

D.No 682

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

***DEPARTMENT OF CIVIL  
ENGINEERING***

***MINUTES OF BOARD OF  
STUDIES MEETING, MAY 2020  
ALONG WITH ITS ANNEXURES***

**Minutes of Board of Studies Meeting held on 30<sup>th</sup> May, 2020**

The meeting of Board of Studies of the Civil Engineering department was held on Saturday, 30<sup>th</sup> May, 2020 online through Google meet (Owing to the unprecedented situation of Covid-19 virus outbreak). Following were present:

1. Dr. A. K. Nema (Expert nominated by V.C.)  
Professor, Civil Engg., IIT Delhi
2. Dr. P. K. Jain (Subject Expert nominated by Academic Council)  
Professor, Civil Engg., MANIT Bhopal
3. Dr. Mahesh Jat (Subject Expert nominated by Academic Council)  
Professor, Civil Engg., MNIT Jaipur
4. Mr. Sanjay Sarwate (Representative from Industry)  
Deputy Director, CSM L&T
5. Mr. Brijesh Kumar Gupta (Alumnus)  
DRM, East Coast Railway, Bhubaneswar
6. Dr. M. K. Trivedi (Chairman BoS & Head of the department)
7. Prof. (Mrs.) Archana Tiwari (Member, BOS)
8. Dr. S. K. Jain (Member, BOS)
9. Dr. R. Kansal (Member, BOS)
10. Dr. S. Tiwari (Member, BOS)
11. Prof. D. Rastogi (Member, BOS)
12. Prof. A. K. Dwivedi (Member, BOS)
13. Prof. A. K. Saxena (Member, BOS)
14. Prof. G. Bhadoriya (Member, BOS)
15. Prof. Aditya K. Agarwal (Member, BOS)

Following agendas were discussed & deliberated upon

Item No. / CE - 1	<p><b>To propose the tentative list of courses which the students can opt from NPTEL platform for Seminar/Self Study Courses in III &amp; V Semester (during 2020-2021)</b></p> <p>Following courses are finalized as Seminar/Self Study courses for III Semester through NPTEL platform</p> <ol style="list-style-type: none"> <li>1. Water, Society &amp; Sustainability</li> <li>2. Python for Data Science</li> </ol> <p>Following courses are finalized as Seminar/Self Study courses for V Semester through NPTEL platform</p> <ol style="list-style-type: none"> <li>1. Principles and Application of Building Science</li> <li>2. GPS Surveying</li> </ol>
Item No. / CE - 2	<p><b>To propose the list and syllabi for all Departmental Elective (DE) Courses of VII Semester under the flexible curriculum along with their COs</b></p> <p>Following courses are finalized as Departmental Elective (DE) courses for VII semester which will be offered in conventional mode under the flexible curriculum for 2017 admitted batch.</p> <ol style="list-style-type: none"> <li>1. 110711, Irrigation Engineering</li> <li>2. 110712, Industrial Waste Treatment</li> <li>3. 110713, Advanced Structural Design (RCC)</li> </ol>

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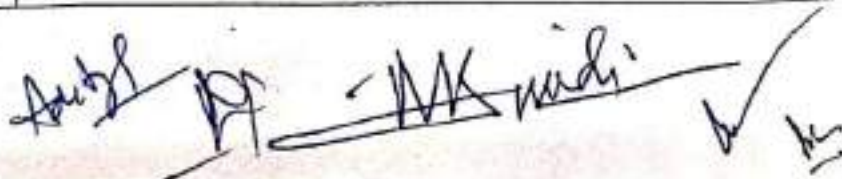
	<p>The syllabus along with COs for these courses were discussed &amp; finalized. The syllabus is attached in Annexure - I and the same has been incorporated in the syllabus file for 2017 batch.</p>
<b>Item No. / CE - 3</b>	<p><b>To propose the list of Courses from SWAYAM/NPTEL/MOOC Platform to be offered in online mode under DE category for credit transfer in the VII Semester</b></p> <p>Following courses are finalized as Departmental Elective (DE) courses for VII semester which will be offered in online mode through SWAYAM/NPTEL/MOOC for credit transfer under the flexible curriculum for 2017 admitted batch.</p> <ol style="list-style-type: none"><li>1. 110751, Matrix Method of Structural Analysis</li><li>2. 110752, Advanced Concrete Technology</li><li>3. 110753, Remote Sensing &amp; GIS</li></ol>
<b>Item No. / CE - 4</b>	<p><b>To propose the Courses &amp; Syllabi to be offered under Open Category (OC) Courses for VII semester students of other departments along with their COs</b></p> <p>Following courses are finalized as Open Category (OC) courses for VII semester which will be offered in conventional mode to students of other departments for 2017 admitted batch.</p> <ol style="list-style-type: none"><li>1. 900201, Integrated Waste Management for Smart City</li><li>2. 900202, Project Planning &amp; Control</li><li>3. 900213, Urban Planning &amp; Transportation Systems.</li></ol> <p>The syllabus along with COs for these courses were discussed &amp; finalized. The syllabus is attached in Annexure - II and the same has been incorporated in the syllabus file for 2017 batch.</p>
<b>Item No. / CE - 5</b>	<p><b>To propose the list of "Additional Courses" which can be opted for getting an</b></p> <ol style="list-style-type: none"><li>(i) <i>Honours (for students of the host department)</i></li><li>(ii) <i>Minor Specialization (for students of other departments)</i></li></ol> <p><i>[These will be completed through SWAYAM/NPTEL/MOOC based Platforms during V and VII semester]</i></p> <p>Following SWAYAM/NPTEL/MOOC courses are proposed as additional courses which can be opted for getting Minor Specialization during VII semester under the flexible curriculum for 2017 admitted batch.</p> <ol style="list-style-type: none"><li>1. Project Management for Managers.</li><li>2. Municipal Solid Waste Management.</li></ol> <p>Following SWAYAM/NPTEL/MOOC courses are proposed as additional courses which can be opted for getting Honours during VII semester under the flexible curriculum for 2017 admitted batch.</p> <ol style="list-style-type: none"><li>1. Theory of Elasticity.</li><li>2. Earthquake Resistant Design of Foundations.</li></ol> <p>Following SWAYAM/NPTEL/MOOC courses are proposed as additional courses which can be opted for getting Minor Specialization during V semester under the flexible curriculum for 2018 admitted batch.</p> <ol style="list-style-type: none"><li>1. Building Materials &amp; Composites.</li><li>2. Municipal Solid Waste Management.</li><li>3. Strength of Materials.</li></ol> <p>Following SWAYAM/NPTEL/MOOC courses are proposed as additional courses</p>

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A signature on the left, a large 'A' in the middle, and a signature 'M. K. Modi' on the right with a checkmark below it.



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	<p>which can be opted for getting Honours during V semester under the flexible curriculum for 2018 admitted batch.</p> <ol style="list-style-type: none"> <li>1. Integrated Waste Management for Smart City.</li> <li>2. Matrix Method of Structural Analysis.</li> <li>3. River Engineering</li> <li>4. Introduction to Multimodal Urban Transportation Systems.</li> <li>5. Glasses in Buildings: Design &amp; Applications.</li> </ol>
Item No. / CE - 6	<p>To prepare the syllabi of Mandatory Course (MC) titled "Intellectual Property Rights" (IPR) of VII semester under the flexible curriculum <i>[This will be prepared &amp; recommended by Institution Level Committee/Academic Development Cell]</i></p> <p>This agenda will be finalized at institute level and adopted uniformly by all the departments.</p>
Item No. / CE - 7	<p>To prepare and recommend the Experiment list/ Lab manual for Laboratory Courses to be offered in VII semester</p> <p>The list of experiments for laboratory courses to be offered in VII semester under the flexible curriculum were discussed &amp; finalised. The list of experiments is attached in Annexure - III. The lab manual for these courses will be prepared in due course of time and circulated among students.</p>
Item No. / CE - 8	<p>To explore and prepare the tentative list of <i>Departmental Elective (DE) Courses for VIII semester (run through SWAYAM/NPTEL/MOOC based platform)</i></p> <p>Following courses are proposed as Departmental Elective (DE) courses for VIII semester to be offered in online mode through SWAYAM/NPTEL/MOOC for credit transfer under the flexible curriculum for 2017 admitted batch.</p> <ol style="list-style-type: none"> <li>1. Plastic Waste Management.</li> <li>2. Modern Construction Materials.</li> <li>3. Infrastructure Planning &amp; Management.</li> <li>4. Hydraulic Structure.</li> </ol>
Item No. / CE - 9	<p>To explore and prepare the tentative list of courses to be offered under <i>Open Category (OC) Courses for VIII semester</i> students of other departments</p> <p>Following courses are proposed as Open Category (OC) courses for VIII semester to be offered to students of other departments under the flexible curriculum for 2017 admitted batch.</p> <ol style="list-style-type: none"> <li>1. Project Economics &amp; Finance.</li> <li>2. Hydropower Engineering.</li> <li>3. Remote Sensing &amp; GIS.</li> </ol>
Item No. / CE - 10	<p>To finalize the new (restructured) PG Scheme of CTM along with syllabus which will be effective from July 2020 (2020 admitted onward batches)</p> <p>The new (restructured) PG Scheme of CTM which has been made in accordance with the guidelines given by Academic Development Cell of Institute is discussed and finalized. The courses which have to be run as electives and as open category courses (conventional mode) are finalized. The courses which have to be run as electives (through SWAYAM/NPTEL mode) have been proposed and will be finalized in next BoS meeting when the final list of SWAYAM/NPTEL is made available.</p>



	<p>The finalized list of elective courses through (conventional mode) in 1<sup>st</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Maintenance Management.</li><li>2. Infrastructure Development.</li><li>3. Formwork for Concrete Structures.</li></ol> <p>The finalized list of open category courses through (conventional mode) in 1<sup>st</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Organizational Behaviour &amp; Management</li><li>2. Safety &amp; Quality Management.</li></ol> <p>The finalized list of open category courses through (conventional mode) in 2<sup>nd</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Fire Engineering &amp; Design.</li><li>2. Sustainable Materials &amp; Green Buildings.</li></ol> <p>The proposed list of elective courses through (SWAYAM/NPTEL) in 2<sup>nd</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Scheduling of Repetitive Construction Projects.</li><li>2. Durability of Concrete Structures.</li><li>3. Project Procurement Systems.</li></ol> <p>The syllabus along with COs for all the courses were discussed &amp; finalized. The compiled new (restructured) scheme of PG CTM along with syllabus is attached in Annexure - IV.</p>
<p><b>Item No. / CE - 11</b></p>	<p><b>To finalize the new (restructured) PG Scheme of Environmental Engineering along with syllabus which will be effective from July 2020 (2020 admitted onward batches)</b></p> <p>The new (restructured) PG Scheme of Environmental Engineering which has been made in accordance with the guidelines given by Academic Development Cell of Institute is discussed and finalized. The courses which have to be run as electives and as open category courses (conventional mode) are finalized. The courses which have to be run as electives (through SWAYAM/NPTEL mode) have been proposed and will be finalized in next BoS meeting when the final list of SWAYAM/NPTEL is made available.</p> <p>The finalized list of elective courses through (conventional mode) in 1<sup>st</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Industrial Waste Management.</li><li>2. Environmental Auditing &amp; Management System.</li><li>3. Environmental Hydraulics.</li></ol> <p>The finalized list of open category course through (conventional mode) in 1<sup>st</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Sustainable Waste Management System.</li></ol> <p>The finalized list of open category course through (conventional mode) in 2<sup>nd</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Global Climatic Changes &amp; Disaster Management.</li></ol> <p>The proposed list of elective courses through (SWAYAM/NPTEL) in 2<sup>nd</sup> Semester are:</p> <ol style="list-style-type: none"><li>1. Plastic Waste Management.</li><li>2. Electronic Waste Management.</li></ol>

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	The syllabus along with COs for all the courses were discussed & finalized. The compiled new (restructured) scheme of PG Environmental Engineering along with syllabus is attached in Annexure - V.															
Item No. / CE - 12	<p><b>Curricula feedback from various stakeholders, its analysis and impact</b></p> <p>The curricula feedback was taken from various stakeholders in the month of April, 2020. The compiled report along with its analysis is attached in Annexure - VI. Some important suggestions given by the stakeholders are as follows:</p> <ol style="list-style-type: none"> <li>1. Include more topics of GATE exam in some of the courses and also subsequently remove topics which are not in GATE exam.</li> <li>2. Availability of standard books in library in sufficient number for all courses.</li> <li>3. Addition of laboratory experiments in some of the courses.</li> <li>4. The external experts have suggested in meeting that for Seminar/Self Study courses, departments can plan mini projects, modules etc at the departmental level and give to students apart from ongoing procedure i.e. students taking up SWAYAM/NPTEL courses.</li> <li>5. The experts have suggested for including a topics on safety management in construction, 3D-5D modelling, virtual reality plan, facades in buildings.</li> <li>6. The experts have also suggested reviewing the existing scheme and if possible reshuffling some of the courses can be done for upcoming batches.</li> </ol>															
Item No. / CE - 13	<p><b>Any other matters</b></p> <p><b>1. Modification in course code, name and syllabus of 110504, Environmental Engineering - I for 2018 admitted batch students.</b></p> <p>As proposed in previous BoS Meeting held in Nov. 2019, for larger interest of students it is decided to change the existing course code, name of 110504, Environmental Engineering - I to 110509, Environmental Engineering. Also the syllabus of this course is modified. The change of course code, name &amp; revised syllabus has been incorporated in the scheme of 2018 admitted batch students as attached in Annexure - VII.</p> <p align="center"><u>Percentage Syllabus Change Made till date in B.Tech Civil Engg. Scheme &amp; Syllabus for 2018 onwards admitted batches from the B.Tech Civil Engg. Scheme &amp; Syllabus</u></p> <table border="1"> <thead> <tr> <th>S. No.</th> <th>Course Code &amp; Course Name in which change has been done for 2018 onwards admitted batch</th> <th>Earlier Course Code &amp; Course Name for 2017 admitted batch</th> <th>Date of Change</th> <th>% Change in Existing Syllabus</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>110406, Water Resources Engineering</td> <td>110405, Engineering Hydrology</td> <td>23.11.2019</td> <td>50%</td> </tr> <tr> <td>2</td> <td>110509, Environmental Engineering</td> <td>110504, Environmental Engineering - I</td> <td>30.5.2020</td> <td>50%</td> </tr> </tbody> </table>	S. No.	Course Code & Course Name in which change has been done for 2018 onwards admitted batch	Earlier Course Code & Course Name for 2017 admitted batch	Date of Change	% Change in Existing Syllabus	1	110406, Water Resources Engineering	110405, Engineering Hydrology	23.11.2019	50%	2	110509, Environmental Engineering	110504, Environmental Engineering - I	30.5.2020	50%
S. No.	Course Code & Course Name in which change has been done for 2018 onwards admitted batch	Earlier Course Code & Course Name for 2017 admitted batch	Date of Change	% Change in Existing Syllabus												
1	110406, Water Resources Engineering	110405, Engineering Hydrology	23.11.2019	50%												
2	110509, Environmental Engineering	110504, Environmental Engineering - I	30.5.2020	50%												

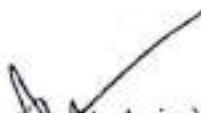
The meeting ended with vote of thanks to the chair.

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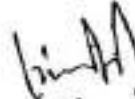
  
(Prof. Aditya K. Agarwal)  
Member, BoS

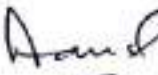
  
(Prof. G. Bhadoriya)  
Member, BoS

(Prof. A. K. Saxena)  
Member, BoS

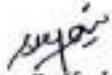
  
(Prof. A. E. Dwivedi)  
Member, BoS

  
(Prof. D. Rastogi)  
Member, BoS

  
(Dr. S. Tiwari)  
Member, BoS

  
(Dr. R. Kansal)  
Member, BoS

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

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

(Mr. Sanjay Sarwate)  
Representative from Industry

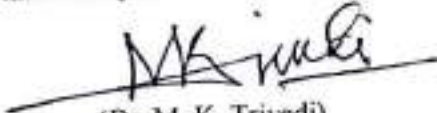
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(Dr. Mahesh Jat)  
Subject Experts nominated by Academic Council

(Dr. P.K. Jain)

*Digitally Approved by External member*  
(Mr. Brijesh Gupta)  
Alumnus

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

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

  
DEAN (ACADEMICS)  
M.I.T.S  
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**ANNEXURE - 1**

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

Course Code: 110711

Course Name: Irrigation Engineering

L	T	P	Credit
2	0	0	2

**Course Objectives:**

- 1) To understand the water requirements of various types of crops.
- 2) To understand the different types of irrigation systems.
- 3) To plan the reservoir systems as per the requirements.
- 4) To understand various types of dam.
- 5) To understand the concepts of Khosla's and Bligh's theory & its applications.
- 6) To understand river training.
- 7) To understand the concepts of Lacey's and Kennedy theory for design of canal systems.
- 8) To understand the canal regulations.

**Syllabus:**

**Unit-I Irrigation Water Requirement and Soil Water Crop Relationship:**

Irrigation, Definition, Necessity, Advantages and disadvantages, Type and methods, Irrigation development.

**Soil:** Types and their occurrence, Suitability for irrigation purposes, Wilting, Coefficient and field capacity, Optimum water supply, Consumptive use and its determination. Irrigation methods - surface and subsurface, Sprinkler and drip irrigation.

**Duty of water,** factors affecting duty and methods to improve duty, Suitability of water for irrigation, Crops and crop seasons, Principal crops and their water requirement, Crop ratio and crop rotation, Intensity of irrigation, Water logging-causes, effects & its prevention.

**Unit-II Reservoirs and Storage Works:**

Types of reservoirs, Reservoir planning, Various investigations, estimation of storage capacity by mass curve analysis, Fixing of principal levels in a storage project, Economical height of dam, Reservoir sedimentation, Suitable site for a reservoir project.

**Dams:** Classification- gravity, earthen, rockfill, arch, buttress, steel & timber dam, Selection of suitable type of dam at a particular location.

**Unit-III Diversion Works and River Training Methods:**

Purpose, Selection of site, Layout and functions of component parts, Types of weirs and barrages, Weir design for surface and subsurface flows, Bligh's, Lane's and Khosla's theories, Silt excluders and silt ejectors.

River training methods - objectives, Design principles of levees, Guide bunds & launching aprons.

**Unit-IV Canal Irrigation:**

Types of canals, Alignment, Design of unlined and lined canals, Kennedy's and Lacey's silt





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theories, Typical canal sections, Canal losses, Linings-objectives, Materials used, Economics.

**Unit-V**

**Introduction to Canal Regulation Structures:** Head and cross regulators, Canal falls, Escape and outlets

**Course Outcomes:**

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

- CO1:** Explain the concepts for planning an irrigation project.
- CO2:** Differentiate various theories used in planning of an irrigation project.
- CO3:** Analyse various requirements for an efficient irrigation project.
- CO4:** Design different components of irrigation system using different theories.
- CO5:** Plan an efficient, economical & safe irrigation system.

