MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM

AND

SCHEME OF EXAMINATION

M.TECH. - CIVIL ENGINEERING

BATCH: 2023-25

FOREWORD

This is to certify that this booklet contains the entire Curriculum and Scheme of Examination of M.Tech Civil Engineering being offered at Faculty of Engineering and Technology at this University. This has been duly vetted and finally approved by the Academic Council of the University **vide 29th Academic Council** held on **05.07.2019** respectively and changes, if any deemed appropriate, shall be duly incorporated after the necessary approval by the Academic Council.

This Curriculum and Scheme of Examination of M.Tech Civil Engineering shall be implemented w.e.f. AY 2023-25.

Prof. (Dr.) Naresh Grover
Dean-Academics, MRIIRS

Date:

Preamble

The program has been designed and developed keeping in focus fast changing technological advancement, new emerging areas and changes in pedagogy.

The full time PG course is spread over two years in four semesters and has been benchmarked against the Model Curriculum by AICTE with training and education aligned to roll out highly-aware, sustainability-minded generation joining the workforce globally. Also inputs of all the stakeholders like employers, alumni and parents, developers, designers, consultants, architects, contractors, and suppliers have been taken to revise the curriculum. Mini project, audit courses, MOOC, open electives and dissertation are the special features of the curriculum. Besides that, typical softwares like STAAD, ETABS, Primavera and MXROAD are also included as part of program laying emphasis on National need relating to technical drawings, Analysis and also to develop Parametric construction design.

There are ample opportunities available to students to opt both for program electives and open electives floated at the University level. Based upon specialization, the program elective baskets contain courses viz. Theory of Thin Plates and Shells, Design of Industrial Structures, Structural Health Monitoring, Design of High Rise Structures for Structural Engineering; Quality Control and Safety in Construction, Human Resource Management in Construction, Analysis in Construction Management for Construction Management ; Advanced Railway Engineering, Road Construction Planning and Management Highway Sub-Grade and Foundation Analysis for Transportation Engineering.

The Curriculum has been further adapted and designed according to the regional requirements of Faridabad, corresponding Census housing data and is oriented towards smart city development through courses like "Intelligent Transportation Systems", "Airport Planning and Design" and "Public Transportation Systems" and" Geographic information System".

Faridabad is located in Zone IV and thus is prone to earthquakes and its eastern boundary is prone to floods. This vulnerability has been taken into account and subjects like "Disaster management" and "Structural Health Monitoring" have been included in the curriculum.

The program also caters to demand of recent socio- cultural global concern about environment and sustainability, gender sensitization, human values and professional ethics. Courses like "Environmental Impact Assessment", "Sustainable Transportation", "Energy Conservation Techniques in "Building Construction" and "Transportation Safety and Environment" address the pertinent issues like environment and sustainability whereas Courses like "Value Education" and "Personality Development through Life Enlightenment Skills" concentrate on human values.

INDEX

Content	Page No.
Vision and Mission of the Department	1
About the Department	1
Program Educational Objectives(PEOs), Program Outcomes (POs) & Program Specific Outcomes (PSOs)	2-3
Mapping of PEOs, POs & PSOs	3
Semester System and Choice Based Credit System	4
Semester wise Study Scheme with Contact hours, assigned credits and distribution of marks	5-13
Course Contents in Detail	14-259
Appendix A: List of courses having relevance to the Local/Regional, National and Global Development needs.	260-262
Appendix B: List of courses having focus on Employability, Entrepreneurship and Skill Development	263-265
Appendix C: List of Courses having focus on Environment and Sustainability, Professional Ethics, Human Values and Gender Equality	266

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

VISION AND MISSION OF THE DEPARTMENT

VISION

To produce highly competent Civil Engineers of International standards for catering to local, national and global needs and to provide state-of-the-art consultancy, research and development in various fields of Civil Engineering.

MISSION

M_1 To provide a rigorous hands-on engineering education integrated in a student-centered environment to equip them with life-long learning skills necessary for professional practice.

M_2 To prepare our students to be the technical, business and global leaders of tomorrow by inculcating team work and communication skills.

M_3 To promote research, development and consultancy through constant interaction with industry and research organizations.

M_4 To inculcate ethical values and professionalism.

ABOUT THE DEPARTMENT

The Civil Engineering department was established in the year 2009. Initially the department offered only UG program alongwith a diploma integrated program in Civil Engineering. The PG was started from 2012 onwards with specialization in Structural Engineering. The department added two more PG programs of Construction Management and Transportation Engineering in 2015 and 2016 respectively. The department will now be offering a 3 year part-time M.Tech program from July 2020 onwards. This program is specially articulated for working professionals. The department boasts of an alumni base of over 800+ students well placed in various companies of national and international repute.

Presently department offers following programs:

- B.Tech(Civil Engineering)
- M.Tech (Civil Engineering with specialization in Structural Engineering/Construction Management/Transportation Engineering), 2-year full time
- M.Tech (Civil Engineering with specialization in Structural Engineering/Construction Management/Transportation Engineering), 3-year part time.
- PhD (Civil Engineering)

The offered programs follow the CBCS and the model curriculum floated by AICTE. Further, the course curriculums have been specially tailored to fulfill the growing global outlook and focuses on upcoming technologies in the field of Civil Engineering, to cater to the needs of the industry and R&D organizations.

A blend of highly qualified and experienced faculty members from length and breadth of country, having M.Tech/Ph.D. degree from IIT, NIT, DTU, JMI and other Institutes of National reputes. Faculty members of Civil Engineering Department have 100+ papers published in various national & international journals of repute.

The Department has fully equipped Labs with state-of-the-art equipment. Structure Lab, Soil Mechanics Lab, Transportation Engineering lab, Concrete Technology lab, Survey Lab, CADD & STADD PRO lab, Fluid Mechanics Lab, Environmental Engineering Lab, Engineering Geology Lab. A

departmental library, IT facilities and adequate research infrastructure helps the students to pursue research and innovation.

The department bridges industry academia interface through regular site visits, expert talks, workshops, and training programs as well as faculty development programs. Students are also encouraged to engage in extracurricular and co-curricular activities, essential for overall development, nurturing of team spirit and developing organizational skills to keep themselves abreast with current developments in the area of Civil Engineering.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Department of Civil Engineering keeping in view interests of all their stakeholders have formulated the Program Educational Objectives (PEOs) that are comprehensive statements describing the career and professional accomplishments that the program is preparing the learner for.

PEO's of M.Tech (Civil Engineering with specialization in Structural Engineering/Construction Management/Transportation Engineering) are:
PEO 1: To impart in-depth knowledge and skills to students so as to enable them solve issues in real world Civil Engineering and provide feasible and viable solutions.
PEO 2: To help them learn to effectively communicate their ideas and research in oral and written form
and to enable them to adapt to the evolving technical challenges and changing career opportunities in their specialized domains.
PEO 3: To inculcate professional and ethical attitude, team spirit and leadership qualities in Students and to make them aware of their social responsibilities.

"Mission of the Department – PEOs matrix"

PEO Statements	Mission 1	Mission 2	Mission 3	Mission 4
PEO 1: To impart in-depth knowledge and skills to students so as to enable them solve issues in realworldCivil Engineering and provide feasible and viable solutions.	**3**	**2**	**3**	**2**
PEO 2: To help them learn to effectively communicate their ideas and research in oral and written format to enable them to adapt to the evolving technical challenges and changing career opportunities in their specialized domains.	**3**	**3**	**3**	**2**
PEO 3: To inculcate professional and ethical attitude, team spirit and leadership qualities in Students andto make them aware of their social responsibilities.	**2**	**3**	**3**	**3**

PROGRAM OUTCOMES (POS)

a. Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
b. Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
c. Elicit views of others, mediate disagreements and help reach conclusions in group settings.
d. Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
e. Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
f. Understand the issues of environmental contexts and sustainable development.
g. Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

PROGRAM SPECIFIC OUTCOMES (PSOs)

h. Demonstrate in-depth knowledge of Structural Engineering/Construction management/ Transportation engineering in real problems, and intellectually integrate it across multiple disciplines.
i. Employ technical knowledge to Structural Engineering/Construction management/ Transportation engineering research, consultancy and management with high ethical values towards social, environmental and economic issues.

