.

Course Outcome:

CO1 Explain municipal solid waste management systems to their physical properties and associated critical considerations in view of emerging technologies

CO2: Outline sources, types and composition of solid waste with methods of handling, sampling and storage of solid waste.

CO3: Select the appropriate method for solid waste collection, transportation and redistribution.

CO4: Describe methods of disposal of municipal solid waste.

Text Books/References:

1. Christensen, H. T., Solid Waste Technology & Management, Wiley, 2010, Volume 1 & 2.

2. Haug, T. R., The Practical Handbook of Compost Engineering, Lewis Publishers, 1993.

3. Reinhart, R. D. and Townsend, G. T., Landfill Bioreactor Design & Operation, CRC Press, 1997, 1st Edition.

4.Tchobanoglous, G. and Kreith, F., Handbook Of Solid Waste Management, McGraw Hill, 2002, 2nd Edition.

5. Tchobanoglous, G., Theisen and Vigil, Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw Hill, 1993.

6. Manual on Municipal 1 Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.

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Course Code	Course Name	L	T	P	Credits
CIV-E06T	Green Buildings	2	0	0	2

Course objectives:

Upon completion of the course, the student should be able to:

- Get a comprehensive overview of materials used for sustainable buildings and be acquainted with the concepts of sustainability in the context of building and conventional engineered building materials
- Understand the effects of technology on materials and how they are used for sustainability.
- Acquire knowledge on various aspects of green buildings.
- Obtain an understanding on minimizing the consumption of natural resources, including water
- Comprehend the concepts of embodied, operational, and Life cycle energy and minimizing energy consumption by optimal design.

Syllabus:

UNIT I SUSTAINABLE BUILDING MATERIALS

Introduction to sustainable building materials, qualities, use, examples-Natural building materials ,locally available and locally manufactured materials, bio-materials-salvaged and recycled materials, Non-toxic materials, low Volatile organic content (VOC) Paints, Adhesive and sealants for use in building, VOC emission issues, and indoor air quality for sustainability and health hazard. Introduction of green building, concept of green building ,History of green building, Need of green building in the present scenario, Importance of green building, Classification of green building, Assessment methods, LEED, GRIHA(Green Rating for Integrated Habitat Assessment) Clay bricks, types of kiln, comparative energy performance emission and financial performance, indoor air quality. Operational energy reduction and net zero energy building, optimization for design of building for energy efficiency and example of optimization through use of Evolutionary genetic algorithm. Radiation budget, Surface water balance, Effects of trees and microclimatic modification through greening, Use of Building integrated photo voltaic (BIPV) and other renewable energy in buildings, basic concepts and efficiency. Energy codes ECBC requirement, concepts of OTTV etc. Green performance rating, requirements of LEED,GRIHA etc.

UNIT II CONCEPT OF EMBODIED ENERGY AND CARBON FOOTPRINT

Material conservation: Idea of embodied energy, Development of the concept, factors to be considered, calculation techniques for embodied energy, Data sets available for calculation of embodied energy, Case studies of embodied energy calculations, Sample embodied energy calculations for a material, low energy materials, sustainable materials, Concept of embodied Carbon or Carbon footprint of material, carbon Emission and its reduction. Alternative materials, Calculation techniques, Life cycle costing analysis techniques.

UNIT III SUSTAINABLE CONSTRUCTION TECHNIQUES

Alternative construction techniques such as SMB, CSEB and steam cured blocks, composite beam and panel, funicular shells, filler slabs, reinforced masonry, ferro-cement walls etc. Case studies, Water conservation: 3 R's for water conservation, rain water harvesting, grey water recycling.

UNIT IV INNOVATIVE USE OF MATERIALS

Use of waste materials such as paper, glass bottles, tires, shipping containers, post-consumer and industrial waste such as fly-ash, building demolition waste, use of salvaged materials from flooring, columns, beams, timber, glass, etc. Role of material, carbon from cement, alternative cements and cementitious material, alternative fuel for cements for reduction in carbon emission, sustainability issues for concrete. Role of quality, minimization of natural resource utilization, High volume fly ash concrete, geo-polymer concrete etc. with alternative material for sustainability.

UNIT V THERMAL PERFORMANCE OF BUILDINGS

Operational energy in buildings, role of materials, and thermal conductivity. Thermal comfort inside the building, factors affecting, cooling and heating requirement, Heat transmission through building sections, thermal performance of building sections, simple calculation for U-value and insulation thickness, Day-lighting and Ventilation.

Course outcomes:

At the end of the course, the student should be able to:

CO1: Examine the properties of common construction materials and understand the transition towards sustainable materials and their behaviors under different environments.

CO2: Suggest materials and technologies to improve buildings' energy efficiency and identify embodied energy of materials.

CO3: Describe the concept of Green Building and justify the necessity of Green Buildings.

CO4: Assess a building on the norms available for green building and explain the concept of carbon footprint

CO5: Examine and identify the green building rating systems and their contribution to sustainability.

CO6: List the major energy efficiency areas for building-Green materials.

CO7: Apply the principles of sustainable development in building design.