**Reference Books:**

- 1. Irrigation & Water Power Engg. – Dr. B.C. Punmia, Dr. Pane, B.B.Lal
- 2. Irrigation, Water Resources & Water Power by Dr. P.N. Modi
- 3. Irrigation Engineering by Varshney
- 4. Irrigation Engineering by Santosh Kumar Garg
- 5. Irrigation, Water Power & Water Resources Engg. By K.R. Arora

**Course Code: 110712**

**Course Name: Industrial Waste Treatment**

L	T	P	Credit
2	0	0	2

**Course Objectives:**

- 1) To provide broad knowledge on various methods of sewage disposal, their effects on water pollution & also provide information on various disposal standards.
- 2) To learn the basics of sewage composition & its characteristics.
- 3) To understand the 3R concepts and how to implement them.
- 4) To provide knowledge on various waste water treatment techniques.
- 5) To provide information on various rules & regulations regarding disposal of municipal wastes.
- 6) To provide information about various existing waste treatment & management techniques of various industries.

**Syllabus:**

**Unit-I Problem of Water Pollution:**

Effects of wastes on streams and sewage treatment plant, natural purification of streams, oxygen sag curve, allowable organic load on streams, classification of stream, stream standards and effluent standards requirement of water for different purposes.

**Unit-II Sampling and Analysis of Wastewater:**

Sampling of waste waters, Grab, Composite and Integrated samples, analysis of waste water, Biochemical Oxygen Demand, Chemical Oxygen Demand and pH value of waste water, Toxicity of waste by Bioassay method.

**Pre-treatment of Wastes:** Volume and strength reduction, salvage of materials, recovery of by products.

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reuse of waste water.

**Unit-III Conventional Methods of Treatment of Waste Water:**

Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal, Advance methods of treatment such as Reverse Osmosis, Ion Exchange Process, Electro Dialysis, Algal Harvesting etc.

**Unit-IV Combined Treatment of Waste Water with Sewage:**

Municipal regulations, Sewer rental charges, Instrumentation in waste water treatment plants, Operation and maintenance of plants, Role of water pollution control board. Low cost Treatment Plant Effluent Treatment Plant Design and Operation.

**Unit-V**

Brief study of industrial processes and treatment methods of waste water from common industries such as Textile, Dairy, Paper and pulp, Tannery & Distillery.  
Hazardous wastes-Impact handling and disposal.

**Course Outcomes:**

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

CO1: Evaluate the effects of waste on streams as per the standards.

CO2: Determine the requirements for safe disposal of sewage.

CO3: Apply suitable techniques for sewage treatment & disposal based upon the available data.

CO4: Apply municipal regulations in operation & maintenance of waste water treatment plant.

CO5: Explain waste management methods of different industries.

**Reference Books:**

1. Liquid Waste of Industries – Theories, Practice and Treatment – N.L. Nemerow, Wesley Publishing Co.
2. Treatment of Industrial Waste – E.B. Besselièvre & Max Graw Hill Book Company
3. Waste Water Engg. – Treatment Disposal & Reuse – Metcalf & Eddy – Tata Mc Graw Hill, New Delhi
4. Waste Water Treatment – Arceivala – Tata Mc Graw Hill, New Delhi
5. Industrial Pollution Control hand book – Lund H.F. Tata Mc Graw Hill, New Delhi

**Course Code: II0713**

**Course Name: Advanced Structural Design – I (R.C.C.)**

L	T	P	Credit
2	0	0	2

**Course Objectives:**

- 1) To understand the behaviour of RCC structures like Retaining wall, Water tanks, Bridges and prestressed concrete.
- 2) To understand the Codal provision for design of RCC structures and prestressed concrete
- 3) To analyse the RCC structures subjected to various loads.
- 4) To analyse RCC bridges subjected to IRC loadings.
- 5) To learn Design of RCC and prestressed concrete structures as per Codal provisions.

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**Syllabus:**

**Unit-I**

**Design of Water Tanks:**

Design requirements, Design of Tanks resting on ground and underground tanks, Rectangular and circular tanks.

**Unit-II**

**Design of Over Head Water tanks:**

Rectangular, Circular & intze type (Membrane analysis only), Design of staging.

**Unit-III**

**Earth Retaining Structures:**

Types of retaining walls, Stability of retaining walls, Design of retaining walls (Cantilever and counter fort type)

**Unit-IV**

**Design of Bridges:**

IRC loading for highway bridges, Slab bridges and T-beams bridges for highway loading (IRC Loads)

**Unit-V**

**Prestressed Concrete:**

Prestressing concepts, materials, and systems of prestressing & prestress losses. Introduction to working & limit state design method.

**Course Outcomes:**

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

- CO1: Explain** behaviour of RCC and Prestressed concrete structures under loads.
- CO2: Determine** forces developed in RCC and Prestressed concrete structures under loads.
- CO3: Compare** designs of RCC and Prestressed concrete structures for given loadings.
- CO4: Develop** economic and safe designs of RCC and Prestressed concrete structures.

**Reference Books:**

1. Plain and Reinforced Concrete by O.P. Jain and Jui Krishna Vol. I & II
2. R.C.C. Structures by B.C. Punmia
3. Advance R.C. Design by N.K.Raju
4. Essentials of Bridge Engineering by D.J. Victor.
5. Design of Bridge Structures by T.R. Jagadeesh & M.A. Jayaram
6. Design of Bridges by N.K. Raju
7. Prestressed Concrete by N.K. Raju
8. Advanced Reinforced Concrete Design by PC Varghese

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ANNEXURE – II

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

Course Code: 900201

Course Name: Integrated Waste Management for Smart City

L	T	P	Credit
2	1	0	3

**Course Objectives:**

- 1) To provide broad knowledge on various aspects of planning & implementation of waste management system in a smart city/town.
- 2) To understand the principles applied in waste management.
- 3) To understand various ways to collect, treat & disposal of waste.
- 4) To understand various methods of energy recovery from waste.
- 5) To understand various aspects of hazardous waste management, E-waste management, biomedical waste management etc.

**Syllabus:**

**Unit I:**

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

**Unit II:**

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

**Unit III:**

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

**Unit IV:**

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

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**Unit V:**

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

**Course Outcomes:**

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

- CO 1: Explain the principles & concepts of waste management.
- CO 2: Apply various techniques of handling the waste.
- CO 3: Apply various techniques of energy recovery from waste.
- CO 4: Plan an effective & efficient waste management system.

**Text Books:**

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

**Reference Books:**

1. Environmental Engineering, Rowe, Peavy & Tchobanoglous, Tata McGraw Hill Publications, 2017
2. CPHEEO, Manual on Municipal Solid Waste management, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2016
3. Solid Waste Engineering, Vesilind P.A., Worrel H. W. and Reinhard, Thomson Learning Inc, 2003

**Course Code: 900202**

**Course Name: Project Planning & Control**

L	T	P	Credit
2	1	0	3

**Course Objectives:**

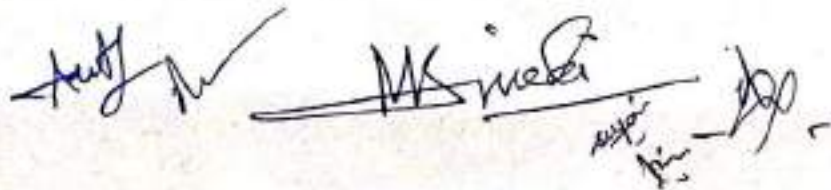
- 1) To know about techniques of project planning.
- 2) To develop the network of project's activities.
- 3) To understand the precedence network technique.
- 4) To discuss the resource utilization in project.
- 5) To understand the project cost control.

**Syllabus:**

**Unit I:**

**Project Planning:**

Introduction to Project Planning Process. Types of Project Plans-Project feasibility plan, Project preliminary plan. Introduction to network techniques – CPM, PERT and Precedence network.  
Project Work Breakdown – Levels of Project work breakdown. Identification of construction activities by work breakdown structure. Activity duration and methods of estimating activity duration – One time estimate three time estimates, trapezoidal distribution estimate. Duration estimation procedure.



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**Unit - II**

**Project Network Analysis:**

Elements of Network, development of network, Numbering of events, Event times - Earliest events time and latest event time. Slack, critical events. Activity times - Earliest start time, Latest finish time, Float and critical activities. Network critical path and its significance. Network analysis by CPM - Defining scope of work, determining activities, establishing work package logic, preparation of network logic program and draft network. Numerical problems.

**Unit-III**

**Precedence Network Analysis:**

Precedence Network Analysis - Modeling procedure analysis of time in PN. Use of PN in repetitive works network. Difference between PN and CPM. Application of Network techniques and their limitations.

**Unit-IV**

**Resource Planning:**

Resources, Types of resources - renewable and non-renewable resources, Resource Histogram, Method of Resource allocation - resource smoothing and resource levelling.

**Unit-V**

**Project Cost Control:**

Direct and indirect cost, slope of direct cost curve, Total project cost and optimum duration, contracting the network for cost optimization. Escalate & Variation in prices.

**Course Outcomes**

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

- CO 1: Know the project planning and project network.
- CO 2: Analyze the network by CPM & PERT.
- CO 3: Analyze the project using precedence network.
- CO 4: Analyze the effect of resource planning on project.
- CO 5: Evaluate the cost of project during planning.

**Recommended Books:**

1. Project planning and Control with PERT and CPM by Dr. B.C. Punmia, K.K. Khandelwal
2. CPM & PERT by L.S. Srinath
3. Construction Management by Sen & Gupta
4. CPM & PERT by Weist & Levy


**Course Code: 900213**

**Course Name: Urban Planning & Transportation Systems**

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To introduce the scope and nature of Urban Planning and Transportation Systems as disciplines.
- 2) To understand the objectives, domains and principles of town planning.
- 3) To study the urbanization trends in India - Issues, concerns and experiences; City planning process and implementation framework in Indian context
- 4) To differentiate between types of plans and concepts in planning.





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- 5) To understand how urbanization and why migration takes place in an urban region.
- 6) To understand the traditional and current planning processes and techniques involved in the urban and transportation planning.
- 7) To understand the urban governance, policies and strategies of the government to tackle issues of an urban environment.
- 8) To understand the impact of technology in both urban and transportation planning.

### Syllabus:

#### Unit-I Introduction to planning discipline

Defining planning as a discipline, its multidisciplinary nature, role of a planner, Objectives and Principles of Urban planning.

Fields of planning - Urban, regional, environmental, transport and infrastructure.

Evolution of settlements- Settlement size, pattern and structure as a function of sociocultural, economic, military and religious factors in historical cities.

Concepts of different types of cities like garden city, linear city etc.

Contributions of eminent planners: Lewis Mumford, Ebenezer Howard, Patrick Geddes, Sir Arthur Clarence Perry, Charles Correa, Le-Corbusier.

#### Unit-II Urbanization

Definition of urbanization, rural-urban migration, various definitions of town and country planning, goals and objectives of planning, socio-economic impacts of growth of urban areas, significance of Census and Demographics, impacts of urbanization, impact of Government Policies on urbanization, urban structure and form - land use distribution, different Land use planning norms.

Overview of Urban Governance Definition, concepts, components, government and governance, hierarchy and structure, forms of governance, process of inclusion and exclusion, 73rd and 74th Constitution Amendment Acts.

#### Unit-III Transportation Systems

Evaluation of urban structure: Transport system, infrastructure and management, transport systems and their types, urban road hierarchy, planning, and management criteria for road and junction improvements, arterial improvement techniques.

Transport survey and studies: study area definitions, survey and their types, sampling methods, survey techniques.

Transportation Planning Process and analytical techniques; Techniques for urban structures analysis, Urban travel characteristics,

Transport and environment: Traffic noise, factor affecting noise statement measures, standards, air pollution standards, traffic safety, accident reporting and recording systems, factors affecting road safety, transport planning for different target groups.

#### Unit-IV Planning in Indian Context

Introduction to types of plans with choice of appropriate scale- development plans, master plan, city development plan, structure plan, district plan, action area plan, subject plan, comprehensive planning, zonal plans etc., hierarchy of plans: regional plan, sub-regional plan, sector plans and spatial plans. town planning schemes, contents of base maps at various scales, notations, measurement of areas.

Database for planning and socio - economic surveys: data requirements for urban and regional planning, sources of primary and secondary data, questionnaire design, measurement scale and their application, sampling techniques; Objectives, types, and significance of planning surveys.

Role of URDPFI guidelines in Town planning, Urban Development Policies and Programmes at various

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levels.

Graphic presentation of statistical and spatial data.

**Unit-V Current trends in urban planning and transportation systems**

Indian scenario - Issues and Policies, Global scenario, Future trends of urbanization.

Review of existing traffic management schemes in Indian cities.

Impact of technology on urban forms and planning, role of disruptive innovations and disaster mitigation in urban planning, advanced transportation systems with their merits and demerits, Intelligent transport system (ITS) its types and applications.

**Course Outcomes:**

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

**CO1: Explain** the concepts for planning a city and land-use patterns.

**CO2: Differentiate** various theories used in urban planning.

**CO3: Analyse** various requirements for transportation systems.

**CO4: Design** approaches in addressing the issues and concerns of urban environment through planning.

**CO5: Plan** strategies for any project with an urban planning perspective as a member and/or leader in a team of planning projects.

**Text Books:**

1. A.B. Gillion and Simon Eisner, "The Urban Pattern", CBS Publishers and Distributors, Delhi.
2. Rishma A., "Town Planning in Hot Cities", Mir Publishers, Moscow.
3. Ward S (2002), "Planning the 20th Century City" John Wiler & Sons.
4. R. Ramachandran, "Urbanisation and Urban Systems in India", Oxford Publications.
5. K. C. Shivrama Krishnan, "Revisioning Indian Cities", Sage Publications.
6. ITPI reader
7. Bruton, M.J., "Introduction to Transportation Planning," Hutchinson Publication, London.
8. Kadiali, L.R., "Traffic and Transportation Planning", Khanna Publishers, Delhi.

**Reference Books:**

1. Broadbent, Geoffery: "Emerging Concepts in Urban Space Design", Van Nostand Reinhold, 1990.
2. Edmund Bacon, "Design of Cities", Penguin, 1976.
3. Francis Tibbalds, "Making people-friendly towns: improving the public environment in towns and cities", Longman, 1992.
4. Rob Krier, "Urban Space", Random House Incorporated, 1979.
5. Jonathan Barnett, "Urban design as public policy: practical methods for improving cities", Architectural Record Books, 1974.
6. Papacoster, C.S. And Prevendons, "Transportation Engineering and Planning" Prentice Hall of India.
7. Introduction to transport planning by Michael J Bruton
8. Principal of Urban transport system planning by Hutchison





ANNEXURE - III

EXPERIMENT LIST FOR PRACTICAL COURSE IN VIIIth SEM.

Course Code: 110706

Course Name: Software Application for Solving Civil Engineering Problems

L	T	P	Credit
0	0	4	2

**Course Objectives:**

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

**List of Experiments:**

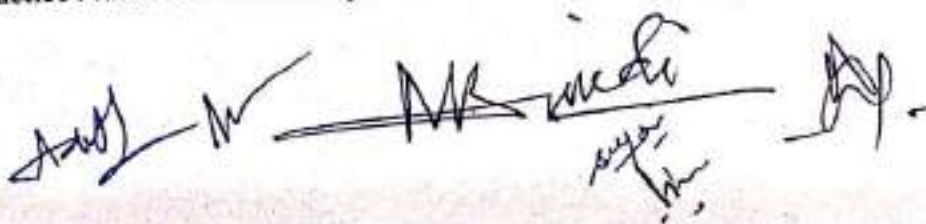
1. Design and analysis of reinforced concrete beam using STADD software.
2. Design and analysis of reinforced concrete slab using STADD software.
3. Design MATLAB code to develop load-response curve for different load conditions for a beam designed of experiment 1.
4. Application of QGIS in preparation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

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

**Course Outcomes**

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

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



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Course Code: 110708

Course Name: Creative Problem Solving

L	T	P	Credit
0	0	2	1

## Course Objectives:

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

## List of Experiments

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

## Course Outcomes

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

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

The block contains several handwritten signatures and initials. A large signature 'MK' is prominent, with 'me' written below it. To the left, there is another signature. Below the 'MK' signature, there are three smaller initials or signatures: 'AD', 'sup', and 'bi'.



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**W.E.F JULY 2020**

## ANNEXURE - IV

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

#### Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted										Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			MOOCs					L	T	P	
			End Sem	Mid Sem	Quiz/Assignment	End Sem	Lab Work / Sessional	Assignment	Exam	Exam							
1.	510111	Computational Techniques	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
2.	510112	Construction Materials & Machines	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
3.	510113	Contract Management	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
4.		#Elective - I	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
5.		*Open Category Course (OC-1)	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
6.	510119	Construction Lab	-	-	-	90	60	-	-	-	-	-	150	-	-	4	4
7.	510120	S Self Learning / Presentation	-	-	-	-	100	-	-	-	-	-	100	-	-	2	2
		Total	350	100	50	90	160	-	-	-	-	-	750	15	-	6	21

#### #Elective - I

- 510114. Maintenance Management
- 510115. Infrastructure Development
- 510116. Formwork for Concrete Structures

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

- 510117. Organizational Behaviour & Management
- 510118. Safety & Quality Management

Noted on 20/07/20  
21/3/20

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

Self learning / presentation through SWAYAM / NPTEL. (Registration in a course will be compulsory for students) your assessment will be based on integral signature

of respective semester using recent technologies /

DEAN (ACADEMICS)  
MITS

Dr. Anshu K. Singh

GWALIOR

19/7/2020

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**W.E.F JULY 2020**

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

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted										Total Marks	Contact Periods per week			Total Credits	
			Theory Slot			Practical Slot			MOOCs					L	T	P		
			End Sem	Mid Sem	Quiz/ Assignment	End Sem	Lab Work / Seasonal	Assignment	Exam	Exam								
1.	510211	Project Economics & Financing	70	20	10	-	-	-	-	-	-	-	-	100	3	-	-	3
2.	510212	Construction Cost Management	70	20	10	-	-	-	-	-	-	-	-	100	3	-	-	3
3.	510213	Construction Project Management	70	20	10	-	-	-	-	-	-	-	-	100	3	-	-	3
4.		##Elective - II	-	-	-	-	-	25	75	-	-	-	-	100	3	-	-	3
5.		**Open Category Course (OC-2)	70	20	10	-	-	-	-	-	-	-	-	100	3	-	-	3
6.	510219	Computational Laboratory for Construction Management	-	-	-	90	60	-	-	-	-	-	-	150	-	-	4	4
7.	510220	S Self Learning / Presentation	-	-	-	-	100	-	-	-	-	-	-	100	-	-	2	2
		<b>Total</b>	<b>280</b>	<b>80</b>	<b>40</b>	<b>90</b>	<b>160</b>	<b>25</b>	<b>75</b>	<b>25</b>	<b>75</b>	<b>75</b>	<b>750</b>	<b>15</b>	<b>6</b>	<b>21</b>		

##Elective-II C through SWAYAM / NPTEL / MOOC based learning platform (with credit transfer facility)  
TENTATIVE COURSE LIST (will be finalized once final list of MOOC course is available in Nov. 2020)

- 510214. Scheduling of Repetitive Construction projects
- 510215. Durability and Repair of Concrete Structures
- 510216. Project Procurement System.

