

<b>Semester: V</b>		
<b>ENTREPRENEURSHIP AND CONSTRUCTION MANAGEMENT (Theory)</b>		
Course Code: MVJ21CV51		CIE Marks:50
Credits: L:T:P:S: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs
<b>Course Learning Objectives: The students will be able to</b>		
1	Introduce the field of management, task of the manager, importance of planning and types of planning	
2	Explain the role and importance of the entrepreneur in economic development and the concepts of entrepreneurship.	
3	Discuss the importance of Small-Scale Industries and the related terms and problems involved.	
4	Outline the Tender process and Contract document.	
5	Introduce the field of management, task of the manager, importance of planning and types of planning	

<b>UNIT-I</b>	
<p><b>Management:</b> Characteristics of management, functions of management, of planning process, types of plans.</p> <p><b>Construction Project Formulation:</b> Introduction to construction management, project organization</p> <p><b>Construction Planning and Scheduling:</b> Introduction, types of project plans, work breakdown structure, Grant Chart, preparation of network diagram- event and activity based and its critical path critical path method, PERT method.</p> <p>Laboratory Sessions/ Experimental learning</p> <ul style="list-style-type: none"> <li>Case study on decision making process in a corporate.</li> </ul> <p>Applications</p> <ul style="list-style-type: none"> <li>Planning in engineering field.</li> </ul> <p>Web Link and Video Lectures</p> <ul style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/110/105/110105146/">https://nptel.ac.in/courses/110/105/110105146/</a></li> <li><a href="https://nptel.ac.in/courses/122/108/122108038/">https://nptel.ac.in/courses/122/108/122108038/</a></li> </ul>	<b>8Hrs</b>
<b>UNIT-II</b>	
<p><b>Resource Management:</b> Basic concepts of resource management, class of labour, Wages &amp; statutory requirement, Labour Production rate or Productivity, Factors affecting labour output or productivity.</p> <p><b>Construction Equipments:</b> classification of construction equipment, estimation of productivity for: excavator, dozer, compactors, graders and dumpers. Estimation of ownership cost, operational and maintenance cost of construction equipments. Selection of construction equipment and basic concept on equipment maintenance.</p> <p>Laboratory Sessions/ Experimental learning</p> <ul style="list-style-type: none"> <li>Case study of steel plant departmentalization.</li> </ul> <p>Applications</p> <ul style="list-style-type: none"> <li>Effective communication in a corporate.</li> </ul>	<b>8Hrs</b>

<p>Web Link and Video Lectures</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/content/storage2/courses/122106031/slides/3_2s.pdf">https://nptel.ac.in/content/storage2/courses/122106031/slides/3_2s.pdf</a></li> </ul>	
<b>UNIT-III</b>	
<p><b>Construction Quality, safety and Human Values:</b> Construction quality process, inspection, quality control and quality assurance, cost of quality, ISO standards. Introduction to concept of Total Quality Management</p> <p><b>HSE:</b> Introduction to concepts of HSE as applicable to Construction. Importance of safety in construction , Safety measures to be taken during Excavation , Explosives , drilling and blasting , hot bituminous works , scaffolds / platforms / ladder , form work and equipment operation. Storage of materials. Safety through legislation, safety campaign. Insurances.</p> <p><b>Ethics :</b> Morals, values and ethics, integrity, trustworthiness , work ethics, need of engineering ethics, Professional Duties, Professional and Individual Rights, Confidential and Proprietary Information, Conflict of Interest Confidentiality, Gifts and Bribes, Price Fixing, Whistle Blowing.</p> <p>Laboratory Sessions/ Experimental learning</p> <ul style="list-style-type: none"> <li>• Case study of a startup.</li> </ul> <p>Application</p> <ul style="list-style-type: none"> <li>• Social auditing in a software company</li> </ul> <p>Web Link and Video Lectures</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/110/106/110106141/">https://nptel.ac.in/courses/110/106/110106141/</a></li> <li>• <a href="https://nptel.ac.in/courses/127/105/127105007/">https://nptel.ac.in/courses/127/105/127105007/</a></li> </ul>	<b>8Hrs</b>
<b>UNIT-IV</b>	
<p><b>Entrepreneurship:</b> Evolution of the concept, functions of an entrepreneur, concepts of entrepreneurship, stages in entrepreneurial process, different sources of finance for entrepreneur, central and state level financial institutions.</p> <p><b>Micro, Small &amp; Medium Enterprises (MSME):</b> definition, characteristics, objectives, scope, role of MSME in economic development, advantages of MSME, Introduction to different schemes: TECKSOK, KIADB, KSSIDC, DIC, Single Window Agency: SISI, NSIC, SIDBI, KSFC.</p> <p>Laboratory Sessions/ Experimental learning</p> <ul style="list-style-type: none"> <li>• Case study on the growth of small-scale industries.</li> </ul> <p>Application</p> <ul style="list-style-type: none"> <li>• Small Scale Industries</li> </ul>	<b>8Hrs</b>
<b>UNIT-V</b>	
<p><b>Contract Management-Tender and its Process:</b> Invitation to tender, Prequalification, administrative approval &amp; Technical sanction. Bid submission and Evaluation process. Contract Formulation: covering Award of contract, letter of intent, letter of acceptance and notice to proceed. Features / elements of standard Tender document ,Law of Contract as per Indian Contract act 1882 , Types of Contract, Entire contract, Lump sum contract, Item rate, % rate, Cost plus with Target, Labour, EPC and BOT, Sub Contracting</p> <p>Laboratory Sessions/ Experimental learning</p> <ul style="list-style-type: none"> <li>• Investigation on the market in correspondence to project.</li> </ul>	<b>8Hrs</b>

Application	
<ul style="list-style-type: none"> <li>• Preparations of project report.</li> </ul>	

Course Outcomes: After completing the course, the students will be able to	
CO1	Prepare a project plan based on requirements and prepare schedule of a project by understanding the activities and their sequence
CO2	Understand labour output, equipment efficiency to allocate resources required for an activity / project to achieve desired quality and safety.
CO3	Establish as an ethical entrepreneur and establish an enterprise utilizing the provisions offered by the federal agencies.
CO4	Identify the social responsibilities of business towards Different Groups
CO5	Discuss Contract documents of domestic and international construction works

Reference Books	
1.	Principles of Management, Tripathy PC & Reddy P, 1999, Tata McGraw Hill.
2.	Management and Entrepreneurship, NVR Naidu and T. Krishna Rao, I.K. International Publishing House Pvt, Ltd. New Delhi
3.	Civil Engineering Contracts and Estimates , B.S. Patil, Universities Press
4.	Management, Stephen P. Robbins & Mary Coulter, 10th Edition, 2009, Prentice Hall (India) Pvt. Ltd
5.	Management, JAF Stoner, Freeman R.E and Daniel R Gilbert, 6th Edition, 2004, Pearson Education,

### Continuous Internal Evaluation (CIE):

#### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

### Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	-	-	-	1	2	3	3	3	3
CO2	1	2	1	-	2	-	1	2	3	3	3	3
CO3	1	2	1	-	2	-	1	2	3	3	3	3
CO4	1	2	1	-	-	-	1	2	3	3	3	3
CO5	1	2	1	-	2	-	1	2	3	3	3	3

Semester: V		
ANALYSIS OF INDETERMINATE STRUCTURES (Theory)		
Course Code: MVJ21CV52		CIE Marks:50
Credits: L:T:P:S: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs
Course Learning Objectives: The students will be able to		
1	Apply the knowledge of mathematics, science and Engineering fundamentals to solve relatively complex Engineering structures.	
2	Develop relevant equations for displacement method and apply the same for analysis on structures for different loading and boundary conditions.	
3	Analyze structural system and interpret data.	
4	Develop conditions for force method and apply the same for analysis on structures with different load and boundary conditions.	
5	Apply the knowledge of mathematics, science and Engineering fundamentals to solve relatively complex Engineering structures.	