RECOMMENDED BOOKS

1. Sustainable Buildings-Design Manual, The Energy and Resources Institute
2. Understanding Green Building Materials- Traci Rose Rider and Jessica McNaughton
3. Green Building Fundamentals- Mike Montoya
4. Sustainable Construction- Green Building Design and Delivery-Charles J.Kibert

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Course Code	Course Name	L	T	P	Credits
CIV-E07T	Assessment & Repair of Structures	2	0	0	2

Course Objectives:

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

- Know about various deterioration and disintegration mechanisms in Structures
- To obtain knowledge of various Repair and retrofitting techniques for Structures
- To gain knowledge of maintenance of Buildings
- To obtain knowledge of various maintenance models for structures

Syllabus:

Unit I: Deterioration and Methods of Repair of Structures:

Disintegration Mechanisms, Moisture Effects, Thermal Effects, Structural Effects, Faulty Construction, Methods and locations of Repair of Structures.

Unit II: Surface Repair & Retrofitting Techniques:

Strategy Design, Selection of Repair Materials, Surface Preparation, Bonding repair materials to Existing concrete, Placement Methods.

Unit III: Other Repair Methods:

Epoxy Bonded Replacement Concrete, Preplaced Aggregate Concrete, Shotcrete/Gunite, Grouting, Injection Grouting, Micro concrete.

Unit IV: Maintenance of Buildings:

Definition, Role of building maintenance in construction process Maintenance generators, Expression of Standards, selection of level of maintenance and fixing standards, Planned maintenance: Planning vis-a-vis Adhoc maintenance, schedule contingency maintenance, levels of planning, planned inspection, etc.

Unit V: Maintenance Models and Design:

Maintenance cycle, maintenance profile, repair replacement models, statistical methods, decision models, optimal renewal cycle, budgeting etc. Effect of design on maintenance, Diagnosis, appraisal, structural defects various methods of repair

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Recognizing the defects or deteriorations in Buildings.

CO2: Understanding repairing methods for Structures.

CO3: Gaining Knowledge of Maintenance of Structures and its various methods.

Text Books/References:

1. Emmons, P.H., Concrete Repair and Maintenance, Galgotia Publication. 2001

2. FEMA 273; NEHRP Guidelines for the Seismic Rehabilitation of Buildings. 1997

3. ATC- 40: Seismic Evaluation and Retrofit of Concrete Buildings, Vol. 1 & 2. 1997

4. M.J.N., Seible, F. and Calvi, G.M., Seismic Design and Retrofit of Bridges by Priestley, John Wiley. 1996

5. Building Maintenance Management-R.LEE

6. Developments In Building Maintenance -I.EJ. GIBSON

7. Concrete Structures: materials, Maintenance And Repair D.CAMPBELL,ALLE

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Course Code	Course Name	L	T	P	Credits
CIV-E09T	Advanced Construction Technology	2	0	0	2

Syllabus:

Unit-I

Concrete Construction methods

Form work design and scaffolding, slip form and other moving forms, pumping of concrete and grouting, mass concreting (roller compacted concrete), ready mixed concrete, various methods of placing and handling concrete, Accelerated curing, Hot and cold weather concreting, Under water concreting, Prestressing.

Unit-II

Steel and composites construction methods:

Fabrication and erection of structures including heavy structures, Prefab construction, industrialized construction, Modular coordination.

Unit-III

Erection Techniques

Major types of mobile crane, Lifting capacities of cranes, modification in cranes for heavy lifting, crane booms, Rated loads for lattice and telescopic boom cranes, Working ranges of cranes, Tower cranes: - classification, operation, tower crane selection,

Unit-IV

Tunneling:

Tunneling equipment, Tunnel boring machine, Pipe Jacking, selection of tunnel alignment, tunneling using Road Headers, Cut and fill techniques, jack down techniques, box type tunneling techniques.

Unit-V

Special construction methods:

Construction in Marine environments, High rise construction, Bridge construction including segmental construction, incremental construction and push launching techniques, River valley projects.

Course outcomes:

CO1: Students will be familiar with the technology of major construction as outlined in the listed topic headings.

CO2: Students will be able to describe, analyze, compare and evaluate the technology of high-rise construction and be aware of some of the problems that can be associated with poor management of construction projects.

BOOKS RECOMMENDED:

1. Purifoy, Schexnayder, Construction Planning, Equipment and Methods, Tata Mc Graw Hill

2. Edward Nawy , Concrete Construction and engineering Handbook , CRC Press.

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Course Code	Course Name	L	T	P	Credits
CIV-E10T	Advanced Structural Analysis	2	0	0	2

Course Objectives:

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

- To introduce the fundamentals of the matrix method of trusses and beams
- To illustrate the formation of stiffness matrices for trusses and beams
- To familiarize with procedures involved while formulating a problem in finite element analysis
- To impart knowledge of the basic element types encountered in finite element analysis

Syllabus:

UNIT I: MATRIX METHODS OF TRUSSES STRUCTURAL ANALYSIS

Introduction to matrices and properties of matrices, Concept of Matrix Method & Flexibility Method. Formulation of Stiffness matrix for simple Planar Elements, Analysis of Planar Trusses (basic).

UNIT II: MATRIX METHODS OF BEAMS AND FRAMES

Formulation of element stiffness matrix for beam/ frame element. Analysis of Beams (basic) and Frames (basic) using stiffness method under nodal and between the nodal loads.