\*\*Open Category Course (OC-2) will have to be opted from the pool of open courses (offered by other than parent department) and based on interdisciplinary aspects.

- 510217. Fire Engineering and Design
- 510218. Sustainable Materials and Green Buildings

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

\*Self learning / presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students has assessment will be based on **Internal** (ACADEMICS)





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**W/E F JULY 2020**


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

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted						MOOCs	Total Marks	Contact Hours per week			Total Credits		
			Theory Slot			Practical Slot					Assignment	Exam	L		T	P
			End Sem.	Mid Sem.	Quiz/Assignment	End Sem. /Practical Viva	Sessional Work/ Practical Record/ Assignment/ Quiz/ Presentation									
1.	510311	Dissertation Part-I (Literature Review/ Problem Foundation/ Synopsis/survey paper, etc.)	-	-	-	150	100		250	-	-	10	10			
2.	510312	*MOOC Course	-	-	-	150	100	25	100	75	-	-	02			
		<b>Total</b>						25	350	-	-	12	12			

\*MOOC course will be treated as the course of open nature and will be decided by concerning department / BoS



  
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**W.E.F JULY 2020**

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

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
			Theory Slot		Practical Slot				L	T	P	
			End Sem.	Mid Sem.	Quiz/ Assignment	End Sem. /Practical Viva	Sessional Work/ Practical Record/ Assignment/ Quiz/ Presentation					
1.	510405	Dissertation Part-II	-	-	-	300	200	500	-	-	14	14
		<b>Total</b>	-	-	-	300	200	500	-	-	14	14

  
  
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# **Syllabus**

**w.e.f. July 2020 Admitted onward  
batches**

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# **Semester-I**



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**Course Code: 510112**

**Course Name: Construction Materials & Machines**

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To study the properties, design and production of various types of concrete i.e. cement
2. To understand the applications of polymeric materials, additives, admixtures.
3. To understand management of equipments used in construction industry.
4. To learn the design & methods of various foundations.
5. To study the design & manufacturing of various types of formwork and prefabricated components
6. To understand the concept of Modular coordination.

**Syllabus:**

**Unit-I**

**Construction Materials & Concrete:** Physical properties of construction materials and testing in field and laboratory as per IS code. Design and production of concrete its manufacture eg. Batching, Mixing, Transporting, Placing compacting and curing. Design and production of high strength Ready mix concrete.

**Unit-II**

**New Construction Materials:** Polymeric materials, Polymer concrete, Additives and admixtures in concrete, Light weight, Heavy and no fine concrete, Ferro cement and fiber reinforced concrete, high performance concrete and composite materials, roller compacted concrete.

**Unit-III**

**Construction Equipments:** Construction equipments and its characteristics, Operation and selection. Different types of construction equipments eg. Power shovels, drag lines, Scrapper, Bulldozer, Tractor, Rippers, Motor graders, aggregate processing and batching plants, Cycle time and capacity ratings, Sizing and matching, Hot Mix plant, RMC Plant.

**Unit-IV**

**Foundations:** Techniques of construction of piles, Cassions, Wells. Cofferdams and diaphragms, Drilling blasting, Underpinning, Shoring and shuttering of foundation.

**Formwork:** Design and construction of different types of formworks and temporary structures, Stationary and slip formwork techniques, Formwork of special structures eg. Shells, Bridges, Towers etc.

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**Unit-V**

**Steel Construction, Prefabrication & Prestressing:** Fabrication and erection (Shop and in situ construction techniques). Erection of steel structures like bridges, Chimneys and trusses.

Application of prefabrication in construction Modular coordination and standardization; Special equipments and plants for industrial production of prefabricated components.

Prestressing methods, Special equipments and plants for industrial production of prestressed components.

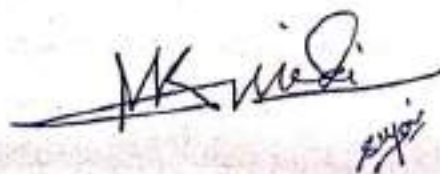
**Course Outcomes:**

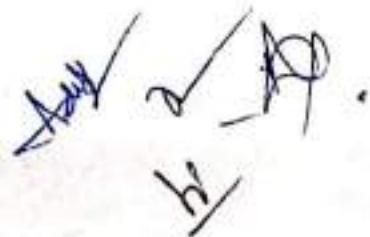
Upon completion of the course, the students will be able to:

- CO 1: **Explain** the advanced elements of buildings, engg. materials & construction.
- CO 2: **Distinguish** the suitability of different foundations in Civil Engineering structure.
- CO 3: **Evaluate** the properties of various types of concrete in construction industry accordingly.
- CO 4: **Apply** various techniques for prefabrication & pre-engineered elements of building and modular coordination and standardization.
- CO 5: **Design** different types of formwork as per their suitability.
- CO 6: **Describe** various methods for design mix of concrete & equipment management.

**Reference Books:**

1. D. G. Gransberg, C. M. Popescu and R. C. Ryan, Construction equipment management for engineers, estimators, and owners, Taylor & Francis, New York, 2006.
2. R. L. Peurifoy, C. J. Schexnayder, A. Shapira and R. Schmitt, Construction planning, equipment, and methods, 8<sup>th</sup> ed., McGraw Hill, New York, 2010.
3. V. Shantha Kumar, Concrete, Oxford University press.
4. A.M. Neville. Properties of concrete, Pearson
5. M.L. Gambhir, Concrete Technology, Tata Mc Graw Hill Pub. Co.
6. Soil Mechanics by Gopal Ranjan , New Age Publishers.
7. Mahesh Verma, Construction Equipment, its planning & Application, Metropolitan Book Co.(P) Ltd.,
8. Foundation Design Manual by Narayan V. Nayak
9. Prestressed concrete by Rajagopalan
10. Prestressed concrete by T.Y. Lin
11. Highway Engg by Justo and Khanna.







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**Course Code: 510113**

**Course Name: Contract Management**

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To understand specification writing, rate analysis and estimating.
2. To understand necessity and methods of valuation.
3. To understand role of Architect, Engineer, Contractor and Owner in a construction project.
4. To know about different acts related to construction.
5. To know about various laws related to construction labour.
6. To know about important conditions of contract in construction.
7. To understand the construction contracts used in infrastructure projects.

**Syllabus:**

**Unit-I**

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

**Unit-II**

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

**Unit-III**

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

**Unit-IV**

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

**Unit-V**

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

**Course Outcomes:**

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

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

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

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

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

CO5: Draft tender document for construction project.

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

### Reference Books:

1. Construction Engineering and Management by S. Seetharaman, Publisher Umesh Pub.
2. Construction Planning and Management by B. Sengupta, Pub. Tata McGraw-Hill Education
3. Construction and Project Management Theory And Practices by N.K. Jha, Pub. Pearson Education India
4. Construction Contracts by Jimmie Hinze, Publisher Tata McGraw-Hill Education
5. Estimating and Costing by B.N. Datta

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Course Code: 510114

Course Name: Maintenance Management

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To learn about building services required in a building.
2. To learn about fire fighting systems in buildings.
3. To understand planning and maintenance requirements of lifts in high rise buildings.
4. To understand water management and planning system in a building.
5. To learn maintenance of building services and management of related tasks.

**Syllabus:**

**Unit I**

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

**Unit II**

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

**Unit III**

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

**Unit IV**

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

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## Unit V

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

### Course Outcome:

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

- CO1: Identify various services required in a building.
- CO2: Carry out planning of fire fighting system for a building.
- CO3: Develop a management strategy for maintenance of building services in a building.
- CO4: Design a sustainable building services plan for a building.

### Reference Books:

1. Building services Design and Management by Jackie Partman, Willey Blackwell 2014.
2. Building Services Engineering by David V .Chadderton, Routledge 2013.

*MK Mehta*  
*Author*      *Dr. P. K. Singh*      *Dr. J. K. Singh*



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Course Code: 510115

Course Name: Infrastructure Development

L	T	P	C
3	-	-	3

**Course Objectives:**

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

**Syllabus:**

**Unit-I**

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

**Unit -II**

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

**Unit-III**

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

**Unit-IV**

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

**Unit - V**

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

**Course Outcomes:**

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

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

**CO2:** Identify various risks in Infrastructure projects.

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

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

**Reference Books:**

1. Infrastructure Development and Financing in India by N Mani Publisher Rediff books, 2012
2. Risk Management in Civil Infrastructure by Mohammed M. Ettouney, Shreenivas Alampalli. Publisher CRC Press Taylor and Francis group, 2017.
3. Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation by W. Ronald Mudson, Ralph Haas. Publisher Mc Graw-Hill, 1997
4. Disaster Resilience Management of Infrastructure System: Computational modeling and Geospatial Technologies by W Waheed Uddin Publisher CRC Press LLC.

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**Course Code: 510116**

**Course Name: Formwork for Concrete Structures**

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To know about various formworks for concrete structure.
2. To know about various issues in formworks and subsequent solutions.

**Syllabus:**

**Unit-1 Introduction**

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

**Unit-2 Formwork for building components**

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

**Unit-3 Formwork for special structure**

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

**Unit-4 MIVAN Formwork**

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

**Unit-5 Issues and failure of Formwork**

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

**Course Outcomes:**

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

- CO1: Explain the concept of formworks.
- CO2: Explain various types of formworks.
- CO3: Evaluate the use of formworks in various structures.

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CO4: Assess the failure issues in formworks.

**Reference Books:**

1. Jha, K.N., Formwork for Concrete Structures, First Edition, McGraw Hill. 2012
2. Austin, C.K., Formwork for concrete, Cleaver - Hume Press Ltd., London, 1996
3. Michael P. Hurst, Construction Press, London and New York. 2003

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**Course Code: 510117**

**Course Name: Organizational Behaviour & Management**

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To know the environment levels in management.
2. To explore the organizational structure and its design.
3. To understand the stress management and communication.
4. To explore the leadership quality for updating the organisation structure.
5. To compare and explore the existing management activity in the world.

**Syllabus:**

**Unit - I:**

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

**Unit-II**

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

**Unit - III**

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

**Unit - IV**

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

**Unit - V**

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

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## Course Outcomes:

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

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

## Recommended Books:

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

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Course Code: ~~510118~~ 800109

Course Name: Safety & Quality Management

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To study the basics of quality and safety management.
2. To learn the code of practice in design and construction for quality standards.
3. To understand and evaluate quality and safety management principles and best practices in construction.
4. To understand and evaluate safety management principles in construction;
5. To acquire good basic practices for quality system and progress for quality assurance and quality improvement for construction companies.

**Syllabus:**

**Unit - I**

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

**Unit - II**

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

**Unit - III**

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

**Quality Assurance and Quality Improvement Techniques:**

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

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**Unit – IV**

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

**Unit-V**

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

**Course Outcomes:**

After this course, students will be able to:

- CO 1:** Explain the quality management systems and utilize the ISO 9000 family of standards.
- CO 2:** Improve the quality of the project through tools and techniques.
- CO 3:** Perform the environmental impact assessment (EIA) for construction projects towards quality.
- CO 4:** Analyse the quality assurance and quality control, quality improvement tools and techniques;
- CO 5:** Evaluate the contract and inspection procedures.
- CO 6:** Identify the safety management practices in construction industry.

**Reference Books:**

1. B. G. Dale, Managing quality, 4th ed., Blackwell Publishing, Oxford, 2003.
2. D. Reese and J. V. Eidson, Handbook of OSHA construction safety and health, 2nd ed., CRC Press, Bocaaton, 2006.
3. F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6th ed., Blackwell Publishing, Oxford, 2006
4. K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction management fundamentals, 2nd ed., McGraw Hill, New York, 2008.
5. S. J. Holt, Principles of construction safety, Blackwell Publishing, Oxford, 2008.
6. The Management and Control of Quality: Sixth edition: James R. Evans, William M. Lindsay.
7. Safety management by John V. Grimaldi Rollin H. Simonds.
8. ISO 9000 family of standards.

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**Course Code: 510119**

**Course Name: Construction Lab**

L	T	P	C
-	-	4	2

**Course Objectives:**

1. To Study and understanding basic knowledge of building materials, such as their identification and classification, relationships between physical characteristics and mechanical properties experimentally measuring them.
2. To understand the role of water in soil and concrete behavior.
3. To understand the concrete mix design and testing; non-destructive testing methods; Studies on simple building system components

**List of Experiments:**

1. Mix Design of Concrete
2. Permeability Test of Concrete
3. Creep Test of Concrete
4. Measurement of In-situ Strength determination by Rebound Hammer and Moisture content in aggregates, soil and hardened concrete surface using NDT techniques.
5. Unconfined Compression Test
6. Direct Shear Test
7. Static Cone Penetration Test
8. Triaxial Shear Test  
(Unconsolidated Undrained, Consolidated Undrained, Consolidated Drained)
9. Vane Shear Test
10. C.B.R. Test of Soil
11. Consolidation Test
12. SPT Test (Demonstration)
13. Marshall stability test of bitumen

**Course Outcomes:**

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

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

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

CO3: Differentiate the flow properties and stresses of soil.

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

## Reference Books:

1. Metha P.K and Monteiro. P.J.M, " CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006
2. Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006
3. Neville. A.M., " Properties of Concrete", 4th Edition Longman,1995
4. Soil Mech. & Found. Engg., Dr. K. R. Arora, Std. Publishers Delhi, 7<sup>th</sup> edition 2014
5. Soil Mech. & Foundation, Dr. B. C. Purnia, Laxmi Publications, Delhi, 16<sup>th</sup> edition 2017
6. Soil Mech. & Found Engg., S. K. Garg, Khanna Publishers, Delhi, 1st edition, 2003
7. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc., 1969



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**Course Code: 510120**

**Course Name: Self Learning / Presentation**

L	T	P	Credit
0	0	2	1

**Course Objectives:**

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

**Syllabus:**

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

**Course Outcomes:**

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

- CO 1:** Analyze contemporary issues in civil engineering/CTM & its allied areas through literature survey.
- CO 2:** Distinguish state of art & relevance of the topic in national & international arena.
- CO 3:** Demonstrate good oral & written communication skills.
- CO 4:** Develop poster and power point presentations for effective communication.
- CO 5:** Display lifelong learning.

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# Semester-II



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**Course Code: 510211**

**Course Name: Projects Economics & Financing**

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To understand managerial economics.
2. To understand demand analysis and forecasting in construction industry.
3. To understand Time value of money and Cost of Capital.
4. To understand budgeting of construction projects.
5. To understand selection and evaluation of construction projects.
6. To understand project financing and risk.
7. To understand the accounting processes in construction industry.

**Syllabus:**

**Unit-I**

**Basic Economic Theories:** Principles of managerial economics, Economic theories, Demand analysis and forecasting, Demand elasticity, Cost and production analysis, Production function, Pricing decisions, Policies & practice.

**Unit-II**

**Money:** Time value of money, Different methods & comparisons, Cash flow, discounted cash flow, cash flow forecasting, Financial ratios and statements, Cost of Capital.

**Unit-III**

**Capital Budgeting:** Working capital, Capital budgeting and performance budgeting, Break even analysis, Project selection, Project appraisals

**Unit-IV**

**Project Financing:** Means of Finance, Financial institutions in India, Policies of financial institutions, Financial assistance, Special schemes, Project risk

**Unit-V**

**Financial Accounting:** Book keeping processes of construction industry, Accountancy cycle, Journals, Forms and ledgers etc. for accounting and monitoring labour, equipment and material costs, PWD accounting procedure and types of financial statements in Government.

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*Asst. Prof.*  
*Dr. P. K. Singh*

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**Course Outcomes:**

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

- CO1: Apply** principles of managerial economics.
- CO2: Perform** demand analysis in construction sector.
- CO3: Workout** time value of money and cost of capital.
- CO4: Analyze** break-even point and appraisal of projects.
- CO5: Determine** appropriate means of financing a project.
- CO6: Monitor** the various cost components of construction projects by using accounting procedures.

**Reference Books:**

1. Project Planning, Analysis, Selection, Financing, Implementation & Review by Prasanna Chandra, Publisher Tata McGraw-Hill Education.
2. Engineering Economics & Analysis, by Donald G Newnan, Publisher Oxford University Press.
3. Economic Theory and The Construction Industry by P. Hillebrandt, Publisher Palgrave Macmillan UK
4. Construction Economics: A New Approach by Danny Myers, Publisher Routledge
5. Construction and Project Management Theory And Practices by K.N. Jha, Publisher Pearson Education India
6. Construction Project Management: Planning, Scheduling and Controlling by K.K. Chitkara, Publisher Tata McGraw-Hill Education

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Course Code: 510212

Course Name: Construction Cost Management

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To know about the trade-offs in construction projects.
2. To explore the time cost trade-off.
3. To understand the multi-objective optimization techniques.
4. To discuss the MCDM methods.
5. To apply the value engineering and productivity in construction.

**Syllabus:**

**Unit-I**

**Trade off Analysis in construction project:** Development of Network. Time-cost trade off curves. Non - convex discontinuous and discrete cost time trade - off curves. Crashing of projects. Resource-constrained project scheduling. Multi-objective trade-off problems. Introduction to deterministic, heuristic and meta-heuristics methods for making multi-objective trade-off. Siemen's method of project cost curve.

**Unit - II**

**Multi criteria Decision Making Methods:** Analytical Hierarchy Process, and its application in planning and management, Introduction to Fuzzy Set Theory and its Application in MCDM.

**Unit-III**

**Multi-objective optimization methods:** Single and multi-objective optimization problems. Pareto-optimality. Introduction to NSGA. Selection. Crossover. Mutation. Non-dominated Sorting. Differences among GA, MOGA, NSGA, NSGA-II. Particle Swarm Optimization. Particle and its position. Local best and global best position. Updating the position of particle. Multi-objective PSO.

**Unit-IV**

**Productivity in Construction:** Definition of Productivity. Productivity measurements. Productivity of production components, Labors, Equipment and Material Capital Productivity. Need for Productivity Planning - Short term and long term productivity planning, Productivity improvement approaches, Productivity Improvement techniques - Technology based, Material based, Employee based and Product based

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**Unit-V**

**Value Engineering:** Principles of value engineering in Project Management, Value engineering team, Value engineering technique, Job Plans, Role of value engineering in productivity, Life cycle costing and its applications.

**Course Outcomes:**

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

- CO1: Explain** the concept of trade-off in construction.
- CO2: Analyze** the trade-off phenomenon in construction using MCDM.
- CO3: Evaluate** the multi-objective trade-off problems using metaheuristic methods.
- CO4: Apply** the value engineering and LCC in construction projects.
- CO5: Evaluate** the labour, material and equipment in construction productivity.