Mapping of PEOs, POs & PSOs

POs / PSOs **PEOs**	a	b	C	d	e	F	g	h	i
PEO 1	2	1	1	2	1	1	3	3	3
PEO 2	1	3	3	1	2	2	2	3	3
PEO 3	1	1	3	3	3	1	3	2	3

SEMESTER SYSTEM AND CHOICE BASED CREDIT SYSTEM

Credit based system of study and student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grade obtained by the student, grade point average is calculated

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for lecture, tutorial and laboratory/clinical practice in a week. A few courses/activities are without credit (s) and are referred to as Audit Pass Courses (APC) but are mandatory to pass as a partial fulfilment of award of degree.

(b) Earning of credits

At the end of every course, a letter "Grade" shall be awarded in each course for which a student has registered. On obtaining a minimum Pass Grade, student shall accumulate the course credits as Earned Credits. A student's performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however shall be mandatory to pass as a partial fulfilment of award of degree.

For Award of Degree of a programme **M.Tech-Civil Engineering.** He/she has to earn minimum **74 credits** during the **2-year duration** of the programme **in 4 semesters**.

The total credits required to be earned have been further classified under two baskets of courses: "Compulsory Courses Basket", and "Elective Courses Basket". The **total credits 56 required** to be earned under "Compulsory Courses Basket" and **18 credits** under "Elective Courses Basket".

All courses under "Compulsory Courses Basket", are required to be qualified and cleared/pass by each and every students enrolled under the programme and are semester-wise listed in the study scheme along with credits assigned to each course.

Under Elective Courses Basket, there will be three types of courses:

- Semester-wise courses offered by the department itself
- Open/Inter-disciplinary courses offered at the Institute/University level notified from the office of Dean-Academics.
- Massive Open Online Courses (MOOCs) available on SWAYAM Platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under "Elective Courses Basket" depending upon his/her interest, capability/pace of learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the "Elective Courses Basket" during the entire programme duration.

However, for registration of courses [including courses under "Compulsory Courses Basket", "Elective Courses Basket" and Previous Semester Courses (wherein he/she was declared in-eligible on the basis of attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.

SEMESTER WISE STUDY SCHEME WITH CONTACT HOURS, ASSIGN CREDITS AND DISTRIBUTION OF MARKS
M. Tech. (Civil Engineering) Specialization: Structural Engineering/Construction Management/Transportation Engineering (2023-25)

	SEMESTER-I										
COURSE TYPE	**SUBJECT CODE**	**SUBJECT**	**PERIODS/WEEK**				**MARKS**			**Duration of Exam**	**Credits**
			L	**T**	**P**	**TOTAL**	**INT**	**EXT**	**TOTAL**		
Program Core I	MCE-SE-101/ MCE-CM-101/ MCE-TE-101	Advanced Structural Analysis/ Project Planning and Control/ Traffic Engineering	3	0	0	3	100	100	200	3 hours	**3**
Program Core II	MCE-SE-102/ MCE-CM-102/ MCE-TE-102	Advanced Solid Mechanics/ Construction Contract Management/ Urban and Regional Transport Planning	3	0	0	3	100	100	200	3 hours	**3**
Program Core III	MCE-101	Advanced Concrete Technology	3	0	0	3	100	100	200	3 hours	**3**
Program Elective-I		Elective-I	3	0	0	3	100	100	200	3 hours	**3**
Program Elective-II		Elective-II	3	0	0	3	100	100	200	3 hours	**3**
Core Lab -I	MCE-SE-151/ MCE-CM-151A/ MCE-TE-151	Structural Design Lab/Planning & Scheduling Lab/Traffic Engineering Lab	0	0	2	2	50	50	100	2 hours	**2**
Core Lab -II	MCE-151	Construction Materials Lab	0	0	2	2	50	50	100	2 hours	**2**
MLC	M- MC-100	Research Methodology and IPR	2	0	0	2	50	50	100	3 hours	**2**
Audit I	M-MC-003	Disaster Management	2	0	0	2	50	50	100	3 hours	**AP**
			19	**0**	**4**	**23**	**700**	**700**	**1400**		**21**

Program Elective – I					
MCE-SE-103	Theory of Thin Plates and Shells	MCE-CM-103	Quality Control and Safety in Construction	MCE-TE-103	Advanced Railway Engineering
MCE-SE-104	Design of Industrial Structures	MCE-CM-104	Building Serviceability and Maintenance Management	MCE-TE-104	Design and Maintenance of Pavements
MCE-SE-105	Theory of Structural Stability	MCE-CM-105A	Construction of Tall Structures	MCE-TE-105	Public Transportation Systems

Program Elective – II					
MCE-SE-106	Analytical and Numerical Methods for Structural Engineering	MCE-CM-106	Energy Conservation Techniques in Building Construction	MCE-TE-106	Road Construction Planning and Management
MCE-SE-107	Structural Health Monitoring	MCE-CM-107	Human Resource Management in Construction	MCE-TE-107	Transportation Economics and Finance
MCE-SE-108	Structural Optimization	MCE-CM-108	Pavement Materials and Construction Techniques	MCE-CM-108	Pavement Materials and Construction Techniques

	SEMESTER-II									
Type	**SUBJECT CODE**	**SUBJECT**	**PERIODS/WEEK**				**MARKS**			**Duration of Exam**	**Credits**
			L	**T**	**P**	**TOTAL**	**INT**	**EXT**	**TOTAL**		
Program Core-IV	MCE-SE-201/ MCE-CM-201/ MCE-TE-201	FEM in Structural Engineering/ Resource Management and Control in Construction/ Geometric Design of Streets and Highways	3	0	0	3	100	100	200	3 hours	**3**
Program Core-V	MCE-SE-202A/ MCE-CM-202/ MCE-TE-202	Structural Dynamics/ Construction Economics and Finance/ Intelligent Transportation Systems	3	0	0	3	100	100	200	3 hours	**3**
Program Core-VI	MCE-201	Numerical Methods in Civil Engineering	3	0	0	3	100	100	200	3 hours	**3**
Program Elective-III		Elective – III	3	0	0	3	100	100	200	3 hours	**3**
Program Elective-IV		Elective – IV	3	0	0	3	100	100	200	3 hours	**3**
Core Lab-III	MCE-SE-251/ MCE-CM-251/ MCE-TE-251	Model Testing Lab/Computational lab/Computational lab	0	0	2	2	50	50	100	2 hours	**2**
Core Lab-IV	MCE-251	Numerical Analysis Lab	0	0	2	2	50	50	100	2 hours	**2**
Project	MCE-200	Mini Project	0	0	4	4	100	50	150	3 hours	**2**
Audit II	M-MC-002	English for Research Paper Writing	2	0	0	2	50	50	100	3 hours	**AP**
	TOTAL		**17**	**0**	**8**	**25**	**750**	**700**	**1450**		**21**

Program Elective – III

MCE-SE-203	Advanced Steel Design	MCE-CM-203	Formwork and Shuttering	MCE-TE-203	Highway Sub-Grade and Foundation Analysis
MCE-SE-204	Design of Formwork	MCE-CM-204	Reliability Analysis in Construction Management	MCE-TE-204	Advanced Engineering Geology
MCE-SE-205	Design of High-Rise Structures	MCE-CM-205	Applied Statistics & Queuing Theory	MCE-CM-205	Applied Statistics & Queuing Theory
MCE-SE-206	Design of Masonry Structures	MCE-CM-206	Construction Project Management and BOT system	MCE-CM-206	Construction Project Management and BOT system
MCE-202	Airport Planning and Design	MCE-202	Airport Planning and Design	MCE-202	Airport Planning and Design
MCE-203	Advanced Construction Technology	MCE-203	Advanced Construction Technology	MCE-203	Advanced Construction Technology

Program Elective – IV					
MCE-SE-207	Design of Advanced Concrete Structures	MCE-CM-207	Legal Aspects in Construction Engineering	MCE-TE-207	Geographic Information Systems
MCE-SE-208	Advanced Design of Foundations	MCE-CM-208	Management Information Systems for Construction Management	MCE-TE-208	Advanced Design of Bridges
MCE-SE-209	Soil Structure Interaction	MCE-CM-209	Entrepreneurship in Construction	MCE-TE-209	Transportation Safety and Environment
MCE-204	Modern Construction Techniques	MCE-204	Modern Construction Techniques	MCE-204	Modern Construction Techniques

	SEMESTER-III									
	SUBJECT CODE	**SUBJECT**	**PERIODS/WEEK**				**MARKS**			**Duration of Exam**	**Credits**
			L	**T**	**P**	**TOTAL**	**INT**	**EXT**	**TOTAL**		
Program Elective-V		Elective – V	3	0	0	3	100	100	200	3 hours	**3**
Open Elective		Open Elective	3	0	0	3	100	100	200	3 hours	**3**
Project	MCE-300	Dissertation Phase – I*	0	0	20	20	200	100	300	3 hours	**10**
			6	**0**	**20**	**26**	**400**	**300**	**700**		**16**