UNIT III: INTRODUCTION TO FINITE ELEMENT METHOD (FEM)

Introduction to Finite Element Method of Structural Analysis. Problem Classification, Modelling, and Discretization. Interpolation, Elements, notes, and D.O.F. Example Applications and history of FEM. Solving problems by FEM.

UNIT IV: ONE-DIMENSIONAL ELEMENTS AND COMPUTATIONAL PROCEDURES

Bar and Beam Elements. Bar and Beam elements of arbitrary orientation. Assembly of Elements. Properties of Stiffness matrices. Boundary Conditions. Exploiting Sparsity. Solving Equations. Mechanical and thermal Loads or Stresses. Structural Symmetry.

UNIT V: BASIC ELEMENTS IN FINITE ELEMENT ANALYSIS

Preliminaries, Interpolation and shape functions. Formulas for element matrices. Linear Triangle (CST), Quadratic Triangle (LST). Bilinear rectangle (Q4). Quadratic rectangle (Q8, Q9). Regular Solid Elements. Choice of interpolation Functions. Improved triangles and Quadrilaterals.

Course Outcomes:

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

CO1 Able to formulate stiffness matrices for trusses and beams.

CO2 Analyse the trusses and matrices using the matrix method of analysis.

CO3 Formulate and model the problem to solve it using the finite element method.

CO4 Analyse some basic structures using the finite element method.

Text Books/References:

1. Basic Structural Analysis by CS Reddy
2. Structural Analysis by R. C. Hibbler
3. Matrix Analysis of Framed Structures by Harry H.West
4. Concepts & Applications of Finite Element Analysis by Robert D Cook
5. Finite Element Method by Deb Debasis

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Course Code	Course Name	L	T	P	Credits
CIV-E11T	Transportation Planning And Economics	2	0	0	2

COURSE OBJECTIVES

The objectives of this course are to learn the transportation Engg I fundamentals of :

To provide basic knowledge in transportation so that students can understand and solve transportation-related problems and design for highway mode of transportation with a focus on highway users' characteristics, geometric and pavement design, traffic engineering, and transportation planning.

SYLLABUS

Unit I: Introduction and scope of transportation planning and transportation economics, transportation planning issues

Unit II: Public Transportation: public transport modes, desirable characteristics of public transport systems, transit system operations, route development, stopping policy, stop location, scheduling, the capacity of transit systems, socially optimal pricing

Unit III: Transport analysis and forecasting: transport planning process, transportation and land use, transport planning strategies, transport planning models, travel demand analysis, operational transportation, and land use, models

Unit IV: Transport economics and finance: pavement economics- construction cost; maintenance cost and vehicle operation cost, economic evaluation of highway projects- basic principles

Unit V: Time value of money; costs and benefits; net present value (NPV) method; benefit-cost (B/C) ratio method; internal rate of return (IRR) method; comparison of evaluation techniques, freight transport-trends, and economic growth

COURSE OUTCOME

To accomplish the abilities/skills for the following.

CO1: Understand the factors influencing road vehicle performance characteristics and design.

CO2: Apply basic science principles in estimating stopping and passing sight distance requirements.

CO3: Understand basic traffic stream parameters and models, traffic flow models, and queuing theory.

CO4: Perform level of service analysis to determine LOS for selected highway segments.

CO5: Use Highway Capacity Software (HCS) for finding LOS.

TEXT BOOK/REFRENCES

1.Transport Planning and Traffic Engineering by CA O'Flaherty, John Wiley & Sons, Inc., New York; Toronto.

2.Transportation Engineering and Planning by Papacostas&Prevedouros, Prentice-Hall of India Private Ltd, New Delhi-110001

3. Principles of Transportation Engineering by Chakarborty& Das, Prentice-Hall of India Private Ltd, New Delhi-110001

4. Urban Transportation Planning by Meyer & Miller, McGraw Hill, New Delhi

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Course Code	Course Name	L	T	P	Credits
CIV-E12T	Design Software (Advanced)	0	0	4	2

Course Objectives:

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

- Know various techniques of modeling building structures
- To obtain knowledge of analyzing and designing various structural elements
- To gain knowledge of modeling and design of masonry buildings
- To obtain post-processing analysis and design report and to compare with manual calculations for validation of results

Syllabus:

Unit I: Multi-Story Residential Modelling using SAP Software:

Study of the design of various building elements; Planning various components of a building with column positioning; Introduction of SAP; Modelling of the building in the SAP is giving all boundary conditions (supports, loading etc.).

Unit II: Multi-Story Residential Design using SAP Software:

Analysis and Design of various structural components of the modal building; Study of analysis Data of the software; Detailing of beams, columns, slab with section proportioning and reinforcement.

Unit III: Design of Footings using SAP Software:

Modeling and designing various types of footings- Isolated, Combined, Strap, Strip, and Mat in SAP software.

Unit IV: Modelling and Design of Masonry Buildings using SAP Software:

Modeling and Design of Masonry Buildings in Design Software like SAP software. Modeling of Walls, Openings, and various other elements of a masonry building.

Unit V: Post Processing of Design Data:

Building Post-Processing Data related to bending, shear, Torsion, and displacements. Comparing different manual charts and software-based data.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Recognizing the benefits of designing by Software.