**Recommended Books:**

1. Golden, Bruce L., Wasil, Edward A., Harker, Patrick T. (Eds.) The Analytic Hierarchy Process, Springer.
2. Joseph J. Moder., PROJECT MANAGEMENT with CPM, PERT and Precedence Diagramming.
3. S. Rajasekaran. and G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Logic, and Evolutionary algorithms". Eastern Economic edition.
4. Kalyanamoy Deb, "Multi-objective optimization using evolutionary algorithms". Wiley.
5. Sumanth, D.J, Productivity Engineering and Management, TMH, New Delhi, 1990
6. Sudit, Ephraim F., "Productivity Based Management", Springer 1984
7. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997.
8. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.

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**Course Code: 510213**

**Course Name: Construction Project Management**

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To know about the basic of project management and project organization.
2. To understand the project planning process, project networks and its analysis through CPM.
3. To understand the method of PERT and Precedence Network analysis for scheduling of const.
4. To plan and manage the resources and discuss the cost control in project's perspective.
5. To discuss the material, inventory and risk management in construction.

**Syllabus:**

**Unit-I**

**Project Management:** Construction Project and its phases. Importance of construction and construction Industries. Construction Project Management and its Relevance, Stakeholders of construction project. Management Information System and its Application in Construction.

**Project Organization:** Construction Organizations and its forms. Structure of Construction Organization. Management Levels. Traits of a Project Manager. Ethical Conduct for Engineers. Factors behind the success of construction projects and construction organizations. Introduction to Claim, Dispute and Project Closure.

**Unit - II**

**Project Planning and Network Analysis:** Introduction to Project Planning Process. Types of Project Plans. Network techniques- Gantt Chart, Mile stone Chart, Work Breakdown structure, AOA & AON networks. Event and Activities. Numbering of events. Event times - Earliest events time and latest event time. Slack, critical events. Activity times - Earliest start time, Latest finish time, Float and critical activities. Network critical path and its significance. Network analysis by CPM - Defining scope of work, determining activities, preparation of network logic program and draft network. Development of structured network using network drawing rules, Numbering of events and computation of critical path. Numerical problems.

**Unit-III**

**PERT:** Introduction to PERT. Difference between CPM and PERT. Uncertainty in project duration estimation. Three time estimate in PERT. Frequency distribution curves for activity duration. Computation of expected time, standard deviation and variance. Critical limit theorem and critical path determination. Event time, slack and computation of completion probability of project.

*AK Mehta*  
*Mr*

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**Precedence Network (PN):** Introduction to PN. Precedence relationship between activities. Precedence Network Analysis – Modeling procedure analysis of time in PN. Use of PN in repetitive works network. Difference between PN and CPM.

### Unit-IV

**Resource Planning:** Planning construction Manpower, Scheduling Construction site workers. Planning Construction Materials quantity estimation. Constrained and unconstrained resource scheduling. Resource usage profile, Resource smoothing. Resource leveling.

**Cost Control:** Project cost, Direct and indirect, slope of direct cost curve, Total project cost and optimum duration, Contracting the network for cost optimization. Escalate & Variation in prices.

### Unit-V

**Materials & Inventory Management:** Introduction to Material management. Material Procurement Process. Material Management Functions. Inventory management in construction.

**Risk and Insurance in Construction:** Introduction to Risk and Risk Management in construction. Risk Identification Process. Risk Analysis and Evaluation Process. Risk Treatment Strategies. Different Insurances in Construction Companies.

### Course Outcomes:

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

**CO1:** Identify the various approaches of project management and organization structure.

**CO2:** Classify the various project network techniques and its applicability in project management.

**CO3:** Analysis and schedule the project using PERT and PN method.

**CO4:** Determine the applicability of resources and finding the optimum cost and optimum project duration.

**CO5:** Apply the concepts of material, inventory and risk management tools in construction project.

### Reference Books:

1. Construction Project Management by K.N Jha
2. C.P.M & PERT by L.S. Srinath.
3. Construction Management by Sen & Gupta.
4. Project Planning and control with PERT and CPM by BC Punmia, K. K. Khandelwal.
5. CPM & PERT by Weist & Levy
6. DDOT Construction management Manual.
7. Project Management and design administration manual by Design construction division.
8. Construction Project Management Handbook: Federal Transit Administration -US





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Course Code: ~~510278~~ 800 208

Course Name: Sustainable Material & Green Building

L	T	P	C
3	-	-	3

**Course Objectives:**

1. To study the properties of various types of sustainable materials in construction.
2. To learn the code of practice and guidelines for green buildings.
3. To select of different types of sustainable construction practices.
4. To understand the alignment of the current practices with the sustainable development goals.
5. To learn the field problems of sustainability in the construction sector.

**Syllabus:**

**Unit-I**

**Sustainable Materials:** Sources, methods of production and environmental implications of building materials; Embodied Energy in Building Materials; Transportation Energy for Building Materials; Maintenance Energy for Buildings; Material cycles in construction, life cycle impacts of materials and products, life cycle assessment of buildings; Resources for Sustainable Building Materials.

**Unit-II**

**Green Buildings:** Concept of Green building, Principles of green buildings, Bureau of energy efficiency; Functions, policies, guidelines, Energy Conservation Building Code; Certification systems - Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED), transforming the existing buildings to sustainable buildings based on GRIHA EB Manual: Criteria and their weightage, site parameters, maintenance and housekeeping, energy, water efficiency, human health and comfort.

**Unit-III**

**Green Construction Practices & Technologies:** Comparative analysis between the traditional and sustainable construction practices, Concrete versus steel technology suitability; Life cycle analysis of technologies; Sustainable Construction Technologies; Waste-based /recycled materials and technologies.

**Unit-IV**

**Sustainable Development Goals and Policies:** Sustainable consumption and production (Goal 12), Sustainability issues for concrete, Operational energy in building role of materials and thermal

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conductivity, Recycling of Industrial and Buildings Wastes, Biomass Resources for buildings, Need and framing of Policies and action plans to reduce construction and demolition waste.

**Unit-V**

**Recent trends and Case studies:**

**Case studies and examples:** Study of existing green buildings-Energy auditing; Green building approaches on field through case studies; Performance rating systems; Environmental impact studies of building projects.

**Recent Trends:** Introduction to softwares used in green buildings, carbon calculators, Role of Building Automation and performance enhancement, Integrated building management system.

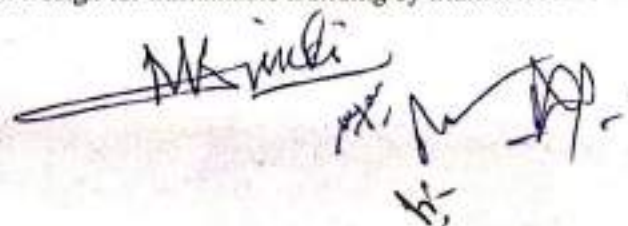
**Course Outcomes:**

After this course, students will be able to:

- CO 1:** Explain the properties of various types of sustainable materials used in construction industry accordingly.
- CO 2:** Distinguish the suitability of sustainable and green practices in construction sector.
- CO 3:** Perform the environmental impact assessment (EIA) for construction projects towards quality.
- CO 4:** Assess an existing building on the norms available by GRIHA for transforming existing buildings to sustainable buildings.
- CO 5:** Examine the impact of building materials choices by auditing the resources used to maintain the materials in their building and discussing the economic, environmental, and health impacts.
- CO 6:** Identify the potential of construction and demolition wastes in order to meet the sustainable development goals.

**Reference Books:**

1. Green Rating for Integrated Habitat Assessment (GRIHA) guidelines
2. Energy Conservation Building Codes: [www.bec-india.nic.in](http://www.bec-india.nic.in)
3. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, Green Building, Handbook, Volume I, Spon Press, 2003
4. Kibert, C. "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2005
5. Chaturvedi, Swati, and John Ochsendorf. "Global Environmental Impacts due to Cement and Steel." *Structural Engineering International* (August 2004)
6. Jerry Yudelson Green building Through Integrated Design. McGraw Hill. 2009.
7. Fundamentals of Integrated Design for Sustainable Building by Marian Keeler, Bill





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Burke

8. Renewable Energy and Environment -A Policy Analysis for India, H, Ravindranath, K Usha Rao, B Natarajan, P Monga, Tata McGraw Hill, 2000
9. Gambhir M.L., Neha Jamwal, Building Materials: Products, Properties and Systems, McGraw Hill Education(India) Private Limited, 2014.
10. Varghese P.C., Building Materials, PHI Learning Pvt. Ltd., Delhi, 2015.
11. Advances in Building Materials and Construction, Central Building Research Institute, Roorkee, 2004.
12. Duggal S.K., Building Materials, New Age Publishers, 2012
13. Rangwala, Engineering Materials, Charotar Publishers, 2015

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**Course Code: 510219**

**Course Name: Computational Laboratory For Construction Management**

L	T	P	C
-	-	4	2

**Course Objectives:**

1. To know and apply the use of software in construction projects such as MATLAB, Primavera, BIM 4D, MS PROJECT and Excel

**List of Experiments:**

1. Introduction to MATLAB and its application.
2. MS Project and its application.
3. Primavera and its application in networking and scheduling.
4. Basics of BIM 4D.
5. Excel and its application.
6. Case study analysis using Primavera, BIM 4D and MS Project.

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**Course Outcomes:**

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

- CO1: Apply MATLAB in Construction Projects
- CO2: Apply Primavera and MS project in Construction Projects.
- CO3: Apply BIM 4D in Construction Projects.

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Course Code: 510220

Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

## Course Objectives:

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

## Syllabus:

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

## Course Outcomes:

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

- CO 1: Analyze contemporary issues in civil engineering/CTM & its allied areas through literature survey.
- CO 2: Distinguish state of art & relevance of the topic in national & international arena.
- CO 3: Demonstrate good oral & written communication skills.
- CO 4: Develop poster and power point presentations for effective communication.
- CO 5: Display lifelong learning.

*Ms. Meeta*  
*Dr. ...*  
*Dr. ...*  
*Dr. ...*

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**W.E.F JULY 2020**

ANNEXURE - V

**Master of Technology in Environmental Engineering (Semester - I)**

Scheme of Examination

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

#Elective - I

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

\* Open Category Course (OC-1) will have to be opted from the pool of open courses and based on interdisciplinary aspects.  
8010 530117. Sustainable Waste Management System.

*Do not start labs, students have to perform practical/assignments/ minor projects related to theory subjects/theoretical concepts of respective semester using recent technologies / languages / tools etc.*

\*Self learning / presentation through SWAYAM / NPTEL. (Registration in a course will be compulsory for students but assessment will be based on Internal/External/ACADEMICS)


  
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**Master of Technology in Environmental Engineering (Semester – II)**

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted										Total Marks	Contact Periods per week			Total Credits
			Theory Slot			Practical Slot			MIOOCs					L	T	P	
			End Sem	Mid Sem	Quiz/Assignment	End Sem	Lab Work / Sessional	Assignment	Exam	Exam							
1.	530211	Air Pollution & Noise Pollution	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
2.	530212	Advanced Treatment Process – II (Water Supply Engineering)	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
3.	530213	Environmental Impact Assessment & Ethics	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
4.		##Elective - II	-	-	-	-	-	-	-	-	25	75	100	3	-	-	3
5.		##Open Category Course (OC-2)	70	20	10	-	-	-	-	-	-	-	100	3	-	-	3
6.	530217	Advanced Environmental Engineering Lab	-	-	-	-	90	60	-	-	-	-	150	-	-	4	4
7.	530218	S Self Learning / Presentation	-	-	-	-	-	100	-	-	-	-	100	-	-	-	2
		<b>Total</b>	<b>280</b>	<b>80</b>	<b>40</b>	<b>90</b>	<b>160</b>	<b>25</b>	<b>75</b>	<b>25</b>	<b>75</b>	<b>750</b>	<b>15</b>	<b>6</b>	<b>21</b>		

##Elective-II Through SWAYAM / NPTEL / MOOC based learning platform (with credit transfer facility)

TENTATIVE COURSE LIST (Will be finalized once final list of MOOC course is available in Nov. 2020)

- 530214. Plastic Waste Management ✓
- 530215. Electronic Waste Management

\*\*Open Category Course (OC-2) will have to be opted from the pool of open courses and based on interdisciplinary aspects.

- 530216. Global Climatic Changes & Disaster Management

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

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

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**W.E.F JULY 2020**

**Master of Technology in Environmental Engineering (Semester - IV)**

Scheme of Examination

S. No.	Subject Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
			Theory Slot		Practical Slot				L	T	P	
			End Sem.	Mid Sem.	Quiz/Assignment	End Sem./Practical Viva	Sessional Work/Practical Record/Assignment/Quiz/Presentation					
1.	530405	Dissertation Part-II	-	-	-	300	200	500	-	-	14	14
		Total	-	-	-	300	200	500	-	-	14	14


  
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# **Syllabus**

**w.e.f. July 2020 Admitted onward batches**



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# Semester-I

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Course Code: 530111

Course Name: Environmental Chemistry & Microbiology

L	T	P	Credit
3	0	0	3

## Course Objectives:

- 1) To impart knowledge of environmental chemistry and its concepts.
- 2) To apply concepts of environmental chemistry in various analysis of water and waste water.
- 3) To impart knowledge of environmental microbiology and its concepts.
- 4) To apply concepts of environmental microbiology in various analysis of water and waste water.

## Syllabus:

### Unit I:

#### Environmental Chemistry

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

### Unit II:

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

### Unit III:

#### Environmental Microbiology

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

### Unit IV:

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

### Unit V:

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

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### Course Outcomes:

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

- CO 1: Explain the concepts of environmental chemistry & microbiology.
- CO 2: Apply the concepts of environmental chemistry in environmental engineering.
- CO 3: Analyse water and waste water quality parameters using the concepts of environmental chemistry.
- CO 4: Apply the concepts of environmental microbiology in environmental engineering.
- CO 5: Explain the concepts of energy generation in cells.

### Books Recommended:

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

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Course Code: 530112

Course Name: Solid and Hazardous Waste Management

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To provide broad knowledge on various aspects of planning & implementation of waste management system in a smart city/town.
- 2) To understand the principles applied in waste management.
- 3) To understand various ways to collect, treat & disposal of waste.
- 4) To understand various methods of energy recovery from waste.
- 5) To understand various aspects of hazardous waste management, E-waste management, biomedical waste management etc.

**Syllabus:**

**Unit I:**

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

**Unit II:**

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

**Unit III:**

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

**Unit IV:**

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

**Unit V:**

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

**Course Outcomes:**

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

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

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CO 2: Apply various techniques of handling the waste.

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

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

**Text Books:**

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

**Reference Books:**

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

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Course Code: 530113

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

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To impart basic knowledge on sewerage system including estimation of sewage quantity & design of sewers.
- 2) To provide a broad knowledge on sewage composition & its characteristics.
- 3) To provide information on disposal standards of effluents & also about various methods of sewage disposal.
- 4) To provide broad knowledge on various techniques of sewage treatment including advanced processes.

**Syllabus:**

**Unit I:**

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

**Unit II:**

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

**Unit III:**

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

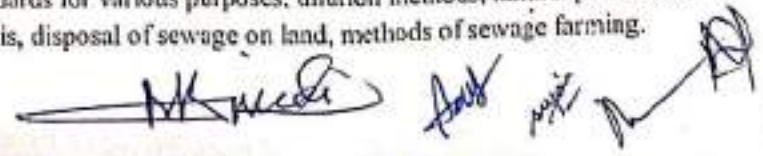
**Unit IV:**

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

**Unit V:**

Sludge treatment: sources of sludge, sludge quantity & quality, sludge thickening and digestion, various methods of sludge treatment, sludge drying beds, sludge disposal.

Sewage disposal: stream & effluent standards for various purposes, dilution methods, natural purification of stream, oxygen sag curve & its analysis, disposal of sewage on land, methods of sewage farming.

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## Course Outcomes:

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

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

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

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

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

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

## Text Books:

1. Sewage Disposal & Air Pollution Engineering, S. K. Garg, Khanna Publishers, 2016
2. Metcalf & Eddy, Inc. Wastewater Engineering, Treatment and Reuse, 3rd Edition, Tata McGraw-Hill, New Delhi, 2003.

## Reference Books:

1. Waste Water Engineering, B.C. Punmia, Laxmi Publication.
2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, New Delhi
3. Wastewater Treatment Plant, Planning Design & Operation, S.R. Qasim, CRC Press, 1998
4. CPHEEO, Manual on Sewerage and Sewage Treatment, Ministry of Urban Development, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2013.





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Course Code: 530114

Course Name: Industrial Waste Management

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To provide broad knowledge on various methods of sewage disposal, their effects on water pollution & also provide information on various disposal standards.
- 2) To learn the basics of sewage composition & its characteristics.
- 3) To provide knowledge on various waste water treatment techniques.
- 4) To provide broad knowledge on common effluent treatment plants, wastewater reuse, waste audit.
- 5) To provide information about various existing waste treatment & management techniques of various industries.

**Syllabus:**

**Unit-I:**

Effects of wastes on streams and sewage treatment plant, natural purification of streams, oxygen sag curve, allowable organic load on streams, classification of stream, stream standards and effluent standards requirement of water for different purposes.

**Unit-II:**

Sampling of waste waters, Grab, Composite and Integrated samples, analysis of waste water, Biochemical Oxygen Demand, Chemical Oxygen Demand and pH value of waste water, Toxicity of waste by Bioassay method.

**Pre-treatment of Wastes:** Volume and strength reduction, source reduction of wastes, salvage of materials, recovery of by products, reuse of waste water.

**Unit-III:**

Equalization, Neutralization, Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge treatment & disposal. Advance methods of treatment such as Adsorption, Reverse Osmosis, Ion Exchange Process, Electro Dialysis, etc.

**Unit-IV:**

Industrial Waste water and environmental impacts, Industrial waste survey, Industrial and common effluent treatment plants, zero effluent discharge systems, Waste management approach, Waste Audit - Evaluation of pollution prevention options.

**Unit-V:**

Brief study of industrial processes and treatment methods of waste water from common industries such as Textile, Dairy, Paper and pulp, Tannery, Distillery, petrochemicals, pharmaceuticals, fertilizers, cement & food processing.

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**Course Outcomes:**

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

- CO1: Explain basic concepts of industrial waste management.
- CO2: Evaluate the effects of industrial waste on streams as per the standards.
- CO3: Determine the requirements for safe disposal of sewage.
- CO4: Apply suitable techniques for reduction & treatment of industrial waste & sludge.
- CO5: Explain waste management techniques of different industries.

**Text Books:**

- 1. Industrial Waste Water Treatment – A.D. Patwardhan, PHI, Delhi
- 2. Waste Water Engg. – Treatment Disposal & Reuse – Metcalf & Eddy – Tata Mc Graw Hill, New Delhi
- 3. Industrial Water Pollution Control – W.W. Eckenfelder, McGraw Hill, 1999.

**Reference Books:**

- 1. Wastewater Treatment – M.N. Rao & Dutta, Oxford & IBH Publishing House, New Delhi.
- 2. Waste Water Treatment – Arceivala – Tata Mc Graw Hill, New Delhi, 2006.
- 3. Industrial Waste Water Management hand book – N.S. Azad, Tata Mc Graw Hill, New Delhi
- 4. Pollution Control in Process Industries – Mahajan, Tata McGraw Hill, Delhi, 1984
- 5. Liquid Waste of Industries – Theories, Practice and Treatment – N.L. Nemerow, Wesley Publishing Co.