UNIT-I	
<p><b>Introduction:</b> Methods of analysis of indeterminate structures – Force and displacement methods.</p> <p><b>Slope Deflection Method:</b> Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy <math>\leq 3</math>.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Modelling and software analysis of beams and plane frames with Kinematic indeterminacy <math>\leq 3</math></li> </ul> <p>Applications: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Numerical problems involving Kinematic indeterminacy greater than 3 by Slope Deflection method.</li> <li>Indeterminate Truss analysis.</li> </ul> <p>Video link / Additional online information: (Self-Learning)</p> <ul style="list-style-type: none"> <li><a href="https://archive.nptel.ac.in/courses/105/105/105105109/">https://archive.nptel.ac.in/courses/105/105/105105109/</a></li> <li><a href="https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf">https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf</a></li> </ul>	<b>8 Hrs</b>
UNIT-II	
<p><b>Moment Distribution Method:</b> Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy <math>\leq 3</math>.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Modelling and software analysis of beams and plane frames with Kinematic indeterminacy <math>&gt; 3</math></li> </ul>	<b>8 Hrs</b>

<p>Applications: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Numerical problems involving Kinematic indeterminacy greater than 3 by Moment Distribution method.</li> </ul> <p>Video link / Additional online information: (Self-Learning)</p> <ul style="list-style-type: none"> <li><a href="https://archive.nptel.ac.in/courses/105/105/105105109/">https://archive.nptel.ac.in/courses/105/105/105105109/</a></li> <li><a href="https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf">https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf</a></li> </ul>	
<b>UNIT-III</b>	
<p><b>Kani's Method:</b> Introduction, Concept, Relationships between bending moment and deformations, Analysis of continuous beams with and without settlements, Analysis of frames with and without sway.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Modelling and software analysis of multi-storey frames with gravity loads.</li> </ul> <p>Applications: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Numerical problems involving Kinematic indeterminacy greater than 3 by Kani's method.</li> </ul> <p>Video link / Additional online information: (Self-Learning)</p> <ul style="list-style-type: none"> <li><a href="https://archive.nptel.ac.in/courses/105/105/105105109/">https://archive.nptel.ac.in/courses/105/105/105105109/</a></li> <li><a href="https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf">https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf</a></li> </ul>	<b>8 Hrs</b>
<b>UNIT-IV</b>	
<p><b>Matrix Method of Analysis (Stiffness Method):</b> Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic indeterminacy <math>\leq 3</math>.</p> <p><b>Matrix Method of Analysis (Flexibility Method):</b> Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy <math>\leq 3</math>.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Modelling and software analysis of multi-storey frames with lateral loads.</li> </ul> <p>Applications: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Analysis of continuous beams and plane trusses using system approach by stiffness method.</li> <li>Analysis of continuous beams using system approach by flexibility method.</li> </ul> <p>Video link / Additional online information: (Self-Learning)</p> <ul style="list-style-type: none"> <li><a href="https://archive.nptel.ac.in/courses/105/105/105105109/">https://archive.nptel.ac.in/courses/105/105/105105109/</a></li> <li><a href="https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf">https://www.vssut.ac.in/lecture_notes/lecture1428730889.pdf</a></li> </ul>	<b>8 Hrs</b>
<b>UNIT-V</b>	
<p><b>Analysis of Beams:</b> Consistent Deformation method - Propped Cantilever Beam and Fixed Beams only. Clapeyron's Theorem of Three Moments – Continuous Beams and Fixed Beam only.</p>	<b>8 Hrs</b>

Laboratory Sessions/ Experimental learning: (Self-Learning) <ul style="list-style-type: none"> <li>• Verification of analysis results of force methods</li> </ul> Applications: (Self-Learning) <ul style="list-style-type: none"> <li>• Development of Three moment equation</li> </ul> Video link / Additional online information: (Self-Learning) <ul style="list-style-type: none"> <li>• <a href="https://archive.nptel.ac.in/courses/105/105/105105109/">https://archive.nptel.ac.in/courses/105/105/105105109/</a></li> </ul>	
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Course Outcomes: After completing the course, the students will be able to	
CO1	Identify Indeterminate structures and determine the moment in indeterminate having variable moment of inertia and subsidence using slope deflection method.
CO2	Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method.
CO3	Analyze the continuous beams and frames by moment distribution method and Kani's method and understanding its iterative nature of obtaining solutions.
CO4	Analyze the trusses and frames by flexibility and stiffness matrix method of system approach.
CO5	Acquire the knowledge to analyze the statically indeterminate beams subjected to gravity loads by force methods.

Reference Books	
1.	Theory of Structures, Punmia B.C, Ashok Kumar Jain & Arun Kumar Jain, 2014, Laxmi Publications, India.
2.	Theory of structures, Ramamrutham, S, 2011, Dhanpat Rai publications.
3.	Structural Analysis, Hibbeler, R.C, 2014, Pearson India
4.	Structural Analysis, Reddy C S, 2010, Tata McGraw-Hill Publishing Company Ltd

### Continuous Internal Evaluation (CIE):

#### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

**Semester End Examination (SEE):**

**Total marks: 50+50=100**

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	1	-	-	-	1	-	1	1
CO2	2	1	2	-	1	-	-	-	1	-	1	1
CO3	2	1	2	-	1	-	-	-	1	-	1	1
CO4	2	1	2	-	1	-	-	-	1	-	1	1
CO5	2	1	2	-	1	-	-	-	1	-	1	1



<b>Semester: V</b>		
<b>DESIGN AND DETAILING OF RC STRUCTURES (Theory and Practice)</b>		
Course Code: MVJ21CV34		CIE Marks:50+50
Credits: L:T:P: 3:0:1		SEE Marks: 50 +50
Hours:40 L+ 26 P		SEE Duration: 03+03 Hours
<b>Course Learning Objectives: The students will be able to</b>		
1	Identify, formulate, and solve engineering problems of RC elements subjected to different kinds of loading.	
2	Illustrate a procedural knowledge in designing various structural RC elements.	
3	Impart the culture of following the codes for strength, serviceability, and durability as an ethics.	
4	Provide knowledge in analysis and design of RC elements for the success in competitive examinations.	