***The topic of dissertation is to be approved by an internal committee at commencement of 3rd Semester**

Program Elective – V					
MCE-SE-301A	Design of Prestressed Concrete Structures	MCE-CM-301	Construction Equipments	MCE-TE-301	Transportation System Planning and Management
MCE-SE-302	Analytical and Finite Element Analysis of Laminated Composite Plates	MCE-CM-302	Total Quality Management in Construction	MCE-TE-302	Traffic Simulation Modelling and Application
MCE-SE-303	Fracture Mechanics of Concrete Structures	MCE-CM-303	Sustainable Building Construction	MCE-TE-303	Application of Geosynthetics in pavements
MCE-SE-304	Design of Plates and Shells	MCE-CM-304	Thrust Areas in Project Management	MCE-TE-304	Sustainable transportation
MCE-301	Precast Construction Technology	MCE-301	Precast Construction Technology	MCE-301	Precast Construction Technology
MCE-302	Retrofitting and Rehabilitation of Structures	MCE-302	Retrofitting and Rehabilitation of structures	MCE-302	Retrofitting and Rehabilitation of structures
MCE-303A	Environmental Impact Assessment	MCE-303A	Environmental Impact Assessment	MCE-303A	Environmental Impact Assessment

SEMESTER-IV

	SUBJECT CODE	**SUBJECT**	**PERIODS/WEEK**				**MARKS**			**Duration of Exam**	**Credits**
			L	**T**	**P**	**TOTAL**	**INT**	**EXT**	**TOTAL**		
Project	MCE-400	Dissertation Phase II**	0	0	32	32	400	200	600	3 hours	16
	TOTAL		**0**	**0**	**32**	**32**	**400**	**200**	**600**		**16**
										GRAND TOTAL CREDIT =	**74**

**** The student should publish atleast one research paper in reputed indexed journal based on their dissertation work**

Course Code	Open Elective	L	T	P	Credits
M-ID-001	Business Analytics	3	0	0	3
M-ID-002	Industrial Safety	3	0	0	3
M-ID-003	Operations Research	3	0	0	3
M-ID-004	Cost Management of Engineering Projects	3	0	0	3
M-ID-005	Composite Materials	3	0	0	3
M-ID-006	Waste to Energy	3	0	0	3

Course Code	Audit Course 1 & 2	L	T	P	Credits
M-MC-001	Stress Management by Yoga	2	0	0	AP
M-MC-002	English for Research Paper Writing	2	0	0	AP
M-MC-003	Disaster Management	2	0	0	AP
M-MC-004	Sanskrit for Technical Knowledge	2	0	0	AP
M-MC-005	Value Education	2	0	0	AP
M-MC-006	Constitution of India	2	0	0	AP
M-MC-007	Pedagogy Studies	2	0	0	AP
M-MC-008	Personality Development through Life Enlightenment Skills.	2	0	0	AP

Summary Semesterwise Marks & Credits				
Semester	MARKS			Credits
	INT	EXT	TOTAL	
I	700	700	1450	21
II	750	700	1450	21
III	400	300	700	16
IV	400	200	600	16
Total				74

SEMESTER-I

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MCE-SE-101: ADVANCED STRUCTURAL ANALYSIS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	End Semester Exam	100

Course Type: Program Core

Course outcomes: At the end of the course, student will be able to
MCE-SE-101.1 Study the skeleton structures using stiffness analysis code.
MCE-SE-101.2 Use direct stiffness method understanding its limitations
MCE-SE-101.3 Develop constitutive relationships between boundary conditions.
MCE-SE-101.4 Analyze rigid jointed frames.
MCE-SE-101.5 Apply numerical methods to solve shape functions.

Unit-1 Influence Coefficients

1.1 Physical Significance,
1.2 Effects of Settlements,
1.3 Temperature Change and Lack of Fit,
1.4 Member Approach and Structure Approach.

Unit-2 Stiffness Method applied to Large Frames

2.1 Local Coordinates and
2.2 Global Coordinates.

Unit-3 Stiffness Matrix Assembly of Structures

3.1 Stiffness Matrix in Global Coordinates,
3.2 Boundary, Conditions,
3.3 Solution of Stiffness Matrix Equations,
3.4 Calculation of Reactions and Member Forces.

Unit-4 Applications to Simple Problems

4.1 Beams, Plane Trusses,
4.2 Plane Rigid Jointed Frames and
4.3 Grids by Structure Approach and Member Approach.

Unit-5 Boundary Value Problems (BVP)

5.1 Approximate Solution of Boundary Value Problems,
5.2 Modified Galerkin Method for One-Dimensional BVP,
5.3 Matrix Formulation of the Modified Galerkin Method.

Unit-6 Linear Element

6.1 Shape Functions,
6.2 Solution for Poisson's Equation,
6.3 General One Dimensional, Equilibrium Problem.

Text Books/ Reference Books:

1. Weaver and Gere, 1990, Matrix Analysis of Framed Structures, Springer
2. P.E.Lewis & Ward J. P, The Finite Element Method, Addison-Wesley Publication Co.
3. J.L. Meek, E and FN, Computer Methods in Structural Analysis, Span Publication.
4. Desai and Able, The Finite Element Method, CBS Publication.

Software required/Weblinks:

NIL

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional-I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-101)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-101.1	2	2	-	1	-	1	3	3	1
MCE-SE-101.2	3	2	-	-	-	-	3	3	2
MCE-SE-101.3	2	1	-	2	-	2	1	3	2
MCE-SE-101.4	3	2	2	2	-	2	2	1	3
MCE-SE-101.5	2	1	2	2	2	3	3	1	2

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MCE-CM-101: PROJECT PLANNING AND CONTROL

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

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

MCE-CM-101.1. Draw Work Break Down Structure for a given Project
MCE-CM-101.2. Analyze projects from scheduling and monitoring perspectives.
MCE-CM-101.3. Interpret network diagrams for planning and execution of a given project.
MCE-CM-101.4. Apply crashing procedures for time and cost optimization.
MCE-CM-101.5. Solve basic inventory management problems.
MCE-CM-101.6. Utilize the software like M S Project/Primavera.

PART-A

Unit-1 Introduction

1.1 Work-study
1.2 Work breakdown structure
1.3 Time estimates

Unit-2 Duration Estimation and Network Representation

2.1. Duration Estimation – Inputs and Methods
2.2. Applications of CPM/PERT
2.3. Statistical concepts

Unit-3 Scheduling and Time – Cost Trade Off

3.1. Man-Material-Machinery-Money optimization
3.2. Scheduling, monitoring, updating
3.3. Cost functions, time-cost trade off,
3.4. Tabulation Approach

PART- B

Unit-4 Resource Scheduling

4.1. Introduction to resources and its influence on schedules
4.2. Resources - based networks
4.3. Interface activities and dependencies
4.4. Line of balancing techniques.

Unit-5 Material Management and Inventory Control

5.1. Introduction to Material management

5.2. Purchases management
5.3. Inventory control
5.4. ABC analysis.

Unit-6 Project Monitoring and Control

6.1 Earned Value Analysis
6.2 Critical Chain
6.3 Project Crashing
6.4 Project Termination

References

1. K.N Jha, 2011, Construction Project Management, First Edition, Pearson Publishers
2. K.K. Chitkara. Construction Project Management: Planning Scheduling and Control, 1998, Tata McGraw Hill Publishing Company, New Delhi
3. M. Calin, Popescu, Chotchal Charoenngam, 1995, Project Planning, Scheduling and Control in Construction: An Encyclopaedia of terms and Applications, Wiley, New York
4. Chris Hendrickson and Tung Au, 2000, Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall Pittsburgh
5. Moder, J C. Phillips and E. Davis, 1983, Project Management with CPM, PERT and Precedence Diagramming, Van Nostrand Reinhold Company, Third Edition, Willis, E. M., Scheduling Construction Projects, John Wiley & Sons
6. Halpin, 1985, D. W. Financial and Cost Concepts for Construction Management, John Wiley & Sons. New York

Software required/Weblinks:
1.MS Project
2. Primavera

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement MCE-CM-101	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-101.1	3	3	3	3	2	-	-	3	2
MCE-CM-101.2	3	3	3	3	2	-	-	3	2
MCE-CM-101.3	3	3	3	2	2	-	-	3	2
MCE-CM-101.4	3	3	3	2	2	-	-	3	1
MCE-CM-101.5	3	3	3	3	3	-	-	3	2
MCE-CM-101.6	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-101: TRAFFIC ENGINEERING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

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

MCE-TE-101.1 Comprehend the concept of different elements for traffic design.
MCE-TE-101.2 Survey the various traffic related studies after having knowledge of these studies.
MCE-TE-101.3 Analyse different aspects of Vehicular traffic flow
MCE-TE-101.4 Understand the control of vehicle, drivers and road users
MCE-TE-101.5 Design the signal timings and phase diagram for smooth movement of traffic.