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Below it, "AD" is written on the left, "hi" in the middle, and "24/01" on the right.  
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**Course Code: 530115**

**Course Title: Environmental Auditing & Management System**

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To provide broad knowledge on various aspects of environmental management system.
- 2) To understand the principles of environmental auditing and complete process.
- 3) To apply the concepts of LCA in environmental management.
- 4) To understand the EMS approach and ISO.
- 5) To understand various concepts of social accountability.

**Syllabus:**

**Unit I:** Concepts of Environmental Audit, objectives of audit, types of audit, features of effective auditing, audit criteria, elements of audit process, planning and organizing audits, pre-visit data collection, audit protocol, onsite audit, data sampling, inspection, evaluation and presentation, exit interview, audit report, action plan, management of audits, waste management contractor audits, environmental statement.

**Unit II:** Environmental audit in Industrial projects, case studies of environmental audits, Life cycle assessment approach (LCA), life cycle costing, eco labeling, stages in LCA of product, procedures for LCA, applications of LCA, sustainable approach towards environment management, green building & green energy concepts and management.

**Unit III:** Environmental Management Systems Approach (EMS): Introduction, principles & elements of successful environmental management, basic concepts of EMS approach, ISO principles, essential elements of an EMS & ISO 14001, benefits of an environmental management system, creating an EMS in line with ISO 14000.

**Unit IV:** Environmental Management Planning, EMS development and implementation project and plan, measurement and evaluations required for an EMS, environmental management reviews and improvements, legal and regulatory concerns, Integrating ISO 9000 & ISO14000, EMAS.

**Unit V:** Social Accountability: requirements, social accountability (SA) 8000 certification, elements of social management system, social policy, planning, implementation, business benefits, corporate social responsibility (CSR), different models.

**Course Outcomes:**

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

- CO1:** Illustrate the process of environmental auditing.
- CO2:** Demonstrate the environmental audit process in industry and other projects.
- CO3:** Explain the concepts of environmental management system approach through ISO guidelines.
- CO4:** Apply various environment management methodologies like LCA, social accountability.
- CO5:** Develop EMS in organizations and improve the existing EMS system.

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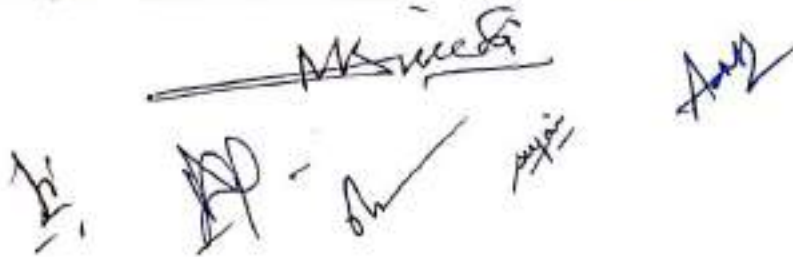
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## Text Books:

- 1) A. K. Shrivastava, Environmental Auditing, APH Publishing, 2003.
- 2) T.V. Ramachandra, Vijay Kulkarni, Environmental Management, TERI Press, 2009
- 3) Richard Welford, Corporate Environmental Management, Universities Press (India), 1996
- 4) Christopher Sheldon, Environmental Management Systems, Routledge Edition, 2006
- 5) Milton P Dentch, ISO 14001:2015 Implementation Handbook, ASQ, 2017

## Reference Books:

- 1) R. D. Tripathi, An Introduction to Environmental Audit, Alfa Publication.
- 2) Vasanthakumar, N.Bhat, Total Quality Environmental Management : An ISO 14000 Approach, Praeger publishers, 1998
- 3) Alan S. Morris, ISO 14000, Environmental Management Standards, Wiley International, 2003.
- 4) Syed Imtiaz Haider, Environmental Management System ISO 14001:2004, CRC Press, 2010
- 5) Deborah Leipziger, Social Accountability SA8000, Viva Books Private Limited, 2010
- 6) B Banerjee, Corporate Environmental Management, PHI Publications, 2009.

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Course Code: 530116

Course Name: Environmental Hydraulics

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To understand the concepts of fluid mechanics and apply them in pipe flow calculations.
- 2) To understand the principles of open channel flow and apply them in sewer system design.
- 3) To apply concepts of hydrology in estimation of storm water and its design.
- 4) To understand concepts of ground water hydraulics.
- 5) To understand concepts of pollutant transfer and estimation of pollution load in water bodies.

**Syllabus:**

**Unit I:**

Introduction to concepts of fluid flow – continuity equation, energy principle, momentum principle, frictional head loss, flow through pipes, major and minor energy losses in pipes, hydraulic gradient and total energy line, flow through pipe in series, parallel, equivalent pipe, water hammer pressure, design of water distribution pipe network using Hardy Cross method and equivalent pipe method.

**Unit II:**

Open channel flow and its classifications, critical flow computations, sub critical flow, super critical flow, uniform flow, gradually varied flow, most efficient/economical sections in channel, specific energy, hydraulic jump, hydraulic elements of sewer & design of sewers.

**Unit III:**

Introduction to Hydrology, Hydrological cycle, Precipitation measurement and analysis of data, runoff and its estimation, hydrograph – unit hydrograph, S-curve hydrograph, synthetic hydrograph, rational method, estimation of storm water quantity and design of storm water sewers.

**Unit IV:**

Ground water estimation & well hydraulics – confined & unconfined aquifers, governing equations for yield of well (Thiem's & Dupuit's), well loss & specific capacity, ground water recharge. Transport & transformation of contaminants in groundwater: processes, governing equations, and initial and boundary conditions, solution of simple cases.

Pumps and their classification, pump performance curves, selection of pumps, head, power & efficiency of pumps, economical diameter of rising main, pumping station and their designs.

**Unit V:**

Introduction to Pollutant transport process in surface water, standards for pollutant disposal in surface water, factors affecting pollutant transport and mixing in river – dilution, dispersion, oxidation, reduction etc., zone of pollution in river, mixing mechanism in river, sag curve, Streeter Phelps equation. Introduction to various software's for design of pipe networks & sewer lines.

**Course Outcomes:**

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

CO I: Apply fluid mechanics principles in analysis and design of pipe flow.

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CO 2: Apply principles of hydraulics for design of sewer lines.

CO 3: Apply principles of surface water hydrology for design of storm water sewer.

CO 4: Estimate groundwater quantity and pollution load on groundwater and surface water.

CO 5: Apply the principles of hydraulics in design of pumping stations and estimation of pollution load on rivers.

## Text Books:

1. Sewage Disposal & Air Pollution Engineering, S. K. Garg, Khanna Publishers, 2016
2. Water Supply Engineering, S.K. Garg, Khanna Publishers, 2016
3. Hydraulics & Fluid Mechanics, P.N. Modi & S.M. Seth, Standard Publishers, 2017

## Reference Books:

1. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, New Delhi
2. CPHEEO, Manual on Sewerage and Sewage Treatment, Ministry of Urban Development, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2013.
3. CPHEEO, Manual on Water Supply and Treatment, Ministry of Urban Development, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 1999.
4. Fluid Mechanics, A.K. Jain, Khanna Publishers, 2004.

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A.K. Jain  
S.K. Garg  
P.N. Modi  
S.M. Seth

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Course Code: ~~530117~~ 800110

Course Name: Sustainable Waste Management System

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To develop an understanding about the concepts of sustainability & sustainable development.
- 2) To understand the concepts of water conservation techniques.
- 3) To understand the concepts of wetlands & other natural wastewater treatment system.
- 4) To provide knowledge on various low cost sanitation methods & other sustainable waste management techniques.
- 5) To provide an insight into sustainable design of buildings.

**Syllabus:**

**Unit I:**

**Introduction:** Concept of sustainability in water and waste management, sustainable development, guidelines and strategies for implementing sustainable development, Pollution prevention & Cleaner production in achieving sustainability, Environmental indices - Bio remediation.

**Unit II:**

**Water Conservation:** Rainwater Harvesting – Roof water harvesting – Technology – Quality – Health issues – Groundwater recharge – Techniques – Case studies – Wastewater reuse and reclamation.

**Unit III:**

**Natural Wastewater Treatment Systems:** Centralized Vs decentralized – Natural and constructed wetlands – Different types – Mechanisms – Performance – Design – Case studies – Land treatment systems.

**Unit IV:**

**Low-Cost Sanitation:** Dry sanitation methods – Pit latrines – VIP latrines – Aquaprivy – Septic tank.

**Organic Solid Waste Management Techniques:** Composting/ Vermicomposting – Biogas technology – Plasma technology

**Unit V:**

**Green Design:** Green buildings - benefits and challenges; public policies and market-driven initiatives; Effective green specifications; Energy efficient design; Passive solar design; Green power; Green materials and Leadership in Energy and Environmental Design (LEED)

**Course Outcomes:**

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

- CO1: Illustrate the concepts of sustainability & sustainable development.
- CO2: Apply various methodologies of water conservation in field.
- CO3: Apply various natural methodologies of wastewater treatment like wetlands.
- CO4: Apply various low cost sanitation & other waste management techniques.

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Topic: Planning sustainable and green design of buildings.

## Reference Books:

1. C. O. F. L. Brooks E.J., Reed S.C., Natural wastewater Treatment Systems, CRC Taylor and Francis, 2006.
2. Panwar S., Leachem R. Environmental Health Engineering in the Tropics; John Wiley & Sons, 1994.
3. Arora S.P. Technical Handbook on Public Health Engineering, Deep Publishers, Simla, 2003.
4. Arora S.P., Anandh, D.N and Harrison, S.L., Environmental Systems – An Introductory Text, Chapman Hall, London, 1994.
5. Meehan J.T. Biological Degradation of Wastes, Elsevier Appl. Science, New York, 1991.
6. M.S. Muralidhar. Energy Efficient Buildings in India, TERI

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**Course Code: 530118**

**Course Name: Environmental Engineering Lab**

L	T	P	Credit
0	0	4	4

**Course Objectives:**

- 1) To acquire knowledge of various types of sampling, its procedure including its preservation.
- 2) To acquire skills to determine various physical, chemical & biological characteristics of water.

**Syllabus:**

Introduction to Sampling Procedure, Types of Sampling, Collection of Samples & Preservation of Sample.

**List of Experiments:**

1. Determination of physical characteristics of water sample (pH, Turbidity, Total Solids (Suspended & Dissolved Solids), Electrical Conductivity)
2. Determination of Acidity & Total Alkalinity of water sample.
3. Determination of Total Hardness, Calcium Hardness, Magnesium Hardness of water sample.
4. Determination of Chloride of water sample.
5. Determination of Sulphate of water sample.
6. Determination of Available Chlorine in bleaching powder & Residual Chlorine of water sample.
7. Determination of Nitrate & Phosphate of water sample.
8. Determination of Optimum Dosage of Coagulants using Jar Test.
9. Determination of MPN of water sample.
10. Application of Plate Count Method for bacterial growth.
11. Study on Gram Staining Technique.

**Course Outcomes:**

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

- CO 1:** Follow sampling procedure & other guidelines for sampling & analysis of water samples.
- CO 2:** Check various water quality parameters.
- CO 3:** Improve the water quality by suggesting suitable corrective measures.
- CO 4:** Train others on various ways of improving the quality of water.

**Reference Books:**

1. Water Supply Engineering, S.K. Garg, Khanna Publishers, New Delhi, 2017.
2. Sawyer C.N., McCarty P. L., and Parkin G.F., Chemistry for Environmental Engineers, McGraw-Hill, New Delhi, 1994.

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3. BIS 3025 Methods of Sampling & Test for Water & Waste Water, BIS 1622.
4. APHA Standard Methods for Examination of Water & Waste water, 2012.

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**Course Code: 530119**

**Course Name: Self Learning / Presentation**

L	T	P	Credit
0	0	2	2

**Course Objectives:**

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

**Syllabus:**

Any relevant topic related to Environmental Engineering from within or beyond the syllabus through Swayam / NPTEL/MOOC.

**Course Outcomes:**

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

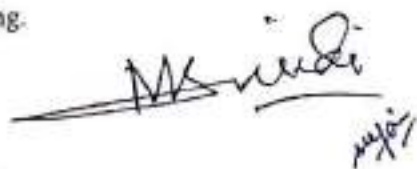
**CO 1: Analyze** contemporary issues in Environmental Engineering & its allied areas through literature survey.

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

**CO 3: Demonstrate** good oral & written communication skills.

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

**CO 5: Display** lifelong learning.









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# Semester-II

Course Code: 530211

Course Name: Air Pollution & Noise Pollution

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To provide a basic knowledge on various sources & effects of air pollution.
- 2) To present and the techniques to control air pollution and apply them.
- 3) To provide a knowledge on air quality standards, monitoring of air quality.
- 4) To increase a basic knowledge on sources, effects of noise pollution & also how to reduce the pollution.

**syllabus:**

**Unit I Introduction:**

Definition of Air Pollution, Sources and classification of air pollutants – Man made – Natural sources – Type of air pollutants – Pollution due to automobiles, Units of measurements of pollutants, Air quality criteria – emission standards – National ambient air quality standards – Air pollution indices – Air quality management in India, Air pollution survey, Air pollution from major industrial operations, Air pollution in Indian cities, Major Air pollution episodes, Air Act.

**Unit II Effects of Air Pollution:**

Analysis of air pollutants – Chemical, Instrumental and biological methods, Air pollution and its effects on human beings, plants and animals – Economic effects of air pollution – Effect of air pollution on meteorological conditions – Changes on the Meso scale, Micro scale and Macro scale, Global Warming, Acid Rain, Ozone Layer Depletion, Indoor Air Pollution & Occupational Diseases.

**Unit III Sampling, Meteorology and Air Quality Modeling:**

Sampling and measurement of particulate and gaseous pollutants – Ambient air sampling – Stack sampling, Environmental factors – Meteorology – temperature lapse rate and stability – Adiabatic lapse rate – Wind Rose – Inversion – Wind velocity and turbulence – Plume behavior – Dispersion of air pollutants: Air Quality Modeling.

**Unit IV Air Pollution Control Measures:**

Control – Source correction methods – Control equipments – Particulate control methods – Bag house filter – Settling chamber – cyclone separators – inertial devices – Electrostatic precipitator – scrubbers – Control of gaseous emissions – Absorption – Absorption equipments – adsorption and combustion devices (Theory and working of equipments only), odour and its control, stack monitoring kit, auto exhaust analyser.

**Unit V Noise Pollution & its Control**

Source of noise – Units and Measurements of Noise – Noise Standards, Noise rating system, Characterisation of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise – General Control Measures – Effects of noise pollution – auditory effects, non - auditory effects: Noise Menace – Prevention and Control of Noise Pollution – Control of noise at source,

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# MADEYI INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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Control of Environmental Pollution, protection of exposed person – Control of other types of Noise Sound  
Methods – sound level meter.

## Learning Objectives:

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

- CO-1: Explain the concepts of air & noise pollution.
- CO-2: Identify the effects of air & noise pollution on environment.
- CO-3: Apply various techniques to measure air & noise pollution.
- CO-4: Solve different noise pollution problems by devising solutions to the identified problems
- CO-5: Apply various techniques used in reducing the environmental pollution.

## Text Books:

1. Air Pollution and Control, M. N. Rao & H. V. N Rao, Tata McGraw Hill Publications., 2017
2. Air Pollution and Control Technologies, Dr. Y. Anjaneyulu, Allied publishers Pvt. Ltd., 2002.

## Reference Books:

1. Storage Disposal & Air Pollution Engineering, S.K. Garg, Khanna Publishers, 31<sup>st</sup> edition, 2008
2. Environmental Pollution Control Engineering, C. S. Rao, New Age Intl Pub., 3<sup>rd</sup> edition, 2018
3. Environmental Engineering, Rowe, Peavy & Tchobanogolous, Tata McGraw Hill Publication, 2017

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**Course Code: 530212**

**Course Name: Advance Treatment Process – II (Water Supply Engg.)**

L	T	P	Credit
3	0	0	3

**Courses Objectives:**

- 1) To understand the concepts of planning a distribution system & subsequently design the water distribution system.
- 2) To understand the operation & maintenance of water supply systems.
- 3) To determine the water quality parameters and also have knowledge on various standards of water quality.
- 4) To understand the concepts of various water treatment techniques.
- 5) To be able to plan & design water treatment plant for a city.

**Syllabus:**

**Unit I:**

Water supply, Components of distribution system, Principles and design of distribution system, Equivalent pipe method, Hardy Cross and Section method, Electrical network analogy method, Construction and maintenance of distribution system, Corrosion and methods of control, Computer applications in distribution network analysis.

**Unit II:**

Quality of water: Factors affecting water quality in various sources, Protection of water quality, Classification of natural water with reference to the best use, Bacteriological quality of water, Effect on health, Standards of water for various uses, Water quality index, Minimal National Standards (MINAS), their significance in relation to Industrial pollution control.

**Unit III:**

Preliminary Treatment and Sedimentation: Degree of treatment required, various operation and flow sheet, Preliminary treatment methods such as screening, coagulation, perikinetic and orthokinetic, flocculation, Coagulants and coagulants aids, Polyelectrolyte, Sedimentation, Class I and Class II clarification, Column settling test, zone and compression settling, Design of sedimentation tank – various types and their working, Tube settlers and their design.

**Unit IV:**

Filtration and Disinfection: Slow and rapid sand filters, Theory of filtration, Design, Operation, Performance and evaluation of filters, Pressure filter, Multi-media filter, Diatomaceous earth filter, Disinfection of water kinetics, Amount of chemicals required for disinfection, Free and combined chlorine, Fixed end disinfectant.

**Unit V:**

Non – Conventional treatment units: Water softening, Methods of softening, Application of Membrane process, Reverse osmosis, Electro-dialysis, Various practices, Removal of fluorides, iron and manganese, Taste and odour removal, Industrial water conditioning, Langlier saturation index, Management of water

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treatment plant residues, Design of complete treatment scheme.

## Courses Outcomes:

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

- CO 1: Explain the concepts of water distribution systems including its operation & maintenance.
- CO 2: Design a water distribution scheme for an area / city.
- CO 3: Evaluate the water quality of an area / city with the help of available standards & guidelines.
- CO 4: Explain the concepts of various water treatment techniques.
- CO 5: Design a water treatment scheme for an area / city.