<b>UNIT-I</b>	
<p><i>Pre requisites: Basic knowledge of Structural Analysis</i></p> <p><b>Introduction to Limit State Design and Serviceability:</b> Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Limiting deflection, short term deflection, long term deflection. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Calculation of deflection and cracking of singly reinforced beam only.</p> <p>Laboratory Sessions/ Experimental learning: (Self Learning)</p> <ul style="list-style-type: none"> <li>To compare various components designed using older methods and limit state method.</li> <li>Comparison of components designed using older methods and limit state method</li> </ul> <p>Applications: (Self Learning)</p> <ul style="list-style-type: none"> <li>To access the importance of strength and serviceability criteria in the design.</li> </ul> <p>Video link:</p> <ul style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/105/105/105105105/">https://nptel.ac.in/courses/105/105/105105105/</a></li> </ul>	<b>8 Hrs</b>
<b>UNIT-II</b>	
<p><b>Limit State Analysis of Beams:</b> Analysis of singly reinforced, doubly reinforced, and flanged beams for flexure and shear.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>Generate excel sheets for analysis of beams</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>In analyzing beams of single and multistoried buildings.</li> </ul> <p>Video link:</p> <ul style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/105/105/105105105/">https://nptel.ac.in/courses/105/105/105105105/</a></li> </ul>	<b>8Hrs</b>

<b>UNIT-III</b>	
<p><b>Limit State Design of Beams:</b> Design of singly and doubly reinforced beams, Design of flanged beams for shear, design for combined bending and torsion as per IS-456.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>• Generate excel sheets for design of beams/ develop 3D models in software to understand detailing.</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• In designing beams of single and multistoried buildings.</li> </ul> <p>Video link:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105/105/105105105/">https://nptel.ac.in/courses/105/105/105105105/</a></li> </ul>	<b>8Hrs</b>
<b>UNIT-IV</b>	
<p><b>Limit State Design of Slabs and Stairs:</b> Introduction to one way and two-way slabs, Design of cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.</p> <p>Laboratory Sessions/ Experimental learning: (Self-Learning)</p> <ul style="list-style-type: none"> <li>• Models of beams and slabs/ Site visits to understand the RC detailing of various components.</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• In designing slabs and stairs for single and multi-storied buildings.</li> </ul> <p>Video link:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105/105/105105105/">https://nptel.ac.in/courses/105/105/105105105/</a></li> </ul>	<b>8Hrs</b>
<b>UNIT-V</b>	
<p><b>Limit State Design of Columns and Footings:</b> Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and for axial load &amp; moment.</p> <p>Laboratory Sessions/ Experimental learning: (Self Learning)</p> <ul style="list-style-type: none"> <li>• Generate excel sheets for design / develop 3D models in software to understand detailing.</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• In designing columns and footings for single and multistoried buildings</li> </ul> <p>Video link:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105/105/105105105/">https://nptel.ac.in/courses/105/105/105105105/</a></li> </ul>	<b>8Hrs</b>
<b>LABORATORY EXPERIMENTS</b>	
<p><b>Prerequisites:</b> Design and Detailing Specifications as per IS 456, SP34, SP16</p> <ol style="list-style-type: none"> <li>1. Detailing of Singly Reinforced, Doubly Reinforced, Cantilever Beams</li> <li>2. Detailing of Staircase, Lintel and Chajja</li> <li>3. Detailing of Column</li> <li>4. Detailing of Slab (one way and two way) under different restrained conditions</li> <li>5. Detailing of Footings</li> </ol>	

Course Outcomes: After completing the course, the students will be able to	
CO1	Restate the design philosophy and principles.
CO2	Solve engineering problems of RC elements subjected to flexure, shear and torsion.
CO3	Illustrate on the procedural knowledge in designs of RC structural elements such as slabs, columns and footings
CO4	Identify the different failure modes of steel tension and compression members and beams and compute their design strengths.
CO5	Design column splices and bases as per the Indian Standards

Reference Books	
1.	Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", McGraw Hill, New Delhi, 2017
2.	H J Sah, "Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)", Charotar Publishing House Pvt. Ltd. 2014
3.	IS: 456-2000, "Indian Standard Code Of Practice For Plain And Reinforced Concrete"
4.	SP 16 (1978): Design Aids for Reinforced Concrete to IS 456:1978

#### Continuous Internal Evaluation (CIE):

##### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

##### Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

#### Semester End Examination (SEE):

**Total marks: 50+50=100**

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete

syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

### Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	1	-	1	-	-	1	-	1	1
CO2	1	1	3	2	-	1	-	-	1	-	1	1
CO3	2	2	1	3	-	1	-	-	2	-	1	1
CO4	1	1	2	2	-	1	-	-	2	-	1	1
CO5	1	1	2	3	-	1	-	-	2	-	1	1

<b>Semester: V</b>		
<b>WATER SUPPLY AND WASTEWATER ENGINEERING (Theory and Practice)</b>		
Course Code: MVJ21CV54		CIE Marks:50+50
Credits: L:T:P: 3:0:1		SEE Marks: 50+50
Hours: 40L+26P		SEE Duration: 03+03 Hrs
Course Learning Objectives: The students will be able to		
1	Evaluate the sources and conveyance systems for raw and treated water.	
2	Design physical and chemical methods to ensure safe and potable water supply.	
3	Explain the concept and design of various physicochemical and biological treatment units	

<b>UNIT-I</b>	
<p><b>WATER:</b> Introduction, Need for protected water supply schemes, Sources water, Water supply systems- Intakes- Water demand- various types of water demand and their estimation- potable and wholesome water quality parameters - drinking water standards- Waterborne diseases- - Comparison from quality and quantity of various sources.</p> <p>Laboratory Sessions/ Experimental learning: Population Forecasting and Urban Planning Practice: A Case Study Video link: <a href="https://nptel.ac.in/courses/105105201/">https://nptel.ac.in/courses/105105201/</a></p>	<b>8 Hrs</b>
<b>UNIT-II</b>	
<p><b>WATER TREATMENT:</b> Layout and general outline of water treatment units- Screening- Aeration- sedimentation- principles- design factors for sedimentation tank- coagulation-flocculation- clarifier design- coagulants- feeding arrangements.</p> <p><b>FILTRATION AND CHLORINATION:</b> Filtration- theory- working of slow and rapid gravity filters- multimedia filters- design of filters- troubles in operation- comparison of filters – disinfection- theory of chlorination- chlorine demand- and other disinfection practices- Miscellaneous treatment methods.</p> <p><b>WATER DISTRIBUTION SYSTEMS:</b> Water distribution systems- Requirements, Layout of Water distribution systems- Design procedures- Hardy Cross and equivalent pipe methods.</p> <p>Laboratory Sessions/ Experimental learning: Design and fabricate low-cost potable filtration unit for the treatment of surface water source. Video link: <a href="https://nptel.ac.in/courses/105105201/">https://nptel.ac.in/courses/105105201/</a></p>	<b>8 Hrs</b>
<b>UNIT-III</b>	
<p><b>WASTE WATER COLLECTION AND CHARACTERISTICS:</b> Conservancy and water carriage systems- sewage and storm water estimation- time of concentration- storm water overflows combined flow- characteristics</p>	<b>8 Hrs</b>

<p>of sewage- effluent discharge standards- cycles of decay- decomposition of sewage- examination of sewage- B.O.D- C.O.D equations.</p> <p><b>HOUSE DRAINAGE</b></p> <p>Design of sewers- shapes and materials- sewer appurtenances- house drainage- components requirements- sanitary fittings- traps- one pipe and two pipe systems of plumbing.</p> <p>Laboratory Sessions:</p> <ul style="list-style-type: none"> <li>• Sampling and testing of wastewater samples to identify various physical, chemical, and biological characteristics of water. (Env.Lab experiments)</li> <li>• Model making of Municipal Wastewater treatment showing various treatment units.</li> </ul> <p>Applications: (Self – Learning)</p> <ul style="list-style-type: none"> <li>• Sample collection procedures and analysis.</li> <li>• Knowledge of BIS standards for various physical, chemical, and biological parameters.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105104102/">https://nptel.ac.in/courses/105104102/</a></li> </ul>	
<b>UNIT-IV</b>	
<p><b>WASTE WATER TREATMENT:</b> Layout and general outline of various units in a waste water treatment plant- primary treatment design of screens- grit chambers- skimming tanks- principles of design- biological treatment- trickling filters- activated sludge process- rotating biological contactors and standard high rate filters.</p> <p>Laboratory Sessions:</p> <ul style="list-style-type: none"> <li>• Model making of suspended and attached growth systems.</li> <li>• Preparation of flow chart showing various waste treatment processes.</li> </ul> <p>Applications: (Self – Learning)</p> <ul style="list-style-type: none"> <li>• Understand the sludge processing techniques and its behavior in different feeding conditions.</li> <li>• Knowledge on varying F/M ratios and understand its applications for various modifications of ASP.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105104102/">https://nptel.ac.in/courses/105104102/</a></li> <li>• <a href="https://nptel.ac.in/courses/105105048/">https://nptel.ac.in/courses/105105048/</a></li> </ul>	<b>8 Hrs</b>
<b>UNIT-V</b>	
<p><b>LOW COST WASTE WATER TREATMENT:</b> Working principle and design of Oxidation ponds- design and operation of Oxidation ditches- Case studies- Sludge digestion and factors effecting- design of Digestion tank- Sludge disposal methods- septic tanks- soak pits.</p>	<b>8 Hrs</b>