CO2: Understanding various design techniques of different components of a Building.

CO3: Gaining Knowledge of Post Processed design data for understanding of design problems.

Text Books/References:

1. SAP 2000, integrated solution for structural analysis and design, getting started, Computers and Structures INC.

2. U.H.Varyani. Structural Design of Multi Storeyed Building. 2014

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Course Code	Course Name	L	T	P	Credits
MTH-E03T	Operation Research & Optimization	2	0	0	2

Course Objectives:

The course aims to build students' capabilities for analyzing different situations in the industrial scenario involving limited resources and finding the optimal solution within constraints. This course also aims to introduce students to use quantitive methods and techniques for effective decisions–making; model formulation, and applications that are used in solving business decision problems.

Syllabus:

Unit I: Introduction

Introduction to operation Research, Linear Programming problem. Formulation of LPP, Graphical solution of LPP, simplex method, artificial variables, big-M method.

Unit II: Transportation Problems

Formulation, solution of balanced transportation problem. Finding initial basic feasible solutions. North-west corner rule, least cost method, and Vogues approximation method

Unit III: Assignment Model and Hungarian method

Assignment Model Formulation, Hungarian method for an optimal solution; solving unbalanced problems; travelling salesman problem and assignment.

Unit IV: Sequencing Models

Solution of sequencing problem; processing and jobs through two machines, processing n jobs through three machines; Processing two jobs through m machines.

Unit V: Dynamic Programming

Introduction to Dynamic programming problems, Characteristics and applications of Dynamic Programming, Mathematical formulation and optimal Solution of Dynamic Programming problems.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1. Understand variety of problems such as assignment, transportation, travelling salesman etc.

CO2. Convert the problem into a mathematical model.

CO3. Understand different queuing situations and find the optimal solutions using models for different situations.

CO4. Solve the problems mentioned in point 1 using linear programming approach using software.

CO5. Analyze any real life system with limited constraints and depict it in a model form.

Text Books/References:

1. P. SankaraIyer, Operations Research, Tata McGraw Hill 2008
2. A.M. Natarajan, P.Balasubramani, A. Tamilarasi, Operations, Pearson Education, 2005.
3. P. K. KantiSwarup and M. M. Singh. "Operation Research." *Sultan Chand & Sons* (1985).
4. Operations Research Edition 2008, Aditham B. Rao, Jaico Publishing House, Mumbai,

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Course Code	Course Name	L	T	P	Credits
CIV-E13T	Quality Control	2	0	0	2

Course Objectives:

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

- Know about various construction projects and their management.
- To obtain knowledge of resource scheduling in a construction Project.
- To gain knowledge of Project Monitoring and its Control.
- To obtain knowledge of Quality Control Indicators.

Syllabus:

Unit I: Construction Project Management:

Project Management, Objectives of a Project, Scientific Way of Managing Project, Construction Industry and National Growth, Project Stakeholders, phases and Project Organization; Project scheduling levels.

Unit II: Duration Estimation, Network Estimation, and Analysis:

Duration Estimation - Types, Inputs, Methods, Parametric Estimation; Factors influencing Productivity, Example for Ideal Productivity, Factored Productivity and Working Time Factor; Piling Activity Example, Applicability of different methods to Estimate Activity Duration; Summary of Key Topics, Types of Networks; Networks - Introduction, Techniques.

Unit III: Resource Scheduling:

What is Resource?, Influence of Resources on Schedule, Two-Span Bridge Example, Resource Decisions; ABCD Example Project; Resource over-allocation; Projects & Resources, Example of Two Resources, Exercise, Two-Span Bridge Example; Review Problem -1; Problem -2 (Cash Resource); Resolving Over-Allocation; Problem 1- Two Resources; Resolving Resource Allocation Problems; Resource Profile Requirements; Resource Levelling - Example Network; Minimum Moment Concept.

Unit IV: Project Monitoring:

Introduction to Precedence Diagramming Method (PDM); PDM network representation and its issues, Network Calculation; PDM – Problem #1; Issues in PDM, Negative Lags, Problem #2 Solution; PDM – Analysis with non-continuous duration, Floats; Defining Relationship (Based on Construction Method) - Simple Shed; Project Monitoring & Control – Typical Project Time Monitoring Process, Levels and Frequency of updates.

Unit V: Quality Control:

Introduction, Quality, Control, Inspection, Quality Control, Statistical Process Control, Quality Circles, Total Quality Management, ISO 9000 Series, Application of ISO 9000 Series and ISO 14000 Series. Classes of Concrete, Mix Design, Construction plan, Storage method, Production and procurement, Sampling and Testing, Management of Concrete Pouring

Course Outcome:

To accomplish the abilities/skills for the following:

CO1: Duration Estimation of Projects by various methods.

CO2: Scheduling of Project.

CO3: Determination of Quality Indices.

Text Books/References:

1. James P. Lewis, "Project Planning, Scheduling & Control", McGraw-Hill Education; 3rd Edition.
2. Gregory T. Haugan, "Project Planning and Scheduling", Management Concepts.
3. James J. O'Brein, "Construction Inspection Handbook: Quality Assurance/Quality", Springer 3rd Edition, 1989.