PART-A

Unit-1Traffic Characteristics Measurement and Analysis

1.1 Elements of Traffic Engineering road user, vehicle and road way
1.2 Vehicle characteristics, IRC standards, Design speed, volume
1.3 Traffic volume studies
1.4 Origin destination studies
1.5 Speed studies
1.6 Travel time and delay studies
1.7 Parking studies and delay studies

Unit-2Highway Capacity and Level of Service

2.1 Basic definitions related to capacity
2.2 Level of service concept
2.3 Factors affecting capacity and level of service
2.4 Computation of capacity and level of service for two lane highways, Multilane highways and free ways.

Unit-3 Theory of Traffic Flow

3.1 Lighthill and Witham's Theory
3.2 Car Following Theory
3.3 The Queuing Theory and its applications
3.4 Vehicle arrival, headways and Gaps
3.5 Simulation of Traffic

PART-B

Unit-4Traffic regulation, control and safety

4.1 Basic Principles of Traffic regulation
4.2 Parking Regulations

4.3 Traffic Safety -Accident studies and analysis; Causes of accidents
4.4 Principles and Practices of Road Safety Audit

Unit-5 Traffic Signals

5.1 Traffic signals
5.2 Pre-timed and traffic actuated
5.3 Design of signal setting
5.4 Phase diagrams, timing diagram
5.5 Signal co-ordination

Unit-6 Traffic Signs and Road Marking

6.1 Importance and General Features of Traffic Signs
6.2 Types of Traffic signs
6.3 Location Height and Maintenance of Signs
6.4 Types of Road Markings

Text Books/ Reference Books:

1. ITE Hand Book, Highway Engineering Hand Book, McGraw Hill.
2. AASHTO, A Policy on Geometric Design of Highway and Streets.
3. R. J. Salter and N. B. Hounsel, 1996, Highway Traffic Analysis and Design, Macmillan Press Ltd.
4. LR Kadiyali, 2010, Traffic Engineering and Transport Planning, Khanna Publishers.

Software required/Weblinks:

https://nptel.ac.in/courses/105101008/50

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-101)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-101.1	2	3	3	3	1	2	-	1	1
MCE-TE-101.2	2	3	3	2	2	-	2	3	2
MCE-TE-101.3	3	3	3	2	1	-	3	3	2
MCE-TE-101.4	3	3	3	3	2	3	2	1	2
MCE-TE-101.5	2	3	3	2	1	3	-	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-102: ADVANCED SOLID MECHANICS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	End Semester Exam	100

Course Type: Program Core

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

MCE-SE-102.1	Describe the elastic and plastic behavior of material and evaluate stress invariants, principal stresses and their directions.
MCE-SE-102.2	Determine strain invariants, principal strains and their directions.
MCE-SE-102.3	Develop constitutive relationships between stress and strain for linearly elastic solid.
MCE-SE-102.4	Analyze theories of failure and design components for safe operation.
MCE-SE-102.5	Apply the concepts of energy methods in solving structural problems by examining the properties of ideally plastic solid.
MCE-SE-102.6	Create numerical methodology to solve continuum problems.

PART -A

Unit 1 Introduction to Elasticity

1.1 Displacement
1.2 Strain and Stress Fields
1.3 Constitutive Relations
1.4 Cartesian Tensors
1.5 Equations of Elasticity

Unit 2 Strain and Stress Field

2.1 Elementary Concept of Strain, Stain at a Point
2.2 Principal Strains and Principal Axes
2.3 Compatibility Conditions
2.4 Stress at a Point
2.5 Stress Components on an Arbitrary Plane
2.6 Differential Equations of Equilibrium
2.7 Hydrostatic and Deviator Components

Unit 3 Equations of Elasticity

3.1 Equations of Equilibrium
3.2 Stress- Strain relations
3.3 Strain Displacement and Compatibility Relations
3.4 Boundary Value Problems
3.5 Co-axiality of the Principal Directions

PART-B

Unit 4 Two-Dimensional Problems of Elasticity

4.1 Plane Stress and Plane Strain Problems
4.2 Airy's stress Function
4.3 Two-Dimensional Problems in Polar Coordinates

Unit 5 Torsion of Prismatic Bars:

5.1 Saint Venant's Method
5.2 Prandtl's Membrane Analogy
5.3 Torsion of Rectangular Bar
5.4 Torsion of Thin Tubes.

Unit 6 Plastic Deformation:

6.1 Strain Hardening
6.2 Idealized Stress- Strain curve
6.3 Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion
6.4 Plastic Stress-Strain Relations
6.5 Principle of Normality and Plastic Potential, Isotropic Hardening.

Text Books/ Reference Books:

1. Timoshenko S. and J.N. Goodier, 1961Theory of Elasticity, McGraw Hill.
2. M.H. Sadd M.H, 2005, Elasticity, Elsevier.
3. RagabA.R., BayoumiS.E., 1999, Engineering Solid Mechanics, CRC Press.
4. M. Ameen, 20005, Computational Elasticity,Narosa.
5. M.A KazimiS, 1994, Solid Mechanics, Tata McGraw Hill.
6. L.S.Srinath, 2000A, dvanced Mechanics of Solids, Tata McGraw Hill.

Software required/Weblinks:

https://nptel.ac.in/downloads/105106049/
https://nptel.ac.in/courses/105101003/
https://nptel.ac.in/courses/112107147/4

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-102)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-102.1	3	2	-	-	-	1	3	3	3
MCE-SE-102.2	3	2	-	-	-	-	3	3	2
MCE-SE-102.3	3	1	-	-	-	2	1	3	2
MCE-SE-102.4	3	2	2	2	-	2	2	1	3
MCE-SE-102.5	2	1	2	2	2	3	3	1	2
MCE-SE-102.6	1	-	3	2	1	1	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-102: CONSTRUCTION CONTRACT MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

Course outcomes: At the end of the course, the students will be able to

MCE-CM-102.1 Explain various provisions of Indian Contracts Act
MCE-CM-102.2 Extend various elements of a Contract and its specifications to real life problems
MCE-CM-102.3 Correlate to the tendering Process
MCE-CM-102.4 Utilize the tender evaluation process
MCE-CM-102.5 Draw inferences from labour laws, workmen compensation act, minimum wages act
MCE-CM-102.6 Construct outlines of dispute resolution mechanism

Unit-1 Constitution Contracts

1.1 Indian Contracts Act - Indian contract act 1872
1.2 Definition of contract and its applicability
1.3 Valid, Voidable and Void contracts

Unit-2 Contract Formulation

2.1 Elements of Contracts, types of contract
2.2 International contracts
2.3 Condition and specification of contract
2.4 Contract Pricing

Unit-3 Contract Conditions

3.1 Qualification of bidders-Pre qualification –
3.2 Bidding - Two Cover System -tender documents-
3.3 Evaluation of Tender from Technical, financial aspects,
3.4 Tendering and contractual procedures.

PART-B

Unit-4 Arbitration and its Importance

4.1 Arbitration and conciliation act 1996
4.2 Violations
4.3 Appointment of arbitrator
4.4 Power and duties of arbitrator

Unit-5 Disputes and Acts

5.1 Dispute review board
5.2 Labour laws
5.3 Workmen compensation act
5.4 Minimum wages Act
5.5 Child labour Act

Unit-6 Dispute Resolution

6.1 Causes of disputes
6.2 Importance of role of various stakeholders
6.3 Industrial dispute Act
6.4 Value engineering

References

1. K.N. Jha,2011, Construction Project Management, First Edition, Pearson Publishers.
2. G.T. Gajaria, 1982, Laws Relating to Building and Engineering Contracts in India, M. M. Tripathi Private Ltd., Bombay, Tamil Nadu PWD Code.
3. Jimmie Hinze, 2001, Construction Contracts, McGraw Hill.
4. T. Joseph, Bockrath, Contracts, the Legal Environment for Engineers and Architects, McGraw Hill,

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement MCE-CM-102	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-102.1	3	3	3	3	2	-	-	3	2
MCE-CM-102.2	3	3	3	3	2	-	-	3	2
MCE-CM-102.3	3	3	3	2	2	-	-	3	2

MCE-CM-102.4	3	3	3	2	2	-	-	3	1
MCE-CM-102.5	3	3	3	3	3	-	-	3	2
MCE-CM-102.6	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-102: URBAN AND REGIONAL TRANSPORTATION PLANNING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-TE-102.1 Apply the transport planning process and its features
MCE-TE-102.2 Design the trip production and attraction models to find out the road users for a particular trip.
MCE-TE-102.3Implement the various split models for various routes of a particular trip.
MCE-TE-102.4Analyse the distribution of traffic flow of a particular trip through gravity model.
MCE-TE-102.5Make use of the various route assignment techniques for networking of traffic.