<p>Laboratory Sessions:</p> <ul style="list-style-type: none"> <li>• Experimental determination of coagulation process.</li> <li>• A visit to college STP to make them understand and give practical exposure about the various wastewater treatment procedures.</li> </ul> <p>Applications: (Self – Learning)</p> <ul style="list-style-type: none"> <li>• Understand the importance of denitrification and removal of phosphorous from the wastewater.</li> <li>• Behavior of digested sludge on drying and its practical use as a manure.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105104102/">https://nptel.ac.in/courses/105104102/</a></li> </ul>	
<b>LABORATORY EXPERIMENTS</b>	
<ol style="list-style-type: none"> <li>1. Determination of pH and Turbidity.</li> <li>2. Determination of Acidity and Alkalinity.</li> <li>3. Determination of Calcium, Magnesium and Total Hardness.</li> <li>4. Determination of Dissolved Oxygen</li> <li>5. Determination of BOD.</li> <li>6. Determination of Chlorides</li> <li>7. Determination of percentage of % of available chlorine in bleaching powder sample and Residual Chlorine.</li> <li>8. Determination of Solids in Sewage: i) Total Solids, ii) Suspended Solids, iii) Dissolved Solids, iv) Volatile Solids, Fixed Solids v) Settleable Solids.</li> <li>9. Determination of optimum coagulant dosage using Jar test apparatus.</li> <li>10. Determination Iron by spectrophotometer.</li> <li>11. Determination of Sodium and Potassium by flame photometer.</li> <li>12. Determination of COD(Demonstration)</li> <li>13. Air Quality Monitoring (Demonstration)</li> <li>14. Determination of Sound-by-Sound level meter at different locations (Demonstration)</li> <li>15. Determination of pH and Turbidity.</li> </ol>	

<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	an insight into the structure of drinking water supply systems, including water transport, treatment and distribution
CO2	understanding of water quality criteria and standards, and their relation to public health,
CO3	design and evaluate water supply project alternatives on basis of chosen selection criteria
CO4	estimate sewage generation and design sewer system including sewage pumping stations
CO5	perform basic design of the unit operations and processes that are used in sewage treatment

Reference Books	
1.	Water Supply Engineering, Garg, S.K. 2008, Khanna Publishers
2.	Garg, S.K., Sewage Disposal and Air Pollution Engineering, Khanna Publishers, 2008.
3.	Wastewater Engineering Treatment and reuse, Metcalf and Eddy, Fourth edition, 2007, Tata McGraw-Hill Edition,
4.	Environmental Engineering, Peavy, H.S., Rowe, D.R. and Tchobanoglous, G, 2013 McGraw Hill.

### Continuous Internal Evaluation (CIE):

#### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the self - study are 20 (2 presentations are held for 10 marks each). The marks obtained in test, quiz and self -studies are added to get marks out of 100 and report CIE for 50 marks.

#### Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

### Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

#### Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks



**CO-PO Mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	-	2	2	1	1	-	2	1
CO2	3	3	2	1	-	1	2	-	1	1	2	1
CO3	3	3	2	1	-	2	2	-	1	1	2	1
CO4	3	3	2	2	-	2	2	-	1	1	2	1
CO5	3	3	2	2	-	2	2	-	1	1	1	1

<b>Semester: V</b>		
<b>PAVEMENT MATERIALS (Theory)</b>		
Course Code: MVJ21CV551		CIE Marks:50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 03 Hrs
<b>Course Learning Objectives: The students will be able to</b>		
1	Explain the different types, properties and tests on soil sub grade.	
2	Explain the properties of aggregates and different test procedures and specifications.	
3	Explain the origin, properties, constituents and preparation of bitumen, tar, cutback bitumen and emulsions.	
4	Illustrate the bituminous mix design method.	
5	Explain in detail about HMA, WMA, CMA Explain types of cement, tests on cement, types of concrete, fillers, and sealers.	

<b>UNIT-I</b>	
<p><b>Prerequisites:</b> Knowledge on basics of Soil Mechanics</p> <p><b>Soil Characterization:</b> Properties of sub grade layers; different types of soils, Soil Classification; Index and other basic properties of soil; A critical look at the different laboratory and in - situ procedures for evaluating the mechanical properties of soils viz. SPT, CPT, CBR, Plate Load test, Field compaction and control.</p> <p>Laboratory Sessions:</p> <ul style="list-style-type: none"> <li>• Basic tests on soil.</li> <li>• Soil Stability Test.</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• To find out the Physical requirements of Aggregates with respect to IRC specifications.</li> <li>• To find out the Optimum Binder Content for Bituminous Mixes.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdf">https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-26.pdf</a></li> <li>• <a href="https://www.youtube.com/watch?v=fqYK4JGIVJY">https://www.youtube.com/watch?v=fqYK4JGIVJY</a></li> <li>• <a href="https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-24.pdf">https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-24.pdf</a></li> </ul>	<b>8 Hrs</b>
<b>UNIT-II</b>	
<p><b>Prerequisites:</b> Knowledge on basic Highway Engineering materials.</p> <p><b>Bitumen:</b> Bitumen and Tar: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements, Grades of bitumen i.e. Penetration Grade, Viscosity Grade. bitumen structure, Rheology of bitumen, Elastic modulus, Dynamic modulus, visco-elastic and fatigue properties, creep test,</p>	<b>8 Hrs</b>

<p>Bituminous Emulsions and Cutbacks, Preparation, characteristics, uses and tests, Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion, Modified binders.</p> <p>Laboratory Sessions:</p> <ul style="list-style-type: none"> <li>• Basic tests on bitumen.</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• To find out the Physical requirements of Bitumen with respect to IRC specifications.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105106053/lec31.pdf">https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105106053/lec31.pdf</a></li> </ul> <p><a href="https://nptel.ac.in/courses/105105107/">https://nptel.ac.in/courses/105105107/</a></p>	
<b>UNIT-III</b>	
<p><b>Prerequisites: Knowledge on basic Highway Engineering materials.</b></p> <p><b>Bituminous Mixes:</b> Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties. Modified bitumen: Crumb Rubber Modified bitumen, Natural rubber modified bitumen, polymer modified bitumen; Long term and short-term ageing and its effect on bitumen performance, Tests to simulate ageing of bitumen viz. RTFOT and PAV. Desirable properties of bituminous mixes, Design of bituminous mixes: Modified Marshall's specifications, Hubbard Field method of mix design, Hveem's method of mix design; Introduction to super pave mix design procedure, HMA, WMA, CMA.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> <li>• Rutting test and Fatigue test</li> <li>• Marshall Mix Design</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• To determine the stability of the mix</li> <li>• To Prepare the stable bituminous mix for the road construction</li> </ul>	<b>8Hrs</b>
<b>UNIT-IV</b>	
<p><b>Pre requisites:</b> Types of equipment <b>Pavement construction.</b> Road construction equipment – different types of excavators, graders, soil compactors / rollers, pavers and other equipment for construction of different pavement layers – their uses and choice, productivity calculation. Problem on equipment usage charges. Investment on equipment, depreciation. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.</p> <p>Laboratory Sessions/ Experimental learning:</p>	<b>8 Hrs</b>