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Course Code	Course Name	L	T	P	Credits
CIV-E04T	Design of Masonry Structures	2	0	0	2

Course Objectives:

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

Know various materials and methods of construction of masonry structures

To obtain knowledge of various codal considerations in design of masonry structures and methods of design of masonry structures

To gain knowledge of various tests used to determine the properties of masonry structures

To obtain knowledge of various units of construction of masonry and their assemblages

Syllabus:

Unit I: Introduction to Masonry Structures:

Introduction to Masonry Structures (History, Nature of Masonry Structures and Behaviour of Masonry under Seismic Forces). Contemporary Masonry Structures. Masonry Units and Masonry Mortar and their properties. Masonry Assemblages and masonry elements. Different forms of Masonry Systems (reinforced masonry, Confined masonry, Pre-stressed masonry). Analysis and Design of Masonry Systems, Different codes for design of masonry systems like IS 1905:1987, NBC Vol 1 Part 6, Codes related to masonry materials like IS 1597: Part 1 1992, IS 2572:1963, IS 2572:2005. Overview of Study of codes related to Earthquake related Design of Masonry Systems like IS 4326:2013.

Unit II: Clay and Concrete Masonry and their Properties:

Overview of Masonry Materials like Clay masonry Units, Physical and Engineering Properties of Masonry Units like compressive strength, Modulus of Elasticity, Flexural tensile strength, water absorption, and testing methods. Efflorescence as a property of masonry unit. Geometry of Masonry Units. Concrete masonry Units, Function of Concrete Masonry Unit, Various Physical and Engineering Properties of Concrete Masonry Units like compressive strength. Property of masonry mortar like water absorption, workability and water retentivity, bond, compressive strength, flexural strength, and volume change (Shrinkage). Grout properties like compressive strength. Reinforcement in masonry. Types of reinforcement. Masonry Buildings and assemblages, Brick and bed material interaction in masonry assemblages. Compressive strength properties of masonry assemblage. Standard Prism test for determining prism compressive strength. Elastic Modulus of masonry in compression. Code compliances related to prism tests. Behaviour of masonry in tension and in shear. Shear strength of bed Joints.

Unit III: Strength and Behaviour of Masonry:

Mechanical Behaviour of Masonry under compression, Theoretical framework for failure stress under compression, Deformation Properties of brickwork under compression, Geometrical Second Order effects, Vertical Load bearing capacity of Masonry URM Wall, Strength of Compression Elements like in Wall-Slab interaction, Wall Strength in terms of End rotations, mechanical behaviour of masonry in out-of-plane bending, Conventional Bending analysis, Arching and Rigid arching mechanism, One way and Two way horizontal Flexure. In-plane action of shear with compression. Various failure modes in compression and shear bi-axial stress.

Unit IV: Design of Masonry Components and Systems:

Structural Design Framework, Lateral Supports and Stability of Structures, Wall thickness and Wall effective length. Wall Slenderness ratio, Permissible compressive, tensile and shear stress, Lintel Design, Design steps to be followed and Design guidelines for Reinforced Masonry, PM Interactions, Shear Reinforcement Design. Anchorage Design.

Unit V: Special Masonry Structures:

Confined Masonry Construction, Structural Components, and Guidelines for confined masonry construction, Behaviour of confined masonry. Infill Masonry and its behaviour. Modelling Infill walls.

Course Outcome:

To accomplish the abilities/skills for the following.

CO1: Recognizing the various materials involved in construction of masonry structures and their properties.

CO2: Understanding the design concept of masonry structures.

CO3: Gaining Knowledge of various tests used in determining properties of masonry.

Text Books/References:

1. Paulay T et al, “Seismic Design of Reinforced Concrete and Masonry Buildings”. John Wiley. 2013
2. Williams, Clement. C, “The Design of Masonry Structures and Foundations”. 1997
3. Dayaratnam Pasala Et.Al, “Brick and reinforced brick structures”, Medtech Publishers, 2018.
4. Various Codes like IS 1905:1987, NBC Vol 1 Part 6, IS 1597: Part 1 1992, IS 2572:1963, IS 2572:2005.

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Course Code	Course Name	L	T	P	Credits
CIV-E15T	Railway And Airport Engineering .	2	0	0	2

COURSE OBJECTIVES

The objectives of this course are to learn the Transportation Engineering fundamentals of :

To expose the students to Railway planning, design, construction and maintenance, and planning and design principles of Airports and Harbours.

SYLLABUS

UNIT I: TRANSPORTATION SYSTEM

Importance of transportation systems, history of railways and its development, development of Indian railways.

UNIT II: PERMANENT WAY

Permanent way and its component, formation, ballast, sleepers, rails. Creep and tilt in rails.

UNIT III: RAILWAY TRACKS

Track resistance and tractive effort, gauge problem, super-elevation near branching of curves, gradients. Track fittings and fastenings, points and crossings, station Platforms, yards, and sidings.

UNIT IV: AIRPORT

Classification of airports; planning, surveys, site selection of airports; Airport geometrics: runway length and patterns & orientation, wind rose diagram, width, and grades of runway, taxiways, and aprons.

UNIT V: AIRPORT PAVEMENT DESIGN

Airport pavement design: difference between highway and airport pavements, introduction to various design methods, airport drainage.