## Text Books:

1. Water Supply Engg., S. K. Garg, Khanna Publishers New Delhi, 2017
2. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill Publication, 2017

## Reference Books:

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhaapat Rai Publishing Company, 2014
2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6<sup>th</sup> edition, 2008
3. Manual of Water Supply and Treatment by CPHEEO, GOI, 2009
4. Water Supply Engg., B. C. Punmia, Laxmi Publication (P) Ltd. New Delhi, 2016
5. Water Supply & Sanitary Engineering By S.K. Husain (Oxford & IBH Publishing Co. New Delhi, India)

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**Course Code: 530213**

**Course Title: Environmental Impact Assessment & Ethics**

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To develop an understanding about the requirements of environment impact assessment in modern day.
- 2) To provide a broad knowledge on the process of environmental impact assessment.
- 3) To provide a broad knowledge on various methods used in impact assessment.
- 4) To provide a practical knowledge on how to carry out environmental impact assessment process through various case studies.
- 5) To provide an insight into various existing environmental laws in India

**Syllabus:**

**Unit I: Environment and its components, Concept of Ecological imbalances, Carrying capacity and Sustainable development, EIA: Definitions, Necessity of EIA, Historical Evolution of EIA: Indian EIA rules 1994 & 2006, Environmental clearance process, Procedure for carrying out EIA in India, Post project monitoring, EIA documentation, EMP, EIS, Life Cycle Assessment, Risk Assessment.**

**Unit II: Environmental Impact Assessment Methodologies: Characteristics of EIA Methods, Ad-hoc method, Checklist, Matrices, Networks, Overlays, Environmental Quality Index, Predictive Models, Comparative study of EIA Methodologies.**

**Unit III: Prediction and assessment of impact on water & air environment: Basic information of air & water quality, Data requirements for impact assessment, Existing standards for air & water quality (surface & subsurface), Identification of impacts, Prediction & assessment of impacts, Mitigation measures. Case Studies - Environmental Impacts of Road, Rail, Dam and thermal power projects or any other major projects on water & air environment.**

**Unit IV: Prediction and assessment of impact on cultural & socio-economic environment: Basic information on cultural resources like archaeological, historical structures, Cultural system, Basic information of socio-economic environment, Description of existing socio-economic environment, Identification of impacts, Prediction & assessment of impacts, Mitigation measures, R & R study.**

**Unit V: Environmental Legislations: List of prevalent environmental acts in India, Brief about provisions in Water Act 1974, Air Act 1981, EPA 1986, International Environmental Laws & Protocols like Montreal Protocol, Rio Earth Summit, Kyoto Protocol, Objective of Ethics, Importance of Ethics, Code of Ethics, Environmental ethics in India, Environmental Audit: Introduction, Necessity, Types, and Process of audit.**

**Course Outcomes:**

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

**CO1: Illustrate the concepts of EIA.**

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- CO2:** Apply various methodologies for carrying out EIA, & laws used in EIA studies.
- CO3:** Analyse impacts on various components of environment.
- CO4:** Apply various laws & ethical practices in environmental management.
- CO5:** Plan for mitigation of impact & accordingly monitor the mitigation measures through environmental audit.

**Text Books:**

- 1) Y. Anjaneyulu & Valli Manickam, Environmental Impact Assessment Methodologies, B S Publishers.
- 2) R. R. Barthwal, Environmental Impact Assessment, New Age International Publishers.

**Reference Books:**

- 1) L. W. Canter, Environmental Impact Assessment, Mc Graw Hill International Publishers International Edition.
- 2) O. V. Nandimath, Handbook of Environmental Decision Making in India: An EIA Model. Oxford University Press.
- 3) Ministry of Environment and forest, Government of India Environmental Impact Assessment Notification, New Delhi, 2006.

*AK Meedi*  
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Course Code: ~~530216~~ 800209

Course Name: Global Climatic Changes & Disaster Management

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To understand the effects of climate change.
- 2) To get knowledge of various protocols & policies on global climate changes.
- 3) To understand various natural disasters.
- 4) To understand various techniques of disaster monitoring.
- 5) To plan for management of disasters and emergency situations.

**Syllabus:**

**Unit-I**

Climate, weather and Climate Change; Overview of Earth's Atmosphere; Layers of Atmosphere; Greenhouse Gases, Aerosols, Impact of CO<sub>2</sub> increase on climate change. Temperature, Radiation and Variation; Heat- Balance of Earth Atmosphere System; Temporal Variation of Air temperature; Hydrologic cycle; Climate Variability like Floods, Droughts, Drought Indicators, Heat waves, Climate Extremes.

Recent Climate Change impact at local and global scale. Ecological Impacts of Climate change: Anthropogenic activities and climate change, Rising of sea level and consequences. Impact on biodiversity and extinction of endemic species, Changing of food chain, Agricultural shifts. Impact of climate change on health.

**Unit-II**

Policy and Legislative issues in Climate Change: The UNFCCC, The Montreal Protocol, From Kyoto to Copenhagen, Towards COP21, ICMR, ICAR & IARI.

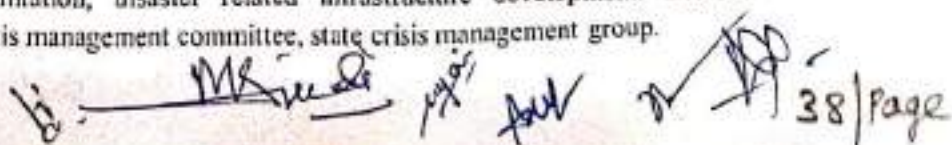
Introduction to Climate Modeling (GCM and RCM Models) IPCC Scenarios, difference between climate change and climate variability Carbon trading and clean development mechanism, Role of countries and citizens in containing in global warming. The Role of Technology Roadmaps and Roundtables.

**Unit-III**

Overview of disaster, major natural disasters – flood, tropical cyclone, droughts, landslides, heat waves, earthquakes, fire hazards, tsunami, etc. – Factors for disaster – climatic change and global sea rise, erosion, environmental degradation, large dams and earthquakes, road building and landslides, Chemical and Biological weapons – case studies.

**Unit-IV**

Techniques of monitoring and design against the disasters, Management issues related to Disaster, Mitigation through capacity building, legislative responsibilities of disaster management; Disaster mapping, assessment, pre-disaster risk and vulnerability reduction, post disaster recovery and rehabilitation; disaster related infrastructure development. Disaster management plan, national crisis management committee, state crisis management group.

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**Unit-V**

Water supply preparedness and protection, emergency water supply strategy, rural and urban emergencies. Assessment of damage. Emergency water supply schemes – Sources, quality, treatment, storage and distribution, operation and maintenance. Sanitation – Human waste and health, strategy for excreta disposal in emergencies, techniques for excreta disposal, disposal of wastewater, management of refuse.

**Courses Outcomes:**

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

- CO 1: Explain** the basic concepts of climate change, the causes of climate change and its effect on environment.
- CO 2: Determine** the important climate variables and the predictions of the changes in the climate system.
- CO 3: Analyse** policy issues and mitigation strategies in response to climate change and other disasters.
- CO 4: Design** an emergency water supply and sewage system.

**Reference Books:**

6. Climate Change and India – Vulnerability Assessment and Adaptation; Edited by P. R. Shukla, Subodh K. Sharma, N. H. Ravindranath, Amit Garg, Sumana Bhattacharya, Universities Press, 2003
7. Global Warming – The Complete Briefing, third edition; John Houghton, Cambridge University Press, 2004,
8. Climate Change- Causes Effects and Solutions; John T. Hardy, Wiley
9. Alexander D, Principles of emergency planning and management, Oxford University Press, 2002.
10. Hallow G. and Bullock J. Introduction to Emergency Management: Elsevier, 2002.
11. Anil Markandya, Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge, 2002.
12. Jepma, C.J., and Munasinghe, M., Climate Change Policy - Facts, Issues and Analysis, Cambridge University Press, 1998.
13. R.B. Singh, Disaster Management, Rawat Publication, New Delhi, 2000
14. H.K. Gupta, Disaster Management, University's Press, India, 2003
15. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001

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**Course Code: 530217**

**Course Name: Advanced Environmental Engineering Lab**

L	T	P	Credit
0	0	4	4

**Course Objectives:**

- 1) To acquire knowledge of sampling of air samples, solid waste samples & waste water samples.
- 2) To acquire skills to determine various characteristics of waste water.
- 3) To acquire skills to determine various characteristics of solid waste.
- 4) To acquire skills to determine various air pollutants.
- 5) To acquire skills to determine noise levels.

**Syllabus:**

1. Introduction to waste water sampling procedure.
2. Introduction to air sampling procedure.
3. Introduction to solid waste sampling procedure.

**List of Experiments:**

1. Determination of Solids (TS, TSS, VSS, FS) in waste water sample.
2. Determination of settling velocity of suspended solids in waste water sample.
3. Determination of D.O. in waste water sample.
4. Determination of B.O.D. in waste water sample.
5. Determination of C.O.D. in waste water sample.
6. Determination of Nitrates in waste water sample.
7. Determination of Oil & Grease in waste water sample.
8. Determination of Heavy Metals in waste water sample.
9. Analysis of solid waste sample (Proximate & Elemental).
10. Determination of calorific value of solid waste sample.
11. Determination of SPM, SO<sub>x</sub> & NO<sub>x</sub> in air using RSPM/HVS.
12. Monitoring of ambient & traffic noise levels using noise level meters.
13. Study of Stack Monitoring Kit.
14. Characterization of wastes from different industries.

**Course Outcomes:**

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

**CO 1: Follow sampling procedure & other guidelines for sampling & analysis of waste water, air &**

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solid waste samples.

CO 2: Check various waste water quality parameters.

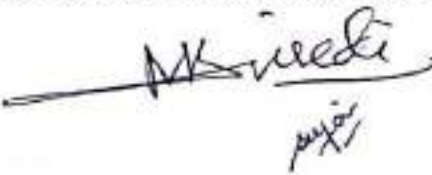

CO 3: Analyze various solid waste characteristics.

CO 4: Analyze the level of pollutants in air.

CO 5: Analyze noise levels in an area / city.

## Reference Books:

1. BIS 3025: Methods of Sampling & Test for Water & Waste Water.
2. BIS 10158, 9234, 9235: Analysis of Solid Wastes.
3. BIS 5182: Measurement of Air Pollution.
4. APHA Standard Methods for Examination of Water & Waste water, 2012.
5. Sawyer C.N., McCarty P. L., and Parkin G.F.. Chemistry for Environmental Engineers, McGraw-Hill, New Delhi, 1994.
6. Water Supply Engineering, S.K. Garg, Khanna Publishers, New Delhi, 2017.

*J.S.*  

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**Course Code: 530218**

**Course Name: Self Learning / Presentation**

L	T	P	Credit
0	0	2	2

**Course Objectives:**

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

**Syllabus:**

Any relevant topic related to Environmental Engineering from within or beyond the syllabus through Swayam / NPTEL/MOOC.

**Course Outcomes:**

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

- CO 1:** Analyze contemporary issues in Environmental Engineering & its allied areas through literature survey.
- CO 2:** Distinguish state of art & relevance of the topic in national & international arena.
- CO 3:** Demonstrate good oral & written communication skills.
- CO 4:** Develop poster and power point presentations for effective communication.
- CO 5:** Display lifelong learning.

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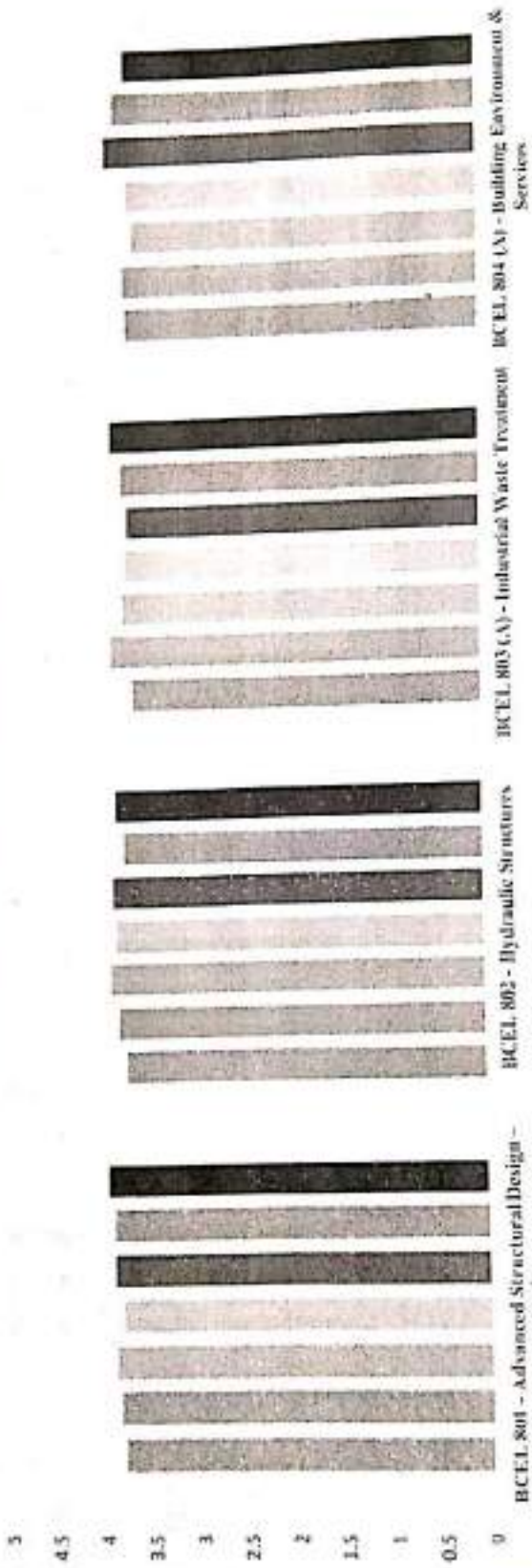
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**ANNEXURE – VI**

**CIRRICULA FEEDBACK ANALYSIS FROM STAKEHOLDERS**

Course Content Student Feedback-UG Final Year



- # 1. The course is well designed
- # 2. The syllabus units are balanced
- # 3. The learning material was available to you
- # 4. The content was clear and easy to understand
- # 5. The course was relevant and updated for present needs
- # 6. The course meets your career expectations
- # 7. The course will be useful to meet your higher studies/future aspirations.

*AK Mehta*

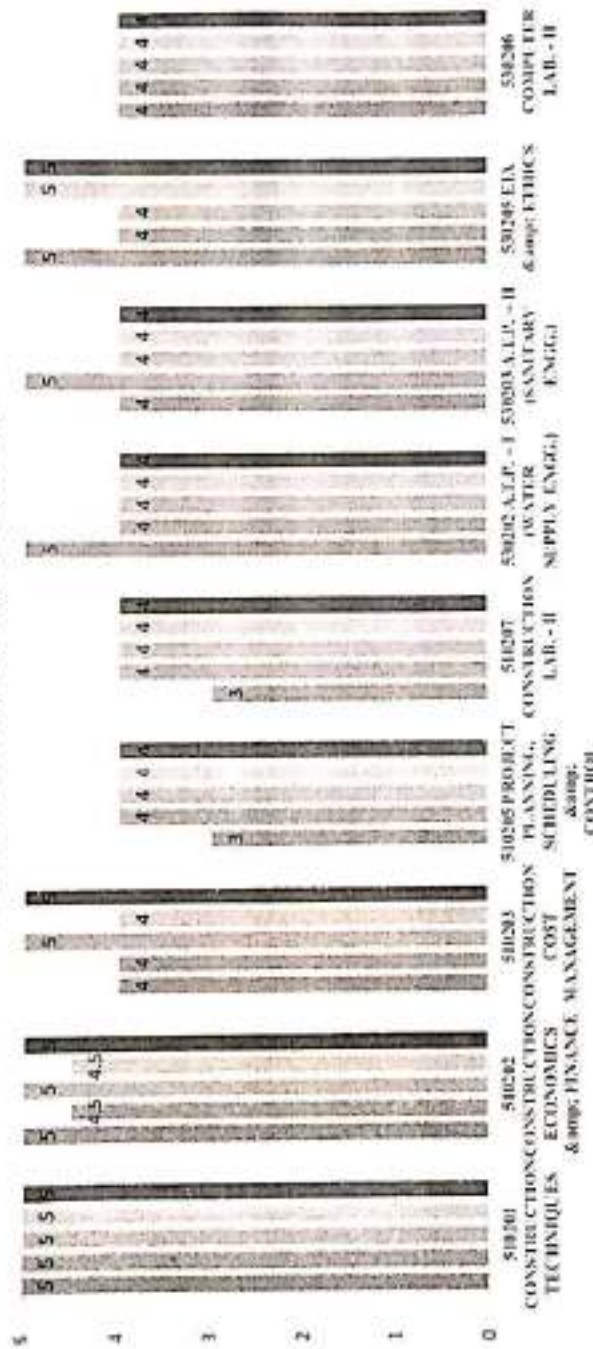
*AK Mehta*

*AK Mehta*

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Course Content Faculty Feedback-PG



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

*MS. Meena*  
*Prof.*  
*Dr. B.*



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Course Content Faculty Feedback-UG



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

  
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**ANNEXURE - VII**

**Course Code: 110509**

**Course Name: Environmental Engineering**

L	T	P	Credit
2	1	2	4

**Courses Objectives:**

Students will be able to understand

- 1) The structure of drinking water supply systems, including water transport, treatment and distribution.
- 2) Water quantity and water quality criteria and standards, and their relation to public health.
- 3) Operation and maintenance of water supply system components.
- 4) How to estimate water requirement of a city.
- 5) How to design water treatment plant for urban & rural areas.
- 6) How to design water distribution network including pipe appurtenances.
- 7) To impart basic knowledge on sewerage system including estimation of sewage quantity and design of sewer.
- 8) To provide a broad knowledge on sewage composition and its characteristics.
- 9) To provide information on disposal standard of effluents and also about various methods of sewage disposal.
- 10) To provide broad knowledge on various techniques of sewage treatment including and advanced treatment process.

**Syllabus:**

**Unit-I**

Water demand (types, variation, factors affecting it), Design period, Population forecasting methods, Intake structures (location, types), Characteristics of water, Water borne diseases, IS Standard of drinking water.

**Unit-II**

Water treatment plant flow diagram, Design, construction and working of Screens, Plain sedimentation tank, Clariflocculator, Filters (Slow sand filters, Rapid sand gravity filters and Pressure filters), Methods of disinfection, Hardness (causes and types), Methods of water softening, Removal of colour, odour and taste from water, Removal of iron and manganese, Algae removal, Fluoridation and De-fluoridation.

**Unit-III**

Distribution system (requirements, layout and methods of distribution), Distribution reservoir (types and its capacity determination), Fixing size of pipes, Analysis of pipe networks (Hardy cross method and Equivalent pipe method), Appurtenances used in distribution networks, Water supply &

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plumping system used in buildings, Rural water supply.

**Unit - IV**

Sewerage schemes & sewerage system and their importance, Collection & conveyance of sewage, Fluctuation in sewage flow, Design of sewer, Sewer appurtenances, Pumps & pumping stations, Characteristics and analysis of sewage (physical, chemical, biological parameters), BOD & COD, Methods of sewage disposal i.e. on land or by dilution, Self-purification capacity of river/stream.

**Unit-V**

Treatment of sewage (preliminary, primary, secondary and tertiary treatment), Design and working principles of screens, Grit chamber, Primary settling tank, Sewage filtration, Activated Sludge Process, Oxidation pond, Aerated lagoon, Anacrobic lagoon, Septic tank & Imhoff tank, Rotating Biological Contactor, Removal of Nitrogen and Phosphorus, Source and treatment of sludge, Sludge thickening and digestion, Sludge drying beds, Sludge disposal, Sewage treatment plants using MBBR and SBR technology.