<ul style="list-style-type: none"> <li>Refer standard contract forms and identify important clauses.</li> </ul> <p>Application:</p> <ul style="list-style-type: none"> <li>Equipment selection.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/105103093/">https://nptel.ac.in/courses/105103093/</a>,</li> <li><a href="https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105104161/lec12.pdf">https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105104161/lec12.pdf</a>,</li> <li><a href="https://syedsohailuddin.files.wordpress.com/2018/07/is-1200-17.pdf">https://syedsohailuddin.files.wordpress.com/2018/07/is-1200-17.pdf</a></li> </ul>	
<b>UNIT-V</b>	
<p>Prerequisites: Knowledge on basic Highway Engineering materials.</p> <p><b>Quality control</b></p> <p>Sub grade: Preparation of sub grade- construction of embankments and cuts for roads; Quality control tests. Flexible Pavements: Specifications of materials, construction method and field control check for of flexible pavement layers –BM- DBM and BC Cement Concrete Pavements: – PQC-FRCC- Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> <li>Compaction Test(density)</li> <li>Quality tests of aggregate.</li> <li>Quality test on the Bituminous and cement concrete during the construction</li> </ul> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> <li><a href="https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-19.pdf">https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-19.pdf</a></li> </ul>	<b>8 Hrs</b>

<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	Gain knowledge about aggregates, properties and tests.
CO2	Capable of doing mix design for different layers of pavement.
CO3	Gain the Knowledge Bituminous Mixes and its Properties.
CO4	Assess quality of materials.
CO5	Inspect and estimate the work of equipment

<b>Reference Books</b>	
1.	Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., 'Highway Engineering', Nem Chand and Bros, Roorkee, 2014.
2.	Partha Chakroborty and Animesh Das, 'Principles of Transportation Engineering', Prentice Hall (India), New Delhi, 2011.
3.	Atkins, N. Harold, Highway Materials, Soils and Concretes, Fourth Edition, Prentice–Hall, 2002.
4.	Freddy L Roberts, Prithvi S Kandhaletal, "Hot Mix Asphalt Materials, mixture design and construction" -(2ndEdition), National Asphalt Pavement Association Research and Education Foundation, Maryland, USA, 2009.

## Continuous Internal Evaluation (CIE):

### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

## Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	-	-	-	-	-	-	-	1
CO2	2	2	1	-	-	-	-	-	-	-	-	1
CO3	2	2	1	1	1	-	-	-	1	-	-	1
CO4	2	2	1	-	-	-	1	-	1	-	-	1
CO5	2	2	1	-	-	-	1	1	-	-	1	1

<b>Semester: V</b>		
<b>WATER RESOURCES MANAGEMENT (Theory)</b>		
Course Code: MVJ21CV552		CIE Marks:50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 03 Hrs
Course Learning Objectives: The students will be able to		
1	Judge surface and ground water resources.	
2	Address the issues of water resources management.	
3	Explain the principles of integrated water resources management.	
4	Apply the legal framework of water policy.	
5	Suggest the different methods of water harvesting.	

<b>UNIT-I</b>	
<p><b>Water Resources:</b> Hydrologic Cycle, Global water resources and Indian Water resources, Water Balance, Available Renewable Water Resources, Surface Water Resources, Groundwater Resources- Types of Aquifers, and Groundwater as a Storage Medium.</p> <p><b>Water resources management:</b> The Water Balance as a Result of Human Interference, Storm water management, Flood water management, Fresh water management, Ground water management, Wastewater management, Urban water management, Water pollution and water quality management. Water table- Factors affecting water table, Water Scarcity</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> <li>• Identification of water management system available in a region</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• Water quantity estimation</li> <li>• Water quantity management</li> <li>• Quantifying the water scarcity.</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/114105044/">https://nptel.ac.in/courses/114105044/</a></li> <li>• <a href="https://nptel.ac.in/courses/114105044/">https://nptel.ac.in/courses/114105044/</a></li> <li>• <a href="https://nptel.ac.in/courses/114105044/">https://nptel.ac.in/courses/114105044/</a></li> </ul>	<b>8 Hrs</b>
<b>UNIT-II</b>	
<p><b>Water Resources Planning and Management:</b> Necessity, Planning and management issues, System components, planning scales, Approaches. Planning and management aspects, Analysis, Models for impact prediction and evaluation, Adaptive Integrated Policies, Post Planning and management Issues. Meeting the Planning and Management Challenges.</p> <p>Laboratory Sessions/ Experimental learning:</p>	<b>8 Hrs</b>

<ul style="list-style-type: none"> <li>Analyzing the alternate solutions for water quality problem in a given region</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>Preparing analytical framework of management system</li> <li>Model analysis for selecting the optimum solution</li> <li>Management of Water quality issues through system approach</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li><a href="https://nptel.ac.in/courses/105108130/">https://nptel.ac.in/courses/105108130/</a></li> </ul>	
<b>UNIT-III</b>	
<p><b>Integrated Water Resources Management:</b> Definition of IWRM- Natural and human integration system, Principles- Water as a finite and vulnerable resource, Participatory approach, The important role of women in water management, Water as an economic good, Implementation of IWRM, Legislative and Organizational Framework.</p> <p><b>Private sector Involvement:</b> Types and Forms of Private Sector Involvement, Benefits of IWRM in different sector- Environmental sector, Food and agriculture sector, water supply and sanitation.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> <li>Identification of private sector participation in water supply for a given</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>Decision making for water quantity problems based on IWRM Concept</li> <li>Evaluation of value of water</li> <li>Monitoring Private sector involvement in water management</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li><a href="http://www.digimat.in/nptel/courses/video/105101010/L08.html">http://www.digimat.in/nptel/courses/video/105101010/L08.html</a></li> <li><a href="https://nptel.ac.in/courses/114105044/">https://nptel.ac.in/courses/114105044/</a></li> </ul>	<b>8Hrs</b>
<b>UNIT-IV</b>	
<p><b>Water Governance:</b> Definition, Necessity of water governance, Principles of effective governance- Approaches, performance and operation water governance challenges, water governance cycle</p> <p><b>National Water Policy:</b> National water resource council, 1987 &amp; 2002 Nation water policy Irrigation Management Transfer Policies and Activities , Legal Registration of ,WUAs , Legal Changes in Water Allocation, – Role of Local Institutions – Community Based Organizations.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> <li>Verification of implementation of water policies in a given region.</li> </ul> <p>Applications: (Self Learning)</p> <ul style="list-style-type: none"> <li>Justification on water allocation</li> <li>Highlighting the water policies during the decision-making process</li> </ul>	<b>8 Hrs</b>