COURSE OUTCOME

Students who complete this course will be able to:

CO1: The students will have the ability to Plan and Design various civil Engineering aspects of Railways, Airports, and Harbour.

TEXT BOOK/REFERENCES

1. Rangawala, S.C. 2002. “Railway Engineering”, Charotar Publishers, Anand

2. Arora, S.P. and Saxena. 2001. “ Railway Engineering” , Dhanpat Rai Publishers, New Delhi.

3. Khanna, Arora and Jain. 2002. “Airport Planning and Design”, Nem Chand and Brothers, Roorkee.

4. Horren Jeff. “Airport Planning and Design

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Course Code	Course Name	L	T	P	Credits
CIV-E16T	Hydropower Engineering	2	0	0	2

Course Objectives:

The basic objectives

- To gain insight into the basic concepts of hydropower engineering
- To provide insight into the design of various components of hydro-power structures such as Dams, penstock, tunnels, surge tanks, draft tubes etc.
- To study the selection of suitable turbines for various types of hydropower plants.

Syllabus:

Unit I: INTRODUCTION

Sources and forms of energy, types of power plants and their comparison, elements of hydropower scheme, hydropower development in India, Hydropower plants classification based on head, storage capacity and layout.

Estimation of Hydropower potential, Processing of hydrological data, Use of extreme and long term hydrological data, mass and elevation volume curves, flow duration curves.

Load and power studies: firm power, secondary power, load curve, load factor, load duration curve, firm capacity, reservoir capacity, capacity factors, Diversity Factor.

Unit II: WATER CONVEYANCE SYSTEM

Power canals: Alignment, Surges in Canals, Design of power canals.

Penstocks: Alignment, types of penstocks, Economic diameter of penstocks, Anchor blocks, Water Hammer, Resonance.

Behaviour of surge tanks, types of surge tanks, hydraulic design, design of simple surge tank-stability.

Unit III: DAMS

Selection of site, preliminary investigations, Final investigations.

Types of Dams, Basic principles of design & details of construction of Gravity Dams. Earthen dams, rock-fill dams and their basic design Considerations.

Spillways: Types of spillways, Spillway gates, Design of stilling basins.

Unit IV: HYDRAULIC TURBINES

Types of turbines and their performance characteristics, Selection of turbines and their specific speed, Turbine setting, Scale ratio, Comparison of turbines, Governing of hydraulic turbines.

Unit V: POWER HOUSE DETAILS

General layout of power house & arrangement of hydropower units, Underground power stations.

Course Outcome:

After completion of this course, the student will be able:

CO1: To understand the role of hydropower in the energy system, in India and internationally.

CO2: To describe the different concepts relevant to hydropower engineering.

CO3: To design essential elements of hydropower plant like conveyance structures, Impoundment structures and Powerhouse.

CO4: To select appropriate Turbine units for a hydropower setting.

Text Books/References:

1. Dandekar, M.M. "*Water Power Engineering*".
2. Deshmukh, M.M. "*Water Power engineering*", Danpat Rai & Sons, New Delhi
3. Nag P.K., "*Power Plant Engineering*" Tata McGraw Hill, 2nd Edition, 4th Fourth reprint 2003.
4. Dr.Sharma P.C, Kataria S. K. & Sons, "*Power Plant Engineering*" 2009
5. Rai-Khanna. G.D., "*An introduction to power plant technology*" Publishers, Delhi, 2013

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Course Code	Course Name	L	T	P	Credits
CIV-E17T	Prestressed Concrete	2	0	0	2

Course Objectives:

The following are the course objectives of the subject:

- To introduce the students to the basic concepts and principles of Prestressed concrete structures.
- Be able to perform analysis and design of prestressed concrete members.
- To give an experience in the implementation of engineering concepts that are applied in field of Prestressed Concrete
- To introduce the students to various prestressing techniques and their application in civil engineering structures.

Syllabus:

Unit I:

Basic concept of prestressing – Advantages of prestressed concrete over reinforced concrete – materials for prestressed concrete and their characteristics. Uniform prestress distribution in prestressed concrete – non-uniform prestress distribution – moments of resistance.

Unit II:

Tensioning devices, Pre-tensioning systems, post-tensioning systems, thermo-electric prestressing, chemical prestressing; Nature of prestress losses, Losses due to: Elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, anchorage slip. Total losses allowed for in Design.

Unit III:

Analysis of pre-stressed structural members for axial loads, flexure, shear & torsion. Analysis calculations for various elements.

Unit IV:

Transfer of Stress in Pretensioned Members, Anchorage Zone stresses in Post-Tensioned Members, Limit state Design Criteria for Prestressed Concrete Members, Principles of Dimensioning Concrete Members.

Unit V

Design of Pre-stressed sections for flexure, axial tension, shear & Torsional forces. Combination of stresses.

Course Outcome:

After this course,

CO1: Students will understand the general mechanical behaviour of prestressed concrete.

CO2: Students will be able to analyse, and design prestressed concrete flexural members.

CO3: Students will be able to analyse and design for vertical and horizontal shear in prestressed concrete.

CO4: Students will be able to analyze transfer and development length as well as prestress losses.