**Courses Outcomes:**

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

- CO 1: Explain the concepts of water supply and waste water engineering.
- CO 2: Determine the requirements for safe supply of water and safe disposal of sewage.
- CO 3: Apply suitable techniques for water & waste water treatment.
- CO 4: Analyse a given water supply scheme and a given sewerage system.
- CO 5: Design a water supply system based upon the needs of society and sewage system for safe disposal of sewage.

**Text Books:**

1. Water Supply Engg., B. C. Punmia, Laxmi Publication (P) Ltd. New Delhi, 2016
2. Water Supply Engg. (Vol. I), S. K. Garg, Khanna Publishers, New Delhi, 2017
3. Sewage disposal and pollution Engg. (Vol. II), S.K. Garg, Khanna Publishers, New Delhi, 2017

**Reference Books:**

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhanpat Rai Publishing Company, 2014
2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6<sup>th</sup> edition, 2008
3. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill Publication, 2017
4. Manual of Water Supply and Treatment by CPHEEO, GOI, 2009
5. Manual on Sewerage & Sewerage Treatment by CPHEEO, GOI, 2013.

**List of Experiments:**

1. Determination of pH of a given water sample and waste water sample.
2. Determination of Total Solids, Dissolved Solids and Suspended Solids of water and waste water sample.

*AK Punmia*  
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3. Determination of Chloride concentration in water and waste water sample.
4. Determination of turbidity of water and waste water sample using turbidity meter.
5. Determination of acidity and alkalinity of the water and waste water sample.
6. Determination of Hardness of the water sample and waste water sample.
7. Determination of D.O. of the water and waste water sample.
8. Determination of optimum dose of coagulants required for the treatment of a given water sample.
9. Determination of MPN of the given water sample and waste water sample.
10. Determination of BOD of a given water and waste water sample.
11. Determination of COD of a given waste water sample.
12. Determination of sulfate and nitrate of given water and waste water sample.

**Course Outcomes:**

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

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

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

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

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

*12* ————— *M. K. Verma*  
*expi* ————— *M. K. Verma*



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**Scheme of Examination**  
**B. Tech. VI Semester (Civil Engineering)**

[For batch admitted in Academic Session 2017-18]

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted						Total Marks	Contact Periods per Week				Total Credits	
				Theory Slot		Practical Slot		AICDSS			I	T	P			
				End Sem.	Mid Sem. Assignment	End Sem.	Lab Work/Sessional	Assignment	Exam							
1.	100005*	HSMC	Ethics, Economics, Entrepreneurship & Management (HSMC-4)	70	20	10	-	-	-	-	-	100	2	-	-	2
2.	110602	DC	Structural Design & Drawing (Steely) (DC-14)	70	20	10	-	-	-	-	-	100	2	1	-	3
3.		DE	(DE-1)*	70	20	10	-	-	-	-	-	100	2	-	-	2
4.		DE	(DE-2)*	-	-	-	-	-	-	25	75	100	2	-	-	2
5.		OC	(OC-1)*	70	20	10	-	-	-	-	-	100	2	-	-	2
6.	100007	MC	Disaster Management (MC)	70	20	10	-	-	-	-	-	100	2	-	-	2
7.	110607	DLC	Minor Project - II (DLC-5)	-	-	-	100	50	-	-	-	150	-	-	4	2
			<b>Total</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>25</b>	<b>75</b>	<b>750</b>	<b>12</b>	<b>1</b>	<b>4</b>	<b>15</b>	
8.	100006*	MC	Indian Constitution & Traditional Knowledge Audit (course) (MC)	70	20	10	-	-	-	-	-	100	3	-	-	-

Permitted to opt for maximum 02 additional courses for the award of Honours or Minor Specialization  
 Summer Internship Project - III (On Job Training) for Four Weeks Duration : Evaluation in VII Semester

- Additional Courses for obtaining Honours or Minor Specialization by desirous students
- \* This course will run for Group B A in V A semester respectively.
  - \* This course will run for Group B A in V A semester respectively. (Passing is optional, however a separate marksheet will be issued in those who opt for it.)
  - \* At least one of these courses must be run through SWAYAM - NPTEL - MOOC.

GROUP A: (Electrical, Electronics, Computer Science, Information Technology, Electronics & Telecommunication)	
GROUP B: ( : Mechanical, Chemical, Biotech, Automobile)	
SEMESTER - VI	
DE - I	OC - I
110611 Wastewater Engineering	110651 Maintenance & Repair of Concrete Structures.
110612. Solid Waste Management	110652. Geotechnical Engineering II (Foundation Engineering)
110613. Construction Planning & Management	110653. Energy Efficiency, Acoustics & Day lighting in Building

1. Building Physics  
 2. Prefabricated Construction Technology  
 LADAV (ACADEMICS) JMKO  
 M.I.T.S  
 GWALIOR



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**Scheme of Examination**  
**B. Tech. VII Semester (Civil Engineering)**

**[For batch admitted in Academic Session 2017-18]**

S. No.	Subject Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Periods per Week			Total Credits	
			Theory Slot		Practical Slot	MOOCs			L	T	P		
			End Sem.	Mid Sem. / Assignment		End Sem.	Lab Work / Sessional						Assignment
1.	DE	(DE-3)*	70	20	10	-	-	-	-	-	-	-	2
2.	DE	(DE-4)*	-	-	-	-	-	-	-	-	-	-	-
3.	OC	(OC-2)*	70	20	10	-	-	25	75	-	-	-	2
4.	OC	(OC-3)*	70	20	10	-	-	-	-	-	-	-	2
5.	MC	Intellectual Property rights (IPR) (MC)	70	20	10	-	-	-	-	-	-	-	3
6.	DI-C	Software Application for Solving Civil Engineering Problems (DI-C-6)	-	-	-	50	50	-	-	-	-	-	2
7.	DI-C	Summer Internship Project - III (04 WYAS) (Evaluation) (DI-C-7)	-	-	-	50	50	-	-	-	-	-	2
8.	DI-C	Creative Problem Solving (Evaluation) (DI-C-8)	-	-	-	25	25	-	-	-	-	-	2
9.		<b>Total</b>	<b>280</b>	<b>80</b>	<b>40</b>	<b>125</b>	<b>125</b>	<b>25</b>	<b>75</b>	<b>11</b>	<b>1</b>	<b>10</b>	<b>17</b>

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

\* At least one of these courses must be run through SWAYAM / NPTEL / MOOC.

SEMESTER - VII	
DE - 3	DE - 4 (Through SWAYAM/NPTEL)
110711 Irrigation Engineering	110751 Matrix Methods of Structural Analysis
110712 Industrial Waste Treatment	110752. Advanced Concrete Technology
110713 Advanced Structural Design	110753 Remote Sensing & GIS
ORCC DEAN (ACADEMICS)	OC - 2
MLTS GWALIOR	900201. Integrated Waste Management for Smart City
	900202. Project Planning & Control
	900213. Urban Planning & Transportation Systems.
	OC - 3

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Course Code: 110711

Course Name: Irrigation Engineering

L	T	P	Credit
2	0	0	2

**Course Objectives:**

- 1) To understand the water requirements of various types of crops.
- 2) To understand the different types of irrigation systems.
- 3) To plan the reservoir systems as per the requirements.
- 4) To understand various types of dam.
- 5) To understand the concepts of Khosla's and Bligh's theory & its applications.
- 6) To understand river training.
- 7) To understand the concepts of Lacey's and Kennedy theory for design of canal systems.
- 8) To understand the canal regulations.

**Syllabus:**

**Unit-I Irrigation Water Requirement and Soil Water Crop Relationship:**

Irrigation, Definition, Necessity, Advantages and disadvantages, Type and methods, Irrigation development.

**Soil:** Types and their occurrence, Suitability for irrigation purposes, Wilting, Coefficient and field capacity, Optimum water supply, Consumptive use and its determination. Irrigation methods - surface and subsurface, Sprinkler and drip irrigation.

Duty of water, factors affecting duty and methods to improve duty, Suitability of water for irrigation, Crops and crop seasons, Principal crops and their water requirement, Crop ratio and crop rotation, Intensity of irrigation, Water logging-causes, effects & its prevention.

**Unit-II Reservoirs and Storage Works:**

Types of reservoirs, Reservoir planning, Various investigations, estimation of storage capacity by mass curve analysis, Fixing of principal levels in a storage project, Economical height of dam, Reservoir sedimentation, Suitable site for a reservoir project.

**Dams:** Classification- gravity, earthen, rockfill, arch, buttress, steel & timber dam, Selection of suitable type of dam at a particular location.

**Unit-III Diversion Works and River Training Methods:**

Purpose, Selection of site, Layout and functions of component parts, Types of weirs and barrages, Weir design for surface and subsurface flows, Bligh's, Lane's and Khosla's theories, Silt excluders and silt ejectors.

River training methods - objectives, Design principles of levees, Guide bunds & launching aprons.

**Unit-IV Canal Irrigation:**

Types of canals, Alignment, Design of unlined and lined canals, Kennedy's and Lacey's silt theories, Typical canal sections, Canal losses, Linings-objectives, Materials used, Economics.

*M. S. Nandi*  
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### Unit-V

**Introduction to Canal Regulation Structures:** Head and cross regulators, Canal falls, Escape and outlets

#### Course Outcomes:

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

**CO1:** Explain the concepts for planning an irrigation project.

**CO2:** Differentiate various theories used in planning of an irrigation project.

**CO3:** Analyse various requirements for an efficient irrigation project.

**CO4:** Design different components of irrigation system using different theories.

**CO5:** Plan an efficient, economical & safe irrigation system.

#### Reference Books:

1. Irrigation & Water Power Engg. – Dr. B.C. Punmia, Dr. Pane, B.B.Lal
2. Irrigation, Water Resources & Water Power by Dr. P.N. Modi
3. Irrigation Engineering by Varshney
4. Irrigation Engineering by Santosh Kumar Garg
5. Irrigation, Water Power & Water Resources Engg. By K.R. Arora

*AK Modi*  
*Dr. P.N. Modi*  
*Varshney*  
*K.R. Arora*



Course Code: 110712

Course Name: Industrial Waste Treatment

L	T	P	Credit
2	0	0	2

**Course Objectives:**

- 1) To provide broad knowledge on various methods of sewage disposal, their effects on water pollution & also provide information on various disposal standards.
- 2) To learn the basics of sewage composition & its characteristics.
- 3) To understand the 3R concepts and how to implement them.
- 4) To provide knowledge on various waste water treatment techniques.
- 5) To provide information on various rules & regulations regarding disposal of municipal wastes.
- 6) To provide information about various existing waste treatment & management techniques of various industries.

**Syllabus:**

**Unit-I Problem of Water Pollution:**

Effects of wastes on streams and sewage treatment plant, natural purification of streams, oxygen sag curve, allowable organic load on streams, classification of stream, stream standards and effluent standards requirement of water for different purposes.

**Unit-II Sampling and Analysis of Wastewater:**

Sampling of waste waters, Grab, Composite and Integrated samples, analysis of waste water, Biochemical Oxygen Demand, Chemical Oxygen Demand and pH value of waste water, Toxicity of waste by Bioassay method.

**Pre-treatment of Wastes:** Volume and strength reduction, salvage of materials, recovery of by products, reuse of waste water.

**Unit-III Conventional Methods of Treatment of Waste Water:**

Removal of suspended solids, removal of inorganic and organic dissolved solids, sludge disposal, Advance methods of treatment such as Reverse Osmosis, Ion Exchange Process, Electro Dialysis, Algal Harvesting etc.

**Unit-IV Combined Treatment of Waste Water with Sewage:**

Municipal regulations, Sewer rental charges, Instrumentation in waste water treatment plants, Operation and maintenance of plants, Role of water pollution control board. Low cost Treatment Plant Effluent Treatment Plant Design and Operation.

**Unit-V**

Brief study of industrial processes and treatment methods of waste water from common industries such as Textile, Dairy, Paper and pulp, Tannery & Distillery.

Hazardous wastes-Impact handling and disposal.

*MK-medi*  
*Dr*  
*Dr*  
*Dr*


### Course Outcomes:

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

- CO1: Evaluate the effects of waste on streams as per the standards.
- CO2: Determine the requirements for safe disposal of sewage.
- CO3: Apply suitable techniques for sewage treatment & disposal based upon the available data.
- CO4: Apply municipal regulations in operation & maintenance of waste water treatment plant.
- CO5: Explain waste management methods of different industries.

### Reference Books:

1. Liquid Waste of Industries – Theories, Practice and Treatment – N.L. Nemerow, Wesley Publishing Co.
2. Treatment of Industrial Waste – E.B. Besselièvre & Max Graw Hill Book Company
3. Waste Water Engg. – Treatment Disposal & Reuse – Metcalf & Eddy – Tata Mc Graw Hill, New Delhi
4. Waste Water Treatment – Arceivala – Tata Mc Graw Hill, New Delhi
5. Industrial Pollution Control hand book – Lund H.F. Tata Mc Graw Hill, New Delhi

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Course Code: 110713

Course Name: Advanced Structural Design – I (R.C.C.)

L	T	P	Credit
2	0	0	2

**Course Objectives:**

- 1) To understand the behaviour of RCC structures like Retaining wall, Water tanks, Bridges and prestressed concrete.
- 2) To understand the Codal provision for design of RCC structures and prestressed concrete
- 3) To analyse the RCC structures subjected to various loads.
- 4) To analyse RCC bridges subjected to IRC loadings.
- 5) To learn Design of RCC and prestressed concrete structures as per Codal provisions.

**Syllabus:**

**Unit-I**

**Design of Water Tanks:**

Design requirements, Design of Tanks resting on ground and underground tanks, Rectangular and circular tanks.

**Unit-II**

**Design of Over Head Water tanks:**

Rectangular, Circular & intze type (Membrane analysis only), Design of staging.

**Unit-III**

**Earth Retaining Structures:**

Types of retaining walls, Stability of retaining walls, Design of retaining walls (Cantilever and counter fort type)

**Unit-IV**

**Design of Bridges:**

IRC loading for highway bridges, Slab bridges and T-beams bridges for highway loading (IRC Loads)

**Unit-V**

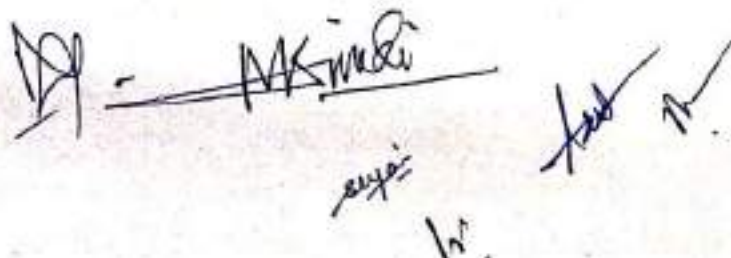
**Prestressed Concrete:**

Prestressing concepts, materials, and systems of prestressing & prestress losses. Introduction to working & limit state design method.

**Course Outcomes:**

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

- CO1: Explain behaviour of RCC and Prestressed concrete structures under loads.
- CO2: Determine forces developed in RCC and Prestressed concrete structures under loads.
- CO3: Compare designs of RCC and Prestressed concrete structures for given loadings.
- CO4: Develop economic and safe designs of RCC and Prestressed concrete structures.

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Course Code: 900201

Course Name: Integrated Waste Management for Smart City

L	T	P	Credit
2	1	0	3

**Course Objectives:**

- 1) To provide broad knowledge on various aspects of planning & implementation of waste management system in a smart city/town.
- 2) To understand the principles applied in waste management.
- 3) To understand various ways to collect, treat & disposal of waste.
- 4) To understand various methods of energy recovery from waste.
- 5) To understand various aspects of hazardous waste management, E-waste management, biomedical waste management etc.

**Syllabus:**

**Unit I:**

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

**Unit II:**

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

**Unit III:**

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

**Unit IV:**

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

**Unit V:**

E-waste management - sources, health effects, issues in India, challenges, handling of E-waste. Plastic waste management - types of plastics, sources of plastic waste, impacts of plastic waste,

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plastic waste management practices. Management of construction & demolition wastes.

**Course Outcomes:**

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

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

**CO 2:** Apply various techniques of handling the waste.

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

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

**Text Books:**

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

**Reference Books:**

1. Environmental Engineering, Rowe, Peavy & Tchobanoglous, Tata McGraw Hill Publications, 2017
2. CPHEEO, Manual on Municipal Solid Waste management, Central Public Health and Environmental Engineering organization, Government of India, New Delhi, 2016
3. Solid Waste Engineering, Vesilind P.A., Worrel H. W. and Reinhard, Thomson Learning Inc, 2003

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Course Code: 900202

Course Name: Project Planning & Control

L	T	P	Credit
2	1	0	3

**Course Objectives:**

- 1) To know about techniques of project planning.
- 2) To develop the network of project's activities.
- 3) To understand the precedence network technique.
- 4) To discuss the resource utilization in project.
- 5) To understand the project cost control.

**Syllabus:**

**Unit I:**

**Project Planning:**

Introduction to Project Planning Process. Types of Project Plans-Project feasibility plan, Project preliminary plan. Introduction to network techniques – CPM, PERT and Precedence network. Project Work Breakdown – Levels of Project work breakdown. Identification of construction activities by work breakdown structure. Activity duration and methods of estimating activity duration – One time estimate three time estimates, trapezoidal distribution estimate. Duration estimation procedure.

**Unit - II**

**Project Network Analysis:**

Elements of Network, development of network, Numbering of events, Event times – Earliest events time and latest event time. Slack, critical events. Activity times – Earliest start time, Latest finish time, Float and critical activities. Network critical path and its significance. Network analysis by CPM – Defining scope of work, determining activities, establishing work package logic, preparation of network logic program and draft network. Numerical problems.

**Unit-III**

**Precedence Network Analysis:**

Precedence Network Analysis – Modeling procedure analysis of time in PN. Use of PN in repetitive works network. Difference between PN and CPM. Application of Network techniques and their limitations.

**Unit-IV**

**Resource Planning:**

Resources, Types of resources – renewable and non-renewable resources, Resource Histogram, Method of Resource allocation – resource smoothing and resource levelling.

**Unit-V**

**Project Cost Control:**

Direct and indirect cost, slope of direct cost curve, Total project cost and optimum duration, contracting the network for cost optimization. Escalate & Variation in prices.

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### Course Outcomes

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

- CO 1: Know the project planning and project network.
- CO 2: Analyze the network by CPM & PERT.
- CO 3: Analyze the project using precedence network.
- CO 4: Analyze the effect of resource planning on project.
- CO 5: Evaluate the cost of project during planning.

### Recommended Books:

1. Project planning and Control with PERT and CPM by Dr. B.C. Punmia, K.K. Khandelwal
2. CPM & PERT by L.S. Srinath
3. Construction Management by Sen & Gupta
4. CPM & PERT by Weist & Levy

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Course Code: 900213

Course Name: Urban Planning & Transportation Systems

L	T	P	Credit
3	0	0	3

**Course Objectives:**

- 1) To introduce the scope and nature of Urban Planning and Transportation Systems as disciplines.
- 2) To understand the objectives, domains and principles of town planning.
- 3) To study the urbanization trends in India - Issues, concerns and experiences; City planning process and implementation framework in Indian context
- 4) To differentiate between types of plans and concepts in planning.
- 5) To understand how urbanization and why migration takes place in an urban region.
- 6) To understand the traditional and current planning processes and techniques involved in the urban and transportation planning.
- 7) To understand the urban governance, policies and strategies of the government to tackle issues of an urban environment.
- 8) To understand the impact of technology in both urban and transportation planning.