<p>in water management</p> <ul style="list-style-type: none"> <li>• Evaluation of effective participation of WUA</li> </ul> <p>Video link / Additional online information: (Self Learning)</p> <ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/114105044/">https://nptel.ac.in/courses/114105044/</a></li> </ul>	
<b>UNIT-V</b>	
<p><b>Water conservation:</b> Definition, Goals, Water conservation techniques- Conservation by surface water storage, Conservation of rain water, Ground water conservation (Online mode), Catchment area protection (CAP) - Inter-basin transfer of water- Adoption of drip sprinkler irrigation, Management of growing pattern of crops, Reducing evapotranspiration, Reducing evaporation from various water bodies- Recycling of water , Measures of water conservation, simple water saving methods.</p> <p><b>Water Harvesting:</b> Water Harvesting Techniques, Micro-catchments, Design of Small Water Harvesting Structures, Farm Ponds, Percolation Tanks, Yield from a Catchment, Rain water Harvesting-various techniques related to Rural and Urban area(Online mode).</p> <p>Laboratory Sessions/ Experimental learning:</p> <ul style="list-style-type: none"> <li>• Design Rainwater harvesting structure in a given region to conserve water.</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>• Design of Rainwater harvesting system</li> <li>• Evaluation of effective conservation of water.</li> <li>• Implementation of micro irrigation system</li> </ul>	<b>8 Hrs</b>

<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	Discuss the potential of groundwater and surface water resources.
CO2	Illustrate the issues related to planning and management of water resources
CO3	Outline IWRM in different regions.
CO4	List out the legal issues of water policy
CO5	Predict the method for water harvesting based on the area.

<b>Reference Books</b>	
1.	Engineering Hydrology , K. Subramanya, 2017, Tata McGraw Hill Publishers, New Delhi
2.	Ground Water, H.M. Raghunath, 2016, Wiley Eastern Publication, New Delhi.
3.	Integrated Water Resources Management, Mollinga, P. et al, Water in South Asia Volume I, 2006, Sage Publications.
4.	Water Resources Systems Planning and Management, Daniel P. Loucks and Eelco van Beek, 2005, UNESCO Publication.



## Continuous Internal Evaluation (CIE):

### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

## Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

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CO3	2	2	1	1	1	-	-	-	1	-	-	1
CO4	2	2	1	-	-	-	1	-	1	-	-	1
CO5	2	2	1	-	-	-	1	1	-	-	1	1

<b>Semester: V</b>		
<b>REPAIR AND REHABILITATION OF STRUCTURES (Theory)</b>		
Course Code: MVJ21CV553		CIE Marks:50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 03 Hrs
<b>Course Learning Objectives: The students will be able to</b>		
1	Investigate the cause of deterioration of concrete structures.	
2	Strategies different repair and rehabilitation of structures.	
3	Evaluate the performance of the materials for repair.	

<b>UNIT-I</b>	
<b>General:</b> Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.	<b>8 Hrs</b>
<b>UNIT-II</b>	
<b>Damage Assessment:</b> Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems.	<b>8 Hrs</b>
<b>UNIT-III</b>	
<b>Influence on Serviceability and Durability:</b> Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection	<b>8 Hrs</b>
<b>UNIT-IV</b>	
<b>Maintenance and Retrofitting Techniques:</b> Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, Externally bonding(ERB) technique, near surface mounted (NSM) technique, External posttensioning, Section enlargement and guidelines for seismic rehabilitation of existing building.	<b>8 Hrs</b>
<b>UNIT-V</b>	
<b>Materials for Repair and Retrofitting:</b> Artificial fiber reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.	<b>8 Hrs</b>

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify the causes for structural (Concrete) deterioration.
CO2	Assess the type and extent of damage and carry out damage assessment of structures through various types of tests.
CO3	Recommend maintenance requirements of the buildings and preventive measures against influencing factors.
CO4	Select suitable materials
CO5	Suggest an appropriate method for repair and rehabilitation.

Reference Books	
1.	Repair of Concrete Structures, R.T.Allen and S.C. Edwards, Blakie and Sons.
2.	Deterioration, Maintenance and Repair of Structures, Sidney, M. Johnson.
3.	Concrete Structures – Materials, Maintenance and Repair, Denison Campbell, Allen & Harold Roper, Longman Scientific and Technical.
4.	Learning for failure from Deficiencies in Design, Construction and Service, Raiker R.N, R&D Center (SDCPL) and CPWD Manual

#### Continuous Internal Evaluation (CIE):

##### Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

#### Semester End Examination (SEE):

**Total marks: 50+50=100**

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	2	-	-	-
CO2	2	2	-	-	-	-	-	-	2	-	-	-
CO3	2	2	-	-	-	-	-	-	2	-	-	-
CO4	2	2	2	-	-	-	-	-	2	1	-	-
CO5	2	2	2	2	-	-	-	-	2	1	-	-

<b>Semester: V</b>		
<b>TRAFFIC ENGINEERING (Theory)</b>		
Course Code: MVJ21CV554		CIE Marks:50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 03 Hrs
<b>Course Learning Objectives: The students will be able to</b>		
1	Understand the human factors and vehicular factors in traffic engineering design.	
2	Conduct different types of traffic surveys and analysis of collected data using statistical concepts.	
3	Use an appropriate traffic flow theory and to comprehend the capacity & signalized intersection analysis.	
4	Understand the basic knowledge of Intelligent Transportation System.	
5		

<b>UNIT-I</b>	
<b>Traffic Planning and Characteristics:</b> Road Characteristics-Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India, Integrated planning of town, country, regional and all urban infrastructures, Sustainable approach- land use & transport and modal integration.	<b>8 Hrs</b>
<b>UNIT-II</b>	
<b>Traffic Surveys:</b> Traffic Surveys- Speed, journey time and delay surveys, Vehicles Volume Survey including non-motorized transports, Methods and interpretation, Origin Destination Survey, Methods and presentation, Parking Survey, Accident analyses-Methods, interpretation and presentation, Statistical applications in traffic studies and traffic forecasting, Level of service- Concept, applications and significance.	<b>8 Hrs</b>
<b>UNIT-III</b>	
<b>Traffic Design and Visual Aids:</b> Intersection Design- channelization, Rotary intersection design, Signal design, Coordination of signals, Grade separation, Traffic signs including VMS and road markings, Significant roles of traffic control personnel, Networking pedestrian facilities & cycle tracks.	<b>8Hrs</b>
<b>UNIT-IV</b>	
<b>Traffic Safety and Environment:</b> Road accidents, Causes, effect, prevention, and cost, Street lighting, Traffic and environment hazards, Air and Noise Pollution, causes, abatement measures, Promotion and integration of public transportation, Promotion of non-motorized transport.	<b>8 Hrs</b>
<b>UNIT-V</b>	

<b>Traffic Management:</b> Area Traffic Management System, Traffic System Management (TSM) with IRC standards, Traffic Regulatory Measures, Travel Demand Management (TDM), Direct and indirect methods, Congestion and parking pricing, All segregation methods- Coordination among different agencies, Intelligent Transport System for traffic management, enforcement and education.	<b>8 Hrs</b>
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<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	Understand the human factors and vehicular factors in traffic engineering design.
CO2	Conduct different types of traffic surveys and analysis of collected data using statistical concepts.
CO3	Use an appropriate traffic flow theory and to comprehend the capacity of intersection
CO4	Use an appropriate traffic flow theory and to carry out the signalized intersection analysis.
CO5	Understand the basic knowledge of Intelligent Transportation System.