Text Books/References:

1. N. Krishna Raju, Prestressed Concrete, Tata McGraw Hill Publishing Co. Ltd, New Dehi
2. K Mallick, A P Gupta, Prestressed concrete, Oxford and IBI Series.
3. R. H. Evans, Bennet E W, Prestressed concrete theory and design, Chapman and Hall, London.
4. T. Y. Lin, Ned H.Burns Design of Prestressed Concrete Structures, Wiley ,John Wiley and Sons

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Course Code	Course Name	L	T	P	Credits
CIV-E18T	Environmental Impact Assessment & Audit	2	0	0	2

Course Objectives:

At the end of the course, students would be able:

- Formulate objectives of the EIA studies
- Identify the need to assess and evaluate the impact on environment.
- Know about Environmental audit and Environmental Impact Assessment

Syllabus:

Unit I: Introduction

Definition, significance and scope of impact assessment, Need & objective, types of environmental impacts, methods of environmental impacts, major steps in impact assessment procedure, generalised approach to impact analysis, social impact assessment.

Unit II: Environment Impact Assessment

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

.Unit III: Global Environmental Issues

Green House Effect, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust.

Unit IV: Environmental audit

Recent trends in industrial waste management, Cradle to grave concept, Life cycle analysis, Clean technologies; Environmental audit and Legislation: Definition and concepts, Environmental audit versus accounts audit, Compliance audit, Relevant methodologies, Various pollution regulations, Introduction to ISO and ISO 14000.

Unit V: Environmental Protection Acts

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries

Course Outcome:

CO1. Aware and sensitise about the present days environmental issues at global and local scale.

CO2: Get acquainted with environmental and social impacts of any developmental activity.

CO3: Knowledge about environmental impact assessment with its objectives and procedure.

Text Books/References

1.Environmental Pollution by R.K. Khitoliya S. Chand, 2014.

2. Glynn, J. and Gary, W. H. K. – Environmental Science and Engineering, Prentice Hall Publishers

3. Suresh K. Dhaneja – Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.

4. Bhatia, H. S. Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.

5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers Rutledge, London, 1992.

6. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications

7. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications

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Course Code	Course Name	L	T	P	Credits
CIV-E19T	Ground Improvement Techniques	2	0	0	2

COURSE OBJECTIVES:

- To understand various ground improvement techniques.

SYLLABUS:

Unit I:

Introduction Soil Types, Soil Investigation & Classification, Ground Modification/Stabilization, Need for Engineered Ground Improvement, Classification of Ground Improvement Techniques, Suitability, Feasibility and Desirability of Ground Improvement Techniques, Current & Future Developments

Unit II:

Ground Improvement Techniques Mechanical Modification: Introduction to Mechanical Modification, Principles of Soil Densification, Properties of Compacted Soil, Compaction Control, Specification of Compaction, Requirements, Types of Compaction Equipment

Unit III:

Hydraulic Modification: Objectives & Techniques, Dewatering Systems, Soil- Water Relationships, Single& Multiple- Well Formulas, Drainage of Slopes, Filtration & Seepage Control, Preloading & Vertical Drains, Electrokinetic Dewatering & Stabilization.

Unit IV:

Chemical Modification/Stabilization: Effect of various admixtures on Engineering Properties of Soils such as Cement, Lime, Fly ash, Bitumen, Cement Lime Fly ash. Other chemical additives such as NaCL, CaCL2 ,CaSO4 , Ca (OH)2, NaOH etc., Grouting- Applications to Embankments, Foundations& Sensitive Soils, Admixtures in Pavement Design.

UnitV:

Thermal Modification: Thermal Properties of Soils, Heat Treatment of Soils, Ground Freezing, Strength & Behaviour of Frozen Ground. Modification By Inclusions & Confinement: Evolution of Soil Reinforcement, Applications of Geosynthetics Material in Civil Engineering, Soil Nailing, Soil Anchors, Soil Confinement by Formwork.

COURSE OUTCOMES

CO1: Analyze the field problems related to problematic soils and solve the problems using the ground improvement techniques.

CO2: Summarize and practice ground improvement using Mechanical modification techniques..

CO3: Design drainage for seepage control, assess dewatering field problems.

CO4: Application of physical and chemical ground improvement techniques using thermal modification, like grouting, shotcreting and gruniting technology.

CO5: Demonstrate the ground improvement techniques such as ground anchors,rock bolting and soil nailing.

Text Books/References:

1. Methods of Treatment of Unstable Ground : Belt – Butterworths, 1975

2. Engineering Principles of Ground Modification: Manfired, R. H.

3. Engineering Treatment of Soils : Bell, F. G

4. Geosynthetics for Soil Improvement : ASCE, GST No. 18,New York

5. Grouting Theory & Practice : Nonveiller, E

6. Soil Stabilization : Ingles, O. G. &Metcalf, J. B.

Appendix VI

Generic Electives

Open Electives (Generic)

S. No	Course Code	Course Title	Hours Per Week			Semester	Credits	Prerequisites
			L	T	P			
1.	CIV-G01T	Civil Engineering Materials and Construction Techniques	**2**	**1**	**0**	**3rd /5th /7th**	**3**	All Departments of SOET (Except Civil Engineering)
2.	CIV-G01T	Disaster Management	**2**	**1**	**0**		**3**	
Total Credits							**6**	