**Syllabus:**

**Unit-I Introduction to planning discipline**

Defining planning as a discipline, it's multidisciplinary nature, role of a planner, Objectives and Principles of Urban planning.

Fields of planning - Urban, regional, environmental, transport and infrastructure.

Evolution of settlements- Settlement size, pattern and structure as a function of sociocultural, economic, military and religious factors in historical cities.

Concepts of different types of cities like garden city, linear city etc.

Contributions of eminent planners: Lewis Mumford, Ebenezer Howard, Patrick Geddes, Sir Arthur Clarence Perry, Charles Correa, Le-Corbusier.

**Unit-II Urbanization**

Definition of urbanization, rural-urban migration, various definitions of town and country planning, goals and objectives of planning, socio-economic impacts of growth of urban areas, significance of

Census and Demographics, impacts of urbanization, impact of Government Policies on urbanization, urban structure and form - land use distribution, different Land use planning norms.

Overview of Urban Governance Definition, concepts, components, government and governance, hierarchy and structure, forms of governance, process of inclusion and exclusion, 73rd and 74th Constitution Amendment Acts.

**Unit-III Transportation Systems**

Evaluation of urban structure: Transport system, infrastructure and management, transport systems and their types, urban road hierarchy, planning, and management criteria for road and junction improvements, arterial improvement techniques.

Transport survey and studies: study area definitions, survey and their types, sampling methods.

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survey techniques.

Transportation Planning Process and analytical techniques: Techniques for urban structures analysis, Urban travel characteristics,

Transport and environment: Traffic noise, factor affecting noise statement measures, standards, air pollution standards, traffic safety, accident reporting and recording systems, factors affecting road safety, transport planning for different target groups.

#### Unit-IV Planning in Indian Context

Introduction to types of plans with choice of appropriate scale- development plans, master plan, city development plan, structure plan, district plan, action area plan, subject plan, comprehensive planning, zonal plans etc., hierarchy of plans: regional plan, sub-regional plan, sector plans and spatial plans, town planning schemes, contents of base maps at various scales, notations, measurement of areas.

Database for planning and socio - economic surveys: data requirements for urban and regional planning, sources of primary and secondary data, questionnaire design, measurement scale and their application, sampling techniques; Objectives, types, and significance of planning surveys.

Role of URDPFI guidelines in Town planning, Urban Development Policies and Programmes at various levels.

Graphic presentation of statistical and spatial data.

#### Unit-V Current trends in urban planning and transportation systems

Indian scenario - Issues and Policies, Global scenario, Future trends of urbanization.

Review of existing traffic management schemes in Indian cities.

Impact of technology on urban forms and planning, role of disruptive innovations and disaster mitigation in urban planning, advanced transportation systems with their merits and demerits, Intelligent transport system (ITS) its types and applications.

#### Course Outcomes:

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

**CO1: Explain** the concepts for planning a city and land-use patterns.

**CO2: Differentiate** various theories used in urban planning.


**CO3: Analyse** various requirements for transportation systems.

**CO4: Design** approaches in addressing the issues and concerns of urban environment through planning.

**CO5: Plan** strategies for any project with an urban planning perspective as a member and/or leader in a team of planning projects.

#### Text Books:

1. A.B. Gillion and Simon Eisner, "The Urban Pattern", CBS Publishers and Distributors, Delhi.
2. Rishma A., "Town Planning in Hot Cities", Mir Publishers, Moscow.
3. Ward S (2002), "Planning the 20th Century City" John Wiler & Sons.
4. R. Ramachandran, "Urbanisation and Urban Systems in India", Oxford Publications.
5. K. C. Shivrama Krishnan, "Revisioning Indian Cities", Sage Publications.

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6. ITPI reader
7. Bruton, M.J., "Introduction to Transportation Planning," Hutchinson Publication, London.
8. Kadijani, L.R., "Traffic and Transportation Planning", Khanna Publishers, Delhi.

**Reference Books:**

1. Broadbent, Geoffery: "Emerging Concepts in Urban Space Design", Van Nostand Reinhold, 1990.
2. Edmund Bacon, "Design of Cities", Penguin, 1976.
3. Francis Tibbalds, "Making people-friendly towns: improving the public environment in towns and cities", Longman, 1992.
4. Rob Krier, "Urban Space", Random House Incorporated, 1979.
5. Jonathan Barnett, "Urban design as public policy: practical methods for improving cities", Architectural Record Books, 1974.
6. Papacoster, C.S. And Prevendons, "Transportation Engineering and Planning" Prentice Hall of India.
7. Introduction to transport planning by Michael J Bruton
8. Principal of Urban transport system planning by Hutchinson

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Course Code: 110706-701

Course Name: Software Application for Solving Civil Engineering Problems

L	T	P	Credit
0	0	4	2

**Course Objectives:**

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

**List of Experiments:**

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

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

**Course Outcomes**

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

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

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Course Code: 110707 702

Course Name: Summer Internship Project - III

L	T	P	Credit
0	0	4	2

**Course Objectives:**

- 1) To develop an appreciation and importance of civil Engineering in developing the infra structure.
- 2) To develop an understanding regarding the various engineering principals to be used in the field Construction activities.
- 3) To emphasize on the use of the modern tools and plants used in the construction industry.
- 4) To build the necessary practical background and exposure to the field problems.
- 5) To develop a technical skill to prepare project documents.

**Syllabus:**

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

2) Candidates will be taken to nearby places where civil engineering works are being carried out during the semester and they shall have to submit a detailed report of their visit.

**Course Outcomes:**

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

- CO1: Observe various activities of civil construction works.
- CO2: Examine the utility of general and specific equipments for construction.
- CO3: Differentiate the construction projects individually and in team.
- CO4: Develop the writing and communication skills for various engineering problems.
- CO5: Adapt lifelong learning for benefit of society.

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Course Code: 110708-703

Course Name: Creative Problem Solving

L	T	P	Credit
0	0	2	1

**Course Objectives:**

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

**List of Experiments**

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

**Course Outcomes**

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

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

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

**ANNEXURE - IX**

**Scheme of Examination**  
**B. Tech. V Semester (Civil Engineering)**

**For batches admitted in academic session 2018 – 19 onwards**

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted				Contact Periods per Week			Total Credits		
				Theory Slot		Practical Slot		Total Marks	L	T		P	
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.						Lab work/ Sessional
1.	110501	DC	Estimating, Costing & Contracting (DC-9)	70	20	10	-	-	3	1	-	4	
2.	110502	DC	Structural Design & Drawing (RCC) (DC-10)	70	20	10	-	-	3	1	-	4	
3.	110503	DC	Fluid Mechanics – II (DC-11)	70	20	10	30	20	2	1	2	4	
4.	110509	DC	Environmental Engineering (DC-12)	70	20	10	30	20	2	1	2	4	
5.	110505	DC	Transportation Engineering (DC-13)	70	20	10	30	20	2	1	2	4	
6.	110506	DLC	Minor Project – I** (DLC-3)	-	-	-	30	20	-	-	-	2	1
7.	110507	DLC	Summer Internship Project – II (Evaluation) (DLC-4)	-	-	-	25	-	-	-	-	6	3
8.	110508	Seminar / Self Study	Self Learning/ Presentation (Through Swayam/NPTEL/MOOC) <sup>2</sup>	-	-	-	-	25	-	-	-	2	1
<b>Total</b>				<b>350</b>	<b>100</b>	<b>50</b>	<b>145</b>	<b>105</b>	<b>12</b>	<b>5</b>	<b>16</b>	<b>25</b>	
Department Level activity / workshop / awareness programme to be conducted; certificate of compliance to be submitted by HoD to the Exam controller through Dean Academics													
9.	Additional Courses for obtaining Honours or Minor Specialization by desirous students			Permitted to opt for <u>maximum 02</u> additional courses for the award of Honours or Minor Specialization									

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

<sup>2</sup> Compulsory registration for one online course using SWAYAM / NPTEL / MOOC, evaluation through attendance, assignment and presentation.

**GROUP A: (Electrical, Electronics, Computer Science, Information Technology, Electronics & Telecommunication)**

**GROUP B: (Civil, Mechanical, Chemical, Biotech, Automobile)**

*Auth* ✓ *Dr. V. K. Srivastava* *Dr. V. K. Srivastava*

**Course Code: 110501**  
**Course Name: Estimating Costing & Contracting**

L	T	P	Credit
3	1	0	4

**Course Objectives:**

- 1) To work out the quantities of various items of civil works like buildings, culverts including steel girders etc.
- 2) To compute earthwork.
- 3) To understand detailed specifications and carry out analysis of rates.
- 4) To understand various methods of carrying out estimation.
- 5) To understand valuation process & fixation of rent.
- 6) To understand contracting procedures.

**Syllabus:**

**Unit I Introduction of Estimating:**

Purpose and importance of estimates, principles of estimating, methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet, bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

**Unit II: Details of Items:**

**Specifications of materials and works:** Types of Specifications, General specifications for Class A, B & C type of building, Detailed specifications of important items of work.

**Rate Analysis:** Task for average artisan, various factors involved in the rate of item, material and labour requirement for various trades, preparation for rates of important items of work, current schedule of rates (C.S.R)

**Unit III: Estimates**

Preparing detailed estimates of various types of buildings, R.C.C Works, Culverts, earth work calculations for roads and Canals, contingencies and work charge establishment, use of computational tools for preparing estimates.

**Unit IV: Valuation**

Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate of interest, methods of valuation, rent fixation of buildings

**Unit V: Contracting**

Contract, Types of engineering contract, essentials documents of engineering Contract, Conditions of contract, Earnest Money Deposit, Security Deposit, Responsibility of Engineer, Contractor & Client.

**Course Outcomes:**

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

**CO 1: Explain the fundamentals of quantity estimation, costing & contracting.**

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CO 2: Apply methods to estimate area, volume & cost.

CO 3: Evaluate mathematical & numerical models for rate & quantity estimation.

CO 4: Determine rates & value.

CO 5: Classify different rates of items, contracts & measurement techniques.

**Text Books:**

1. Estimating & costing in civil engineering, B.N. Dutta, UBS Publishers, 28<sup>th</sup> revised edition 2016
2. Estimating & Costing, S.C. Rangwala, Charotar Publishing House, 17<sup>th</sup> edition 2017

**Reference Books:**

1. Estimating & Costing for Civil Engg., G.S. Birdie, Dhanpat Rai Publications, 6<sup>th</sup> edition 2014
2. Estimating & Costing specification & valuation in civil engineering, M. Chakraborti, 2006

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**Text Books:**

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

**Reference Books:**

1. Reinforced Cement Concrete, P. Dayaratnam, Medtech Publishers, 5<sup>th</sup> edition, 2017.
2. Reinforced Concrete Design, S.N. Sinha, Tata McGraw Hill, 3<sup>rd</sup> edition, 2017
3. Plain and Reinforced Concrete, O.P. Jain and Jai Krishna, Nem Chand Pub., 8<sup>th</sup> edition, 2008
4. Reinforced Cement Concrete, Winter & Nelson, McGraw Hill, 11<sup>th</sup> edition, 1991

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P. C. Varghese  
A. K. Jain  
P. Dayaratnam

Course Code: 110503

Course Name: Fluid Mechanics - II

L	T	P	Credit
2	1	2	4

**Course Objectives:**

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

**Syllabus:**

**Unit-I**

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

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

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

**Unit - II Forces on immersed bodies:**

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

**Unit - III Uniform Flow in open Channels:**

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

**Unit - IV Gradually varied flow**

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

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*Dr. Anand*



### Unit - V Introduction to Fluid Machinery: Turbines & Pumps

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

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

#### Course Outcomes:

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

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

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

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

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

**CO 5: Design** open & closed conduit systems.

#### Text Books:

1. Fluid Mechanics, Modi & Seth, Standard Book house, Delhi, 21<sup>st</sup> edition, 2017
2. Open Channel Flow, K. Subramanya, Tata McGraw Hill, New Delhi, 5<sup>th</sup> edition, 2019

#### Reference Books:

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

#### List of Experiments:

1. To determine the performance characteristics of Pelton Wheel.
2. To determine the performance characteristics of Francis Turbine.
3. To determine the performance characteristics of Kaplan Turbine.
4. Calibration of multistage (Two) Pump & Study of characteristics of variable speed pump.
5. To determine the coefficient of discharge for rectangular notches.
6. To determine the coefficient of discharge for triangular notches.
7. To determine the characteristics of the Reciprocating pump at variable speed.
8. To prepare the calibration curve for rotameter.

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

**CO 1: Differentiate** between turbines & pumps.

**CO 2: Select** the efficient turbines by studying the performance characteristics of various turbines.

**CO 3: Distinguish** the performance characteristics of various pumps.

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**Course Code: 110509**  
**Course Name: Environmental Engineering**

L	T	P	Credit
2	1	2	4

**Courses Objectives:**

Students will be able to understand

- 1) The structure of drinking water supply systems, including water transport, treatment and distribution.
- 2) Water quantity and water quality criteria and standards, and their relation to public health.
- 3) Operation and maintenance of water supply system components.
- 4) How to estimate water requirement of a city.
- 5) How to design water treatment plant for urban & rural areas.
- 6) How to design water distribution network including pipe appurtenances.
- 7) To impart basic knowledge on sewerage system including estimation of sewage quantity and design of sewer.
- 8) To provide a broad knowledge on sewage composition and its characteristics.
- 9) To provide information on disposal standard of effluents and also about various methods of sewage disposal.
- 10) To provide broad knowledge on various techniques of sewage treatment including and advanced treatment process.

**Syllabus:**

**Unit-I**

Water demand (types, variation, factors affecting it), Design period, Population forecasting methods, Intake structures (location, types). Characteristics of water, Water borne diseases, IS Standard of drinking water.

**Unit-II**

Water treatment plant flow diagram. Design, construction and working of Screens, Plain sedimentation tank, Clariflocculator, Filters (Slow sand filters, Rapid sand gravity filters and Pressure filters), Methods of disinfection, Hardness (causes and types), Methods of water softening, Removal of colour, odour and taste from water, Removal of iron and manganese, Algae removal, Fluoridation and De-fluoridation.

**Unit-III**

Distribution system (requirements, layout and methods of distribution), Distribution reservoir (types and its capacity determination), Fixing size of pipes, Analysis of pipe networks (Hardy cross method and Equivalent pipe method), Appurtenances used in distribution networks, Water supply & pumping system used in buildings, Rural water supply.

**Unit - IV**

Sewerage schemes & sewerage system and their importance, Collection & conveyance of sewage, Fluctuation in sewage flow, Design of sewer, Sewer appurtenances, Pumps & pumping stations,

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Characteristics and analysis of sewage (physical, chemical, biological parameters), BOD & COD, Methods of sewage disposal i.e. on land or by dilution, Self-purification capacity of river/stream.

#### Unit-V

Treatment of sewage (preliminary, primary, secondary and tertiary treatment), Design and working principles of screens, Grit chamber, Primary settling tank, Sewage filtration, Activated Sludge Process, Oxidation pond, Aerated lagoon, Anaerobic lagoon, Septic tank & Imhoff tank, Rotating Biological Contactor, Removal of Nitrogen and Phosphorus, Source and treatment of sludge, Sludge thickening and digestion, Sludge drying beds, Sludge disposal, Sewage treatment plants using MBBR and SBR technology.

#### Courses Outcomes:

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

CO 1: Explain the concepts of water supply and waste water engineering.

CO 2: Determine the requirements for safe supply of water and safe disposal of sewage.

CO 3: Apply suitable techniques for water & waste water treatment.

CO 4: Analyse a given water supply scheme and a given sewerage system.

CO 5: Design a water supply system based upon the needs of society and sewage system for safe disposal of sewage.

#### Text Books:

1. Water Supply Engg., B. C. Punmia, Laxmi Publication (P) Ltd, New Delhi, 2016
2. Water Supply Engg. (Vol. I), S. K. Garg, Khanna Publishers, New Delhi, 2017
3. Sewage disposal and pollution Engg. (Vol. II), S.K. Garg, Khanna Publishers, New Delhi, 2017

#### Reference Books:

1. Water Supply & Sanitary Engg., G.S. Birdie, Dhanpat Rai Publishing Company, 2014
2. Water & Waste Water Technology, Mark J Hammer, Prentice Hall of India, 6<sup>th</sup> edition, 2008
3. Environmental Engineering, Peavy, Rowe & Tchobanoglous, McGraw Hill Publication, 2017
4. Manual of Water Supply and Treatment by CPHEEO, GOI, 2009
5. Manual on Sewerage & Sewerage Treatment by CPHEEO, GOI, 2013.

#### List of Experiments:

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

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Course Code: 110505

Course Name: Transportation Engineering

L	T	P	Credit
2	1	2	4

**Course Objectives:**

- 1) To study the planning aspects of roads & highway.
- 2) To study the geometric design aspects of highway and road.
- 3) To know about pavement material and design.
- 4) To understand the construction process and methods of roads & highway.
- 5) To study about traffic characteristics and design of intersections.

**Syllabus:**

**Unit – I Highway Development and Planning**

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

**Unit – II Highway Geometric Design**

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

**Unit – III Traffic Studies**

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

**Unit -IV**

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

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

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### Unit – V Evaluation and Maintenance of Pavements

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

#### Course Outcomes:

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

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

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

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

CO 4: Design pavements as per regulations.

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

#### Text Books:

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

#### Reference Books:

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

#### List of Experiments:

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

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**Course Code: 110506**  
**Course Name: Minor Project - I**

L	T	P	Credit
0	0	2	1

**Course Objectives:**

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

**Syllabus:**

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

**OR**

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

**Course Outcomes:**

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

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





Course Code: 110507

Course Name: Summer Internship Project - II

L	T	P	Credit
0	0	6	3

**Course Objectives:**

- 1) To make student acquire good oral & written communication skills.
- 2) To promote the habit of lifelong learning.
- 3) To prepare students develop adequate soft skills to be able to present their topic effectively to listeners.

**Syllabus:**

Each candidate shall have to undergo 15 days in house summer internship related to soft skills at the institute after the completion of their 4<sup>th</sup> Semester exams (in summer vacations) and after successful completion of internship they have to submit detailed report.

**Course Outcomes:**

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

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

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

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Course Code: 110508

Course Name: Self Learning / Presentation

L	T	P	Credit
0	0	2	1

**Course Objectives:**

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

**Syllabus:**

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

**Course Outcomes:**

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

- CO 1: Analyze contemporary issues in civil engineering & its allied areas through literature survey.
- CO 2: Distinguish state of art & relevance of the topic in national & international arena.
- CO 3: Demonstrate good oral & written communication skills.
- CO 4: Develop poster and power point presentations for effective communication.
- CO 5: Display lifelong learning.



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