<b>Reference Books</b>	
1.	Kadiyali.L.R. "Traffic Engineering and Transport Planning ", Khanna Publishers, Delhi, 2013
2.	S K Khanna and CEG Justo and A Veeraragavan, "Highway Engineering", Nem Chand and Bros.
3.	Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
4.	SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994

#### **Continuous Internal Evaluation (CIE):**

##### **Theory for 50 Marks**

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

#### **Semester End Examination (SEE):**

**Total marks: 50+50=100**



<b>Semester: V</b>		
<b>ENVIRONMENTAL STUDIES (Theory)</b>		
Course Code: MVJ21CV56		CIE Marks: 50
Credits: L:T:P: 1:0:0		SEE Marks: 50
Hours: 15 L		SEE Duration: 02 Hrs.
<b>Course Learning Objectives: The students will be able to</b>		
1	Relate interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences including geo-systems, biology, chemistry, economics, political science and international processes	
2	Study drinking water quality standards and to illustrate qualitative analysis of water.	
3	Critically evaluate the science and policy ramifications of diverse energy portfolios on air and water quality, climate, weapons proliferation and societal stability.	

<b>UNIT-I</b>	
<p><b>Introduction</b> to environmental studies, Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.</p> <p><b>Ecosystems (Structure and Function):</b> Forest, Desert, Rivers, Ocean</p> <p><b>Biodiversity:</b> Types, Hot spots; Threats and Conservation of biodiversity, Deforestation.</p> <p>Video link: <a href="https://nptel.ac.in/courses/127/106/127106004/">https://nptel.ac.in/courses/127/106/127106004/</a></p>	<b>3 Hrs</b>
<b>UNIT-II</b>	
<p><b>Advances in Energy Systems</b> (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, Tidal and Wind.</p> <p><b>Natural Resource Management (Concept and case-study):</b> Disaster Management, Sustainable Mining and Carbon Trading.</p> <p>Video link: <a href="https://nptel.ac.in/courses/121/106/121106014/">https://nptel.ac.in/courses/121/106/121106014/</a></p>	<b>3 Hrs</b>
<b>UNIT-III</b>	
<p><b>Environmental Pollution:</b> Surface and Ground Water Pollution, Noise pollution, Soil Pollution and Air Pollution.</p> <p><b>Waste Management &amp; Public Health Aspects:</b> Bio-medical Waste, Solid waste, Hazardous waste and E-waste.</p>	<b>3 Hrs</b>



Video link:	
<ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/122/106/122106030/">https://nptel.ac.in/courses/122/106/122106030/</a></li> <li>• <a href="https://nptel.ac.in/courses/105/103/105103205/">https://nptel.ac.in/courses/105/103/105103205/</a></li> <li>• <a href="https://nptel.ac.in/courses/120/108/120108005/">https://nptel.ac.in/courses/120/108/120108005/</a></li> <li>• <a href="https://nptel.ac.in/courses/105/105/105105160/">https://nptel.ac.in/courses/105/105/105105160/</a></li> </ul>	
<b>UNIT-IV</b>	
<b>Global Environmental Concerns (Concept, policies, and case-studies):</b> Global Warming, Climate Change, Acid Rain, Ozone Depletion and Fluoride problem in drinking water.	<b>3 Hrs</b>
Video link:	
<ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/122/106/122106030/">https://nptel.ac.in/courses/122/106/122106030/</a></li> <li>• <a href="https://nptel.ac.in/courses/120108004/">https://nptel.ac.in/courses/120108004/</a></li> <li>• <a href="https://onlinecourses.nptel.ac.in/noc19_ge23/preview">https://onlinecourses.nptel.ac.in/noc19_ge23/preview</a></li> </ul>	
<b>UNIT-V</b>	
<b>Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications):</b> G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems.	<b>3 Hrs</b>
Video link:	
<ul style="list-style-type: none"> <li>• <a href="https://nptel.ac.in/courses/105/102/105102015/">https://nptel.ac.in/courses/105/102/105102015/</a></li> <li>• <a href="https://nptel.ac.in/courses/120/108/120108004/">https://nptel.ac.in/courses/120/108/120108004/</a></li> </ul>	

<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	Describe the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and Abiotic components.
CO4	Apply their ecological knowledge to illustrate and graph a problem
CO5	Describe the realities that managers face when dealing with complex issues.

<b>Reference Books</b>	
1.	Principals of Environmental Science and Engineering, Raman Siva kumar, Cengage learning, Singapur, 2 <sup>nd</sup> Edition, 2005.

2.	Environmental Science – working with the Earth G.Tyler Miller Jr. Thomson Brooks /Cole, 11 <sup>th</sup> Edition, 2006
3.	Textbook of Environmental and Ecology, Pratiba Singh, Anoop Singh & Piyush Malaviya , ACME Learning Pvt. Ltd. New Delhi, 1 <sup>st</sup> Edition.

**Continuous Internal Evaluation (CIE):**

**Theory for 50 Marks**

CIE for 50 marks, executed by way of tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 40 marks and assignment is evaluated for 10 marks. The three tests are conducted for 40 marks each and the average of all the tests are calculated for 40. The marks for the assignments are 10 (2 assignments for 5 marks each). The marks obtained in test and assignment are added and report CIE for 50 marks.

**Semester End Examination (SEE):**

SEE for 50 marks, executed by means of an examination. The Question paper contains objective type questions for 50 marks covering the entire syllabus having same complexity in terms of COs and Bloom's taxonomy level.

Total marks: 50+50=100

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	3	1	-	2	2	1	1	-	2	1
CO2	3	3	2	1	-	1	2	-	1	1	2	1
CO3	3	3	2	1	-	2	2	-	1	1	2	1
CO4	3	3	2	2	-	2	2	-	1	1	2	1

<b>Semester: V</b>		
<b>RESEARCH METHODOLOGY &amp; IPR</b> (Ability Enhancement Course)		
Course Code: MVJ21IPR57		CIE Marks: 50
Credits: L:T:P: 1:0:0		SEE Marks: 50
Hours: 15 L		SEE Duration: 02 Hrs.
<b>Course Learning Objectives: The students will be able to</b>		
1	Give an overview of the research methodology and explain the technique of defining a research problem	
2	Explain the functions of the literature review in research.	
3	Explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review.	
4	Explain various research designs and their characteristics	
5	Explain the details of sampling designs, and also different methods of data collections.	
6	Explain the art of interpretation and the art of writing research reports.	

<b>UNIT-I</b>	
<p><b>Research Methodology:</b> Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, <b>Defining the Research Problem:</b> Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.</p> <p>Laboratory Sessions/Experimental learning:</p> <ul style="list-style-type: none"> <li>Formulating Case study report on Problems Encountered by the Scholar's involved in research</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>Research Design</li> <li>Layout Plan for Alternatives</li> </ul>	<b>3 Hrs</b>
<b>UNIT-II</b>	
<p><b>Reviewing the literature:</b> Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.</p> <p>Laboratory Sessions/Experimental learning:</p> <ul style="list-style-type: none"> <li>Developing Conceptual Framework for Literature review under given issues</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>Review Paper Preparation</li> </ul>	<b>3 Hrs</b>