PART-A

Unit 1 Introduction

1.1 Urban Transportation system planning
1.2 Transport and socioeconomic activities
1.3 Transportation in the cities, Freight transportation
1.4 Transport planning process, Evaluation and choice, Implementation
1.5 Sequence of activities involved in transport analysis

Unit 2 Trip Generation Analysis

2.1 Trip production analysis
2.2 Category analysis
2.3 Trip attraction modelling

Unit 3 Mode Choice Modeling

3.1 Influencing factors, earlier modal split models
3.2 Trip-End type modal split model
3.3 Trip-interchange modal split model
3.4 Disaggregate mode-choice model
3.5 Logit model of mode-choice
3.6 Multinomial logit model
3.7 Case Studies

PART-B

Unit 4 Trip Distribution Analysis

4.1 Basis of trip distribution
4.2 Gravity model of trip distribution and case studies
4.3 Growth factor model

Unit 5 Route Assignment

5.1 Description of transport network
5.2 Route choice behaviour
5.3 The minimum path
5.4 Route assignment techniques with Examples

Unit 6 Transportation Survey

6.1 Definition of study area zoning
6.2 Types of movements
6.3 Types of surveys
6.4 Cordon line Survey

Reference Books:

1. J.D.D Ortuza and L.G Willumsen, 2009, Modelling Transport, John Wiley & Sons,.
2. M.E. Ben Akiva, and S.RLerman, 1985, Discrete Choice Analysis : Theory and Application to Travel Demand, The MIT Press, Cambridge, Massachusetts, 1985.
3. B.G. Hutchinson, 1974, Principles of Urban Transport Systems Planning, McGraw Hill Book Company, 1974.
4. L.R. Kadiyali, 2006, Traffic Engineering and Transport Planning Khanna Publishers, New Delhi,.

Software/ web links

http://nptel.ac.in/courses/105107067/
Tool Kits by Ministry of Urban Development, Govt. of India.
SPSS

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-102)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2

MCE-TE-102.1	2	3	2	1	1	2	-	1	1
MCE-TE-102.2	3	3	3	2	2	2	2	3	2
MCE-TE-102.3	1	3	3	2	1	3	2	3	-
MCE-TE-102.4	3	2	3	2	3	3	3	2	2
MCE-TE-102.5	3	2	3	2	1	-	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-101: ADVANCED CONCRETE TECHNOLOGY

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-101.1 Summarize the concepts of conventional concrete and its differences with other concretes like no fines, light weight etc.

MCE-101.2 Describe different aspects of modern concrete technology that has evolved as a result of rapid developments in mechanized construction.

MCE-101.3 Use mineral and chemical admixtures in concrete for more challenging environments with emphasis on durability

MCE-101.4 Correlate the microstructure formation, strength and durability issues

MCE-101.5 Design a concrete mix which fulfills the required properties for fresh and hardened concrete

MCE-101.6 Demonstrate research skills on an assigned topic in concrete technology at master's level of education.

PART- A

Unit 1

1.1 Cement and Aggregate
1.2 Production, composition and properties
1.3 Cement chemistry
1.4 Types of cements; special cements
1.5 Mineralogy properties
1.6 Tests and standards

Unit 2

2.1 Chemical and mineral admixtures: Water reducers, air entrainers, set controllers
2.2 Specialty admixtures - structure properties, and effects on concrete properties
2.3 Introduction to supplementary cementing materials and pozzolanas
2.4 Fly ash, blast furnace slag, silica fume, and metakaolin - their production, properties, and effects on concrete properties
2.5 Other mineral additives - reactive and inert

Unit 3

3.1 Mix Design methods and quality control
3.2 Concrete Production, batching, Mixing, transporting, placing compaction and curing
3.3 Workability, rheological aspects
3.4 Mechanical Properties at hardened state
3.5 Long term properties such as creep and shrinkage

PART -B

Unit 4

4.1 Engineering properties of concrete
4.2 Compressive strength and parameters affecting it, platen effect
4.3 Tensile strength - direct and indirect
4.4 Modulus of elasticity and Poisson's ratio
4.5 Stress strain response of concrete

Unit 5

5.1 Dimensional stability and durability
5.2 Creep and relaxation - parameters affecting
5.3 Shrinkage of concrete - types and significance, Parameters affecting shrinkage
5.4 Measurement of creep and shrinkage
5.5 Introduction to durability
5.6 Relation between durability and permeability
5.7 Chemical attack of concrete; corrosion of steel rebars; other durability issues

Unit 6

6.1 Properties and applications of: High strength - high performance concrete
6.2 Reactive powder concrete
6.3 Lightweight, heavyweight, and mass concrete
6.4 Fibre reinforced concrete
6.5 Self-compacting concrete; shotcrete; other special concretes

Text Books/ Reference Books:

1. M.S Shetty,Concrete Technology, S Chand Publications.
2. M.L Gambhir, Concrete Technology, Tata Mc Graw Hill Publications
3. Povindar K. Mehta, P. Kumar Mehta, Paulo J. M. Monteiro, 2006, Concrete: microstructure, properties, and materials McGraw-Hill,
4. A.M Neville, Properties Of Concrete, Fourth edition , Pearson Education
5. IS 383:1970- Coarse and fine aggregates from natural source for concrete
6. IS: 10262:2009- Concrete mix proportioning-Guidelines
7. S.P.-23 Handbook on concrete mixes.

Software required/Weblinks:

https://nptel.ac.in/courses/105106176/
https://swayam.gov.in/nd1_noc19_ce44

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-101)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-101.1	3	-	-	-	-	3	3	2	2
MCE-101.2	1	-	-	2	2	3	-	1	1
MCE-101.3	-	1	2	-	2	2	1	3	3
MCE-101.4	3	-	-	-	-	1	1	1	1
MCE-101.5	-	-	-	2	-	1	1	3	3
MCE-101.6	1	3	3	1	1	3	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-103: THEORY OF THIN PLATES AND SHELLS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- I

Course outcomes: At the end of the course, the students will be able to

MCE-SE-103.1. Apply analytical method for the solution of thin plates and shells
MCE-SE-103.2. Conduct static analysis of Plates
MCE-SE-103.3. Contrast analysis of circular plates to rectangular plates under various loadings
MCE-SE-103.4. Analyze cylindrical ad conical shells
MCE-SE-103.5. Relate to thermal stresses in plates and shells

PART A

Unit 1 Introduction

1.1 Space Curves, Surfaces,
1.2 Shell Co-ordinates, Strain Displacement Relations,
1.3 Assumptions in Shell Theory,
1.4 Displacement Field Approximations, Stress Resultants,
1.5 Equation of equilibrium using Principle of Virtual Work,
1.6 Boundary Conditions

Unit 2 Static Analysis of Plates

2.1 Governing Equation for a Rectangular Plate,
2.2 Navier Solution for Simply- Supported Rectangular Plate under Various Loadings,
2.3 Levy solution for Rectangular Plate with other Boundary Conditions

Unit 3 Circular Plates

3.1 Analysis under Axi- Symmetric Loading,
3.2 Governing Differential Equation in Polar Co-ordinates.
3.3 Approximate Methods of Analysis- Rayleigh-Ritz approach for Simple Cases in Rectangular Plates

PART B

Unit 4 Static Analysis of Shells: Membrane Theory of Shells

4.1 Cylindrical shells
4.2 Conical Shells
4.3 Spherical Shells

Unit 5 Shells of Revolution with Bending Resistance

5.1 Cylindrical Shell

5.2 Conical Shells
5.3 Application to Pipes and Pressure Vessels.

Unit 6Thermal Stresses in Plate/ Shell

6.1 Thermal Stresses in Plates
6.2 Thermal Stresses in Shells

Text Books/ Reference Books:

1. S. Timoshenko and W. Krieger, 1959, Theory of Plates and Shells, 2nd Edition, McGraw Hill.
2. C.Ugural Ansel, 2009, Stresses in Plates and Shells, 3rd Edition, McGraw Hill.
3. H. Kraus, 1967, Thin Elastic Shells, John Wiley and Sons.
4. K. Chandrashekhara, 2001, Theory of Plates, Universities Press.
5. G.S. Ramaswamy, 2005, Design and Construction of Concrete Shells, McGraw-Hill.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement (MCE-SE-103)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-103.1	3	3	3	3	2	-	-	3	2
MCE-SE-103.2	3	3	3	3	2	-	-	3	2
MCE-SE-103.3	3	3	3	2	2	-	-	3	2
MCE-SE-103.4	3	3	3	2	2	-	-	3	1
MCE-SE-103.5	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-104: DESIGN OF INDUSTRIAL STRUCTURES

Credits	3	Max. Mark	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	End Semester Exams	100

Course Type: Program Elective-I

Course outcomes: At the end of the course, the students will be able to -

MCE-SE-104.1. Interpret the stresses induced in structures
MCE-SE-104.2. Develop constitutive relationships between stress and strain of different structural elements
MCE-SE-104.3. Analyze the chimneys structures.
MCE-SE-104.4. Design of rectangular riveted steel water tank
MCE-SE-104.5. Apply numerical methods to pressed steel water tank.

PART-A

Unit 1 Steel Gantry Girders

1.1 Introduction, loads acting on gantry girder,
1.2 Permissible stress, types of gantry girders and crane rails,
1.3 Crane data, maximum moments and shears,
1.4 Construction detail, design procedure.

Unit2 Portal Frames

2.1 Design of portal frame with hinge base,
2.2 Design of portal frame with fixed base -Gable Structures –
2.3 Lightweight Structures.

Unit 3 Steel Bunkers and Silos

3.1 Design of square bunker – Jansen's and Airy's theories – IS Code provisions –
3.2 Design of side plates
3.3 Stiffeners – Hooper – Longitudinal beams Design of cylindrical silo – Side plates –
3.4 Ring girder – stiffeners.

PART -B

Unit 4 Chimneys

4.1 Introduction, dimensions of steel stacks, chimney lining,
4.2 Breech openings and access ladder, loading and load combinations,
4.3 Design considerations, stability consideration,
4.4 Design of base plate, design of foundation bolts, design of foundation.

Unit 5 Water Tanks

5.1 Design of rectangular riveted steel water tank

5.2 Tee covers, Plates, Stays, Longitudinal and transverse beams
5.3 Design of staging, Base plates
5.4 Foundation and anchor bolts.

Unit 6 Design of pressed steel water tank

6.1 Design of stays, Joints
6.2 Design of hemispherical bottom water tank, side plates
6.3 Bottom plates, joints, Ring girder
6.4 Design of staging and foundation.

Text Books/ Reference Books:

1. B.C. Punmia., A.K.Jain, A.K.Jain, 1998, Design of Steel Structure, 2nd Edition, Lakshmi Publishers.
2. R. Chandra, Design of Steel Structures, 2009, 12th Edition, Standard Publishers.
3. N. Subramaniyam, 2011, Design of Steel Structures, Oxford University Press.
4. S. Ramamurtham, 1986, Design of Steel Structures, Dhanpat Rai Publishing Company.

Software required/Weblinks:

https://nptel.ac.in/courses/105/105/105105162/
https://nptel.ac.in/courses/105/106/105106112/

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-104)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
MCE-SE-104.1	2	2	-	-	-	1	3	3	1
MCE-SE-104.2	3	2	-	-	1	-	3	3	2
MCE-SE-104.3	3	2	2	2	-	2	2	2	3
MCE-SE-104.4	2	1	2	2	1	3	3	1	2
MCE-SE-104.5	2	-	2	2	1	1	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-105: THEORY OF STRUCTURAL STABILITY

Periods/week	Credits	Max. Marks	: 200
L: 3 T: 0	3	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		External/ End Semester Exam	: 100

Course Type: Program Elective-I

Course outcomes: At the end of the course, the students will be able to

MCE-SE-105.1. Describe the concept of stability of discrete and continuous systems
MCE-SE-105.2. Relate to concept of axial and flexural buckling to column stability
MCE-SE-105.3. Correlate member buckling vs global buckling
MCE-SE-105.4. Utilize the concept of shear, flexure and torsion on stability of beams
MCE-SE-105.5. Justify the use of special concretes for inelastic buckling

PART A

Unit 1: Criteria for Design of Structures

1.1 Stability, Strength, and Stiffness,
1.2 Classical Concept of Stability of Discrete Systems,
1.3 Classical Concept of Stability of Continuous Systems
1.4 Linear and nonlinear behaviour.

Unit 2: Stability of Columns

2.1 Axial and Flexural Buckling,
2.2 Lateral Bracing of Columns,
2.3 Combined Axial, Flexural and Torsion Buckling

Unit 3: Stability of Frames

3.1 Member Buckling versus Global Buckling
3.2 Slenderness Ratio of Frame Members

PART B

Unit 4: Stability of Beams

4.1 Lateral torsion buckling

Unit 5: Stability of Plates

5.1 Axial flexural buckling
5.2 Shear flexural buckling

5.3 Buckling under combined loads

Unit 6: Introduction to Inelastic Buckling and Dynamic Stability

6.1 Ferrocement
6.2 SIFCON
6.3 Fibre Reinforced Concrete

References

1.Timoshenko and Gere, 1981, Theory of elastic stability, Tata Mc Graw Hill.
2. C. Alexander,1974, Principles of Structural Stability Theory, Prentice Hall, New Jersey.
3. N.G.R. Iyengar, 1988, Structural Stability of columns and plates, Eastern west press Pvt. Ltd.
4.F. Bleich,1952, Bucking Strength of Metal Structures, Tata McGraw Hill, New York.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-105)	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-105.1	3	3	3	3	2	-	1	3	2
MCE-SE-105.2	3	3	3	3	2	1	-	3	2
MCE-SE-105.3	3	3	3	2	2	-	2	3	2
MCE-SE-105.4	3	3	3	2	2	1	-	3	1
MCE-SE-105.5	3	3	3	3	3	-	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-103: QUALITY CONTROL AND SAFETY IN CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

Course Outcomes: **At the end of course, the students will be able to**

MCE-CM-103.1. Justify planning and control of quality during design of structures

MCE-CM-103.2. Apply quantitative techniques used in quality control and quality assurance during construction

MCE-CM-103.3. Relate the general concept and philosophy of total quality management from standards

MCE-CM-103.4. Prioritize safety provisions

MCE-CM-103.5. Utilize standards/codes with regards to construction quality/safety

PART-A

Unit 1: Concept of Quality

1.1 Introduction to quality
1.2 Planning and control of quality during design of structures
1.3 Preparation, Responsibility Matrix, Monitoring for Quality- PDCA Cycle.
1.4 Quality aspects in every phase in the life cycle of Construction project.

Unit 2: Quantitative Analysis in Quality Control

2.1 Quantitative techniques in quality control, Quality assurance during construction
2.2 Inspection of materials and machinery, in process inspection and test
2.3 Preparation of quality manuals, check-list and inspection report

Unit 3: Quality Assurance Systems and Standards/ Codes

3.1 Establishing quality assurance system, Quality standards/codes in design and construction
3.2 Concept and philosophy of total quality management (TQM)
3.3 Training in quality and quality management systems (ISO-9000)

PART-B

Unit 4: Introduction to Construction Safety

4.1 Concept of safety, Factors affecting safety: Physiological, Psychological and Technological
4.2 Planning for safety provisions
4.3 Construction Safety Management

Unit 5: Safety in Construction Operations

5.1 Structural safety, Safety consideration during construction, demolition and during use of equipment
5.2 First Aid on Site, Safety Awareness Programs

5.3 Management of accidents/injuries and provision of first aid, Provisional aspect of safety
5.4 Site management with regard to safety recommendations

Unit 6: Safety Policy
6.1 Study of Safety Policies, including Methods and Equipments
6.2 Training for safety awareness and implementation, Formulation of safety manuals
6.3 Safety legislation, standards/codes with regard to construction
6.4 Quality vs. Safety, Case Studies

Text Books/ Reference Books:

1. R. J. Coble, Theo C. Haupt, Jimmie Hinze, 2000, The Management of Construction Safety and Health, Taylor & Francis.
2. Abdul Razzak Rumane, 2010, Quality Management in Construction Projects, Taylor & Francis.
3. Tim Howarth and Paul Watson, 2008, Construction Safety Management, John Wiley & Sons.
4. Phil Hughes and Ed Ferrett, 2008, Introduction to Health and Safety in Construction: The Handbook for Construction Professionals and Students on Nebosh and Other Construction Courses, 3rd Edition, Publisher Routledge.