Note:

3. *Generic Electives are School Level electives and are offered to the students of the School of Engineering and Technology.*
4. *The students of the Department of Civil Engineering have to choose Generic Electives from the list of Generic Electives offered by other Departments of School of Engineering and Technology.*

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-G01T	Civil Engineering Materials and Construction Techniques	2	1	0	3

Syllabus:

UNIT I:Bricks& Timber:

Bricks: Classification, Characteristics of good bricks, Ingredients of good brick earth, Different forms of bricks, testing of bricks as per BIS. Defects of bricks.
Timber :Types of timber, Seasoning of timber; Methods, Defects in Timber, Decay of Timber, Preservation of Timber,Testing of Timber, Veneers , Plywood.

UNIT II: Cement, PCC & RCC

Cement:Cement: OPC,PPC , Composition, Types of cement. Plain concrete, composition and grades of concretes
RCC : Properties and composition of RCC, Applications and uses of RCC, Types of steel used in RCC.

UNIT III:Form work & Scaffolding

Form work, Scaffolding, shoring, Shuttering and underpinning; their types, characteristics,

UNIT IV: Structural elements

Performance and application to building processes.Foundation,DPC, brick masonry and stone masonry. Beams columns and slabs. Lintel beams and plinth beams, Roofs and floors. Trusses

UNIT V: Construction equipment& Repairing

Selection ,cranes, hoists, mixers, transit mixer, conveyors, vibrators, bulldozer, dumpers, trenchers, excavators, hoe, graders, piling hammers, pumps, compressors, bitumen mixer, bitumen mix plant, rollers, clam shell, aggregate production techniques, crushers.
Minimum repair works, repair of cracks and sinking of floor.

Course Outcomes:

After the completion of this course the students will have:

CO 1. Knowledge regarding characteristics of bricks and timber

CO 2. Knowledge regarding Cement, Plain cement Concrete and Reinforced concrete

CO 3. Knowledge regarding formwork and scaffolding
CO 4.Various structure elements of building**.**

Text Books/References:

1. Building materials by Parbinsingh.
2.Building materials and construction by Gurcharan Singh
3.Construction Methods Plant and Equipment by R.L. Purifoy.
4.Building Construction by S.P. Arora& S.P. Bindra

B.Tech **Civil Engineering** **Regulation 2020**

Course Code	Course Name	L	T	P	Credits
CIV-G02T	Disaster Management	2	1	0	3

Syllabus:

UNIT 1

Earthquake, causes and classification, Estimation of size of earthquake, Magnitude and intensity, seismic waves, Isoseismal maps, Recurrence intervals, Fault slip rates, Response spectrum.

UNIT 2

Floods, causes of floods, Flood damages, Flood analysis and flood plain zooning, Drought and its impact.

UNIT 3

Cyclones and Tsunami, their causes characteristics and their impact, Prediction and control Measures,Avalanches – Mechanism, Classification, Control measures.

UNIT 4

Landslides - Mechanism, Causative factors, Landslides monitoring and prediction, Landslide hazard zonation.

UNIT 5

Vulnerability and Risk Management, Case studies for natural hazards, Fire hazard.

Course outcomes

The students will be able to

CO 1. Differentiate the types of disasters, causes and their impact on environment and society

CO 2. Assess vulnerability and various methods of risk reduction measures as well as mitigation.

CO 3. Disaster damage assessment and management.

Text Books/References:

1. Reiter, L Earthquake Hazard Analysis, Issues and Insights, Columbia University Press.

2. Hyndman D. and Hyndman D, Natural Hazard and Disasters, Brooks/cole.

3. Mileti D.S., Disasters by Design: A Reassessment of Natural Hazards in United States.

Annexure VII

Evaluation Mechanism for Practical Courses, Projects (Minor/Pre and Major), Seminars and Industrial Training

a) Practical Courses

a.i. Attendance - 10 marks

a.ii. Continuous assessment throughout the semester consisting preferrrably of a viva and report evaluation after each experiment is performed – 40 marks

a.iii. Major Exam – 50 marks, consisting of:

Viva-voce - 20 marks

Performing a particular practical/simulation during the exam alongwith report writing for the same – 30 marks

b) Projects (Minor)

Marks to be given by concerned Project supervisor(s) - 20

The following would be evaluated by a duly constituted departmental committee

11. Preliminary presentation (held at the beginning of the semester) – 20 marks
12. Final Presentation which would include demonstration of model/simulation (if any) – 30 marks
13. Final Viva-voce – 20 marks
14. Report – 10 marks

c) Projects (Major)

Marks to be given by concerned Project supervisor(s) – 20

Preliminary presentation to be evaluated by a duly constituted departmental committee and held at the beginning of the semester – 20 marks

The following would be evaluated by the External examiner

10. Final Presentation which would include demonstration of model/simulation (if any) – 30 marks
11. Final Viva-voce – 20 marks
12. Report – 10 marks

d) Industrial training

The evaluation would be done by a duly constituted departmental committee and would preferably be spaced throughout the semester. The division of marks would be as follows:

Presentation – 50 marks

Report – 20 marks

Viva-voce – 30 marks