<ul style="list-style-type: none"> <li>Article Preparation for Research</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>Review of Literatures: <a href="https://nptel.ac.in/courses/110/105/110105091/">https://nptel.ac.in/courses/110/105/110105091/</a></li> </ul>	
<b>UNIT-III</b>	
<p><b>Research Design:</b> Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.</p> <p><b>Design of Sample Surveys:</b> Introduction, Sample Design, Sampling and Non- sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.</p> <p>Laboratory Sessions/Experimental learning:</p> <ul style="list-style-type: none"> <li>Preparation of particular layout for different types of sampling design</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>Strategy Planning for Resource Management</li> <li>Alternatives Risk Management</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>Qualitative Research : <a href="https://nptel.ac.in/courses/109105115/">https://nptel.ac.in/courses/109105115/</a></li> </ul>	<b>3 Hrs</b>
<b>UNIT-IV</b>	
<p><b>Data Collection:</b> Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method – Advanced Computing Techniques, Development of Software.</p> <p><b>Interpretation and Report Writing:</b> Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout, Records and Lab report</p> <p>Applications:</p> <ul style="list-style-type: none"> <li>Types of data collection for the project work</li> <li>Case study and data interpretation</li> <li>Thesis Writing</li> <li>Journal Writing</li> </ul> <p>Video link / Additional online information:</p> <ul style="list-style-type: none"> <li>Report Writing: <a href="https://nptel.ac.in/courses/121106007/">https://nptel.ac.in/courses/121106007/</a></li> </ul>	<b>3 Hrs</b>
<b>UNIT-V</b>	
<p><b>Intellectual Property:</b> The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, The Protection of Plant Varieties and Farmers' Rights Act, 2001, The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity,</p>	<b>3 Hrs</b>

<p>The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR. World Intellectual Property Organisation (WIPO), WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection. Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO.</p> <p>Laboratory Sessions/Experimental learning:</p> <ul style="list-style-type: none"> <li>Formulating Patent Draft for Provision Specifications with detailed diagrams</li> </ul> <p>Applications:</p> <ul style="list-style-type: none"> <li>Provisional and Detailed Specification for filing the patent</li> <li>Design patenting</li> </ul> <p>Video link / Additional online information: Intellectual Property Rights: <a href="https://nptel.ac.in/courses/110105139/">https://nptel.ac.in/courses/110105139/</a></p>	
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<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	Discuss research methodology and the technique of defining a research problem
CO2	Explain the functions of the literature review in research, carrying out a literature search
CO3	Develop theoretical and conceptual frameworks and writing a review.
CO4	Explain various research designs and their characteristics and art of interpretation and the art of writing research reports
CO5	Explain the Patent procedure and history of patents

<b>Reference Books</b>	
1.	"Research Methodology Methods and Techniques", C.R Kothari, New Age International Publishers, 2004, 2 <sup>nd</sup> Edition, ISBN (13) : 978-81-224-2488-1

### Continuous Internal Evaluation (CIE):

#### Theory for 50 Marks

CIE for 50 marks, executed by way of tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 40 marks and assignment is evaluated for 10 marks. The three tests are conducted for 40 marks each and the average of all the tests are calculated for 40. The marks for the assignments are 10 (2 assignments for 5 marks each). The marks obtained in test and assignment are added and report CIE for 50 marks.

#### Semester End Examination (SEE):

SEE for 50 marks, executed by means of an examination. The Question paper contains objective type questions for 50 marks covering the entire syllabus having same complexity in terms of COs and Bloom's taxonomy level.

**Total marks: 50+50=100**

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	1	2	2	3	-	-	1	2	3	1	-	1
CO2	3	2	2	3	2	-	3	3	1	1	-	3
CO3	2	1	-	-	-	3	2	2	3	1	3	2
CO4	1	1	2	-	1	3	3	3	1	-	1	1
CO5	2	2	1	3	3	2	3	2	1	2	3	1

<b>Semester: V</b>		
<b>UNIVERSAL HUMAN VALUES (Theory)</b>		
Course Code: MVJ21UHV58		CIE Marks: 50
Credits: L:T:P: 2:0:0		SEE Marks: 50
Hours: 30 L		SEE Duration: 03 Hrs.
<b>Course Learning Objectives: The students will be able to</b>		
1	Appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.	
2	Facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.	
3	Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.	

<b>UNIT-I</b>	
<p><b>Introduction to Value Education:</b> Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.</p> <p><b>Practical Sessions:</b> (1) Sharing about Oneself (2) Exploring Human Consciousness (3) Exploring Natural Acceptance.</p> <p>Video link:</p> <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=85XCw8SU084">https://www.youtube.com/watch?v=85XCw8SU084</a></li> <li>• <a href="https://www.youtube.com/watch?v=E1STJoXCXUU&amp;list=PLWDeKF97v9SP_Kt6jqzA3p_Z3yA7g_OAQz">https://www.youtube.com/watch?v=E1STJoXCXUU&amp;list=PLWDeKF97v9SP_Kt6jqzA3p_Z3yA7g_OAQz</a></li> <li>• <a href="https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw">https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</a></li> </ul>	<b>6 Hrs</b>
<b>UNIT-II</b>	
<p><b>Harmony in the Human Being:</b> Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.</p> <p><b>Practical Sessions:</b> (4) Exploring the difference of Needs of Self and Body (5) Exploring Sources of Imagination in the Self (6) Exploring Harmony of Self with the Body</p>	<b>6 Hrs</b>

Video link: <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=GpuZo495F24">https://www.youtube.com/watch?v=GpuZo495F24</a></li> <li>• <a href="https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw">https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</a></li> </ul>	
<b>UNIT-III</b>	
<p><b>Harmony in the Family and Society:</b> Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.</p> <p><b>Practical Sessions:</b> (7) Exploring the Feeling of Trust (8) Exploring the Feeling of Respect (9) Exploring Systems to fulfill Human Goal</p>	<b>6 Hrs</b>
Video link: <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=F2KVV4WNnS">https://www.youtube.com/watch?v=F2KVV4WNnS</a></li> <li>• <a href="https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw">https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</a></li> </ul>	
<b>UNIT-IV</b>	
<p><b>Harmony in the Nature/Existence:</b> Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.</p> <p><b>Practical Sessions:</b> (10) Exploring the Four Orders of Nature (11) Exploring Co-existence in Existence</p>	<b>6 Hrs</b>
Video link: <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=1HR-QB2mCF0">https://www.youtube.com/watch?v=1HR-QB2mCF0</a></li> <li>• <a href="https://www.youtube.com/watch?v=lfN8q0xUSpw">https://www.youtube.com/watch?v=lfN8q0xUSpw</a></li> <li>• <a href="https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw">https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</a></li> </ul>	
<b>UNIT-V</b>	
<p><b>Implications of the Holistic Understanding – a Look at Professional Ethics:</b> Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession</p> <p><b>Practical Sessions:</b> (12) Exploring Ethical Human Conduct (13) Exploring Humanistic Models in Education (14) Exploring Steps of Transition towards Universal Human Order</p>	<b>6 Hrs</b>
Video link: <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=BikdYub6RY0">https://www.youtube.com/watch?v=BikdYub6RY0</a></li> <li>• <a href="https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw">https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</a></li> </ul>	

<b>Course Outcomes: After completing the course, the students will be able to</b>	
CO1	Explore themselves, get comfortable with each other and with the teacher



CO2	Enlist their desires and the desires are not vague.
CO3	Restate that the natural acceptance (intention) is always for living in harmony, only competence is lacking
CO4	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them
CO5	Present sustainable solutions to the problems in society and nature

Reference Books	
1.	AICTE SIP UHV-I Teaching Material, <a href="https://fdp-si.aicte-india.org/AicteSipUHV_download.php">https://fdp-si.aicte-india.org/AicteSipUHV_download.php</a>
2.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
3.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
4.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

#### Continuous Internal Evaluation (CIE):

CIE for 50 marks is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

#### Semester End Examination (SEE):

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

**Total marks: 50+50=100**

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	2	2	3	2	1	2	1
CO2	-	1	-	-	-	2	2	3	2	1	2	1
CO3	-	1	-	-	-	2	2	3	2	1	2	1
CO4	-	1	-	-	-	2	2	3	2	1	2	1
CO5	-	1	-	-	-	2	2	3	2	1	2	1