Software required/Web links:
https://nptel.ac.in/courses/105104161/27
https://nptel.ac.in/courses/105104161/21
https://nptel.ac.in/courses/105104161/31

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement (MCE-CM-103)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-103.1	1	-	3	-	3	3	3	3	1
MCE-CM-103.2	3	-	3	-	2	3	3	3	1
MCE-CM-103.3	2	-	3	-	2	3	3	3	2
MCE-CM-103.4	-	-	3	-	3	3	3	3	3
MCE-CM-103.5	-	1	3	-	2	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-104 BUILDING SERVICEABILITY AND MAINTENANCE MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-I

Course outcomes: At the end of the course, students will be able to

MCE-CM-104.1. Describe components of urban forms and their planning
MCE-CM-104.2. Optimize functional planning of buildings with spatial synthesis graphical techniques
MCE-CM-104.3. Utilize standards for fire prevention and control
MCE-CM-104.4. Determine space requirements for engineering services in the buildings.
MCE-CM-104.5. Make use of M.I.S. for building maintenance

PART-A

Unit 1: Urban forms

1.1 Components of urban forms and their planning.
1.2 Concepts of neighbourhood unit.
1.3 Street system and layout in a neighbourhood.

Unit 2: Building Plans

2.1 Functional planning of buildings,
2.2 optimization of space: Spatial Synthesis graphical techniques,
2.3 heuristic procedures,

Unit 3: Space requirements

3.1 Formulation of linear and non-linear optimization problem.
3.2 Space requirements and relationships for typical buildings, like residential offices, hospitals, etc.

PART-B

Unit 4: Fire Safety

4.1 Fire standards,
4.2 Fire list, fire resistance,
4.3 Classification of buildings,
4.4 Means of escape, alarms, etc.

Unit 5: Building Services

5.1. Engineering services in a building as a systems.
5.2 Lifts and escalators,
5.3 Cold and hot water systems,
5.4 waste water systems, and electrical systems

Unit 6: Maintenance

6.1 Building Maintenance:
6.2 Scheduled and contingency maintenance planning.
6.3 M.I.S. for building maintenance.
6.4 Maintenance standards.
6.5 Economic maintenance decisions

Reference:

1. G. M. Fair, J. C. Geyer and D. Okun,1968, Water and waste Engineering, Vol.II, John Wiley & sons, Inc., New York.
2. R.G.Hopkinson and J.D.Kay, 1969, The Lighting of buildings, Faber & Faber, London.
3. NBC, 1968, Hand book for Building Engineers in Metric systems, New Delhi.
4. H. William. Severns and Julian R. Fellows, 1964, Air conditioning and refrigeration ,John Wily and sons.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement MCE-CM-104	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-104.1	3	3	3	3	2	-	-	3	2
MCE-CM-104.2	3	3	3	3	2	-	-	3	2
MCE-CM-104.3	3	3	3	2	2	-	-	3	2
MCE-CM-104.4	3	3	3	2	2	-	-	3	1
MCE-CM-104.5	3	3	3	3	3	-	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCE-CM-105A: Construction of Tall Structures

Periods/week Credits	Max. Marks: 200
L: 3 T: 0 3	Continuous Evaluation: 100
Duration of Examination: 3 Hours	End Semester Exams: 100

Course Outcomes: At the end of this course, students will be able to:
MCE-CM-105A.1 – Understand the basic fundamentals of Tall Structures.
MCE-CM-105A.2 – Analyze the Tall Structure for Wind Loads.
MCE-CM-105A.3 – Analyze the Tall Structure for Seismic Loads.
MCE-CM-105A.4 – Rehabilitate the existing Tall Structures.
MCE-CM-105A.5 – Apply the latest ASCE/ISCodal Provisions in construction practices.

PART-A

Unit 1: An Introduction to Tall Structures

1.1. Development of Tall Structures.
1.2. Architectural Review of Tall Structures.
1.3. Building Regulations and Control.
1.4. Concept of Sustainable Construction in Tall Structures.
1.5. Planning and Site Investigation.
1.6. Case Studies.

Unit 2: Wind Loads on Tall Structures

2.1. Action of Wind on Tall Structures.
2.2. Design criteria for Wind Loads.
2.3. Overview of ASCE 7 – 10 Wind Load Provisions.
2.4. Consideration of IS 16700: 2017 and IS 875 (Part III) for Wind Load provisions.

Unit 3: Seismic Load Considerations for Tall Structures

3.1. Duration, Velocity and Displacement.
3.2. Seismic Issues due to Configuration Irregularities.
3.3. Overview of Structural Dynamics of Tall Structures.
3.4. Building Performance Levels of Tall Structures.

PART-B

Unit 4: Seismic Design for Tall Structures

4.1. Seismic Design Criteria as per ASCE considerations.
4.2. Seismic Design Criteria as per Indian Standard Codal provisions.
4.3. Introduction to Ductile Detailing of Tall structures

Unit 5: Performance – Based Design Approach for Tall Structures

5.1. Definition of Performance – based Design approach.
5.2. Performance – based Design approach for Natural Hazards.
5.3. Disaster Risk Reduction for Tall Structures.
5.4. Performance issues related to Tall Commercial Structures.

Unit 6: Rehabilitation of Existing Tall Structures

6.1. Objectives of Rehabilitation of Tall Structures.
6.2. Seismic Rehabilitation of structures as per ASCE standards.

6.3. Rehabilitation for Concrete and Steel Tall Structures.

Text Books/ Reference Books:

1. Bungale S. Taranath, 2016, Tall Building Design: Steel, Concrete, and Composite Systems, CRC Press.
2. Feng Fu,2018, Design and Analysis of Tall and Complex Structures, Elsevier Science.
3. Yit Lin M. Chew, 2017, Construction Technology For Tall Buildings, World Science Publishing Company.
4. Bungale S. Taranath, 2016, Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, CRC Press.
5. Minimum Design Loads for Buildings and Other Structures, ASCE.
6. IS 16700: 2017 – 'Criteria for Structural Safety of Tall Concrete Buildings'.
7. IS 875 (Part III) – Wind Loads on Buildings and Structures.

Software required/Weblinks

Design the High Rise Buildings (Level 1) | Udemy

Evaluation Tools:

Assignment/Tutorials 20 Marks
Sessional tests 60 Marks
Class Quiz 20 Marks
Term end examination 100 Marks

Assignments, Sessionals and End Semester Examination paper will consist of various difficulty levels to accommodate the different capabilities of students. Assessment should cover all course outcomes and upper limit for lower order skills will be 40% (for knowledge-oriented questions). However, weightage for different cognitive levels in the question papers can vary.

The paper setter must ensure the coverage of the entire syllabus while setting the question papers and mention the learning outcomes across each section to be measured by the examination. Weightage of the sections may vary as per the number of respective lecture hours mentioned in the syllabus. Action verbs should be used from Bloom's Taxonomy while designing question papers

COURSE ARTICULATION MATRIX

CO Statement (MCE-CM-105A)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-105A.1	3	3	2	1	2	-	-	3	1
MCE-CM-105A.2	3	3	2	1	2	-	-	3	1
MCE-CM-105A.3	3	3	2	1	2	-	-	3	1
MCE-CM-105A.4	3	3	2	1	2	-	-	3	1
MCE-CM-105A.5	3	3	2	1	2	-	-	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-103 ADVANCED RAILWAY ENGINEERING

Periods/week	Credits		Max. Marks	: 200
L: 3	T: 0	3	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs			External/ End Semester Exam	: 100

Course Type: Program Core

Course Outcomes: At the end of the course, the students will be able to

MCE-TE-103.1. Relate to the basics of railway Engineering and traffic growth trends
MCE-TE-103.2. Utilize the existing technology to the design, construction, and maintenance of railways
MCE-TE-103.3. Apply track standards for design development
MCE-TE-103.4. Identify modern trend in railway design
MCE-TE-103.5. Propose different models of urban transport in metropolitan transportation systems.

PART-A

Unit 1: Introduction

1.1 Important developments of Indian Railways
1.2 Organization of Indian Railway
1.3 Traction revolution for traffic growth on Indian Railways.
1.4 Railway Track Components and Important features

Unit 2: Track and Track Stresses

2.1 Permanent way, Track standards & structure,
2.2 Forces and loads on the Tracks
2.3 Stresses in rail and sleeper,
2.4 Ballast, coning & Tilting of rails,
2.5 Type of rails, Defects in rails, Rail failures,

Unit 3: Formation, Sleeper & Ballast

3.1 Functions and Design of formation,
3.2 Track drainage, failure of bank & remedial measures,
3.3 Soil Exploration and Survey, Soil stabilization methods
3.4 Sleeper types, sleeper density, functions & requirement
3.5 Ballast, its types and functions

PART-B

Unit 4: Point, Crossing & Turnouts:

4.1 Turnout, type of switches, tongue rail,
4.2 Details of crossing, reconditioning of points & crossings
4.3 Calculation of elements of turnout Cole's method and IRS method.
4.4 Symmetrical split, Diamond crossing
4.5 Design problems

Unit 5: Signal and Interlocking

5.1 Types of Signals,
5.2 Details of electrical signalling system,
5.3 Track circuits,
5.4 Absolute block system, Automatic block system, interlocking & methods,
5.5 Modern signalling techniques, Route relay interlocking, CTC systems.

Unit 6: Metropolitan Railways

6.1 Travel pattern, problems,
6.2 Modernisation of railways and future trends
6.3 Different forms of urban Transport

Text Books/ Reference Books:

1. Saxena and Arora, 2000, Railway Engineering, Dhanpat Rai, Delhi.
2. Ronald. A. Inglis, 1995, An Introduction to Railway Engineering Chapman & Hall Ltd., London.
3. W.W.Hay, 1995, Railway Engineering, Chapman & Hall Ltd., London.
4. J. S. Mundrey, 2000, Track Modernization.

Software required/Weblinks:
https://nptel.ac.in/courses/105107123/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement (MCE-TE-103)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
MCE-TE-103.1	2	3	1	-	-		-	2	2

MCE-TE-103.2	3	3	2	-	-	-	-	3	3
MCE-TE-103.3	3	3	3	-	-	-	-	3	3
MCE-TE-103.4	3	3	3	-	-	-	-	3	3
MCE-TE-103.5	2	3	3	1	-	-	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-104: DESIGN AND MAINTENANCE OF PAVEMENTS

Credits	4	Max. Marks	200
L-T-P	3-1-0	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Examination	100

Course Type: Program Elective-I

Course Outcomes: At the end of course, the students will be able to
MCE-TE-104.1. Relate to the importance of sub-grade soil properties on pavement performance
MCE-TE-104.2. Explain various elements in design of flexible pavements
MCE-TE-104.3. Utilize the concept of failure cracks and other defects in pavements
MCE-TE-104.4. Design flexible pavement for various requirements
MCE-TE-104.5. Solve problems related to stresses and design requirements for rigid pavements.

PART-A

Unit I: Introduction

1.1 Components of pavement structure,
1.2 Importance of Sub-Grade soil properties on pavement performance,
1.3 Functions of Sub-Grade, sub-base, base course and wearing course,
1.4 Stresses in flexible pavements, Stresses in homogeneous masses and layered system, deflections, shear failures, equivalent wheel and axle loads displacement,
1.5 Strain and Stress Fields, Constitutive Relations,
1.6 Cartesian Tensors and Equations of Elasticity.

Unit 2: Elements in design of flexible pavement

2.1 Loading Characteristics-Static, impact and repeated loads,
2.2 Effects of dual wheels and tandem axles, area of contact and tyre pressure, modulus,
2.3 CBR value of different layers,
2.4 Equivalent single wheel load, equivalent stress equivalent deflection criterion, equivalent wheel load factors,
climatic and environmental factors.

Unit 3: Types of distress

3.1 Structural and functional,
3.2 Serviceability, fatigue cracking,
3.3 Pavement deformation and low temperature shrinkage cracking.
3.4 Factors affecting performance.
3.5 Relation between performance & distress

PART-B

Unit 4: Design methods for flexible pavement

4.1 Group Index method, California bearing ratio (CBR), Triaxial method, McLeod Method, Benkelman Beam method.
4.2 Boussiusq's and Burmister'sanalysisand design method.
4.3 Design of flexible airport pavements.

Unit 5: Foundation

5.1 Elements in design of Rigid pavements
5.2 Wheel load, stresses, Westergaard's analysis.
5.3 Basic properties of concrete elasticity, shrinkage & creep, durability of concrete,
5.4 Rigid pavement design, concrete mix design.

Unit 6: Temperature stresses

6.1 Thermal properties of aggregates and concrete
6.2 Effect of temperature variations on concrete pavements
6.3 Westergaard's and Tomlinson's analysis of warping stresses
6.4 Combination of stresses due to different causes
6.5 Flexible Pavement overlays and Rigid Pavement overlays

Text Books/ Reference Books:

1. L.R. Kadiyali, 2005, Principles & Practice of Highway Engineering Khanna Publisher.
2. E.J. Yoder, 1991, Principles of Pavement Design, John Wiley & Sons Inc., New York.
3. Relevant IRC, ASTM, AASHTO and other Codes, Manuals and Specifications.
4. Teng,2016, Functional Designing of Pavements, McGraw Hill
5. E.J. Yoder and Witezak, 1975, Principles of Pavement Design, Wiley & Sons.
6. Ralph Haos,Ronald Hudson andZaniesuk, 1994, Modern Pavement Management

Software required/Weblinks:

http://textofvideo.nptel.ac.in/105105107/lec37.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%

Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement (MCE-TE-104)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-TE-104.1	1	2	1	-	-		-	2	2
MCE-TE-104.2	1	2	2	-	-	-	-	2	3
MCE-TE-104.3	2	2	2	-	-	-	-	3	3
MCE-TE-104.4	1	2	2	-	-	-	-	3	3
MCE-TE-104.5	2	3	3	1	1	1	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-105: PUBLIC TRANSPORTATION SYSTEMS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: **Program Elective-I**

Course outcomes: At the end of the course, students will be able to

MCE-TE-105.1. Comprehend the urban passenger transportation modes, their classification, theories and trends.

MCE-TE-105.2. Distinguish between conventional and unconventional transportation systems and their possibility in future transportation.

MCE-TE-105.3. Plan for railway passenger and goods movement facility and their control.

MCE-TE-105.4. Design airport facility and terminal requirements for air traffic movement and control.

MCE-TE-105.5. Propose navigation aids for waterways and pipeline transportation.

MCE-TE-105.6. Interpret the application of conventional systems in transportation and tracking the congestion in the various transportation modes.

PART-A

Unit 1

1.1 Urban passenger transportation modes
1.2 Transit classifications and definitions
1.3 Theory of urban passenger transport modes
1.4 Rail transit, bus transit, Para transit and ride sharing
1.5 Designing for pedestrians
1.6 Trends in transit rider ship and use of different modes

Unit2

2.1 Classification of transportation systems
2.2 Conventional transportation systems
2.3 Unconventional transportation systems
2.4 Prototypes and tomorrow's solutions, analysis
2.5 Interpretation of information on transportation systems
2.6 Perspectives of future transportation

Unit 3

3.1 Planning of railway
3.2 Passenger and goods terminals
3.3 Layout
3.4 Passenger facilities
3.5 Traffic control

PART-B

Unit 4

4.1 Airport Planning
4.2 Requirements and components
4.3 Design of runway
4.4 Taxiway design, Apron
4.5 Parking configuration
4.6 Terminal requirements
4.7 Airport marking and lighting
4.8 Air traffic control

Unit 5

5.1 Planning of Harbours and ports
5.2 Cargo handling, Containerization
5.3 Navigation aids Inland waterways
5.4 Pipeline transportation

Unit 6

6.1 Urban transportation systems
6.2 Mass rapid transit system
6.3 Light rail transit, Personal rapid transit
6.4 Guided way systems, cabin taxi, dual mode bus
6.5 Para transit systems
6.6 Demand responsive system
6.7 Intermediate public transport

Text Books/ Reference Books:

1. E. George. Gray and Lester A. Hoel, 1992,Public Transportation, Prentice Hall, 2nd Edition, New Jersey.
2. R. Vukan. Vuchic, 1999, Urban Public Transportation Systems and Technology, Prentice Hall Inc., New Jersey.
3. R. Horst. Weigelt, E. Rainer. Gotz and Helmut H. Weiss, 1977, City Traffic,A Systems Digest, Van Nostrand Reinhold Company, New York
4. John W. Dickey, 1984, Metropolitan Transportation Planning, Tata McGraw-Hill.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Attempt any Four from rest. Each question will be of 20 marks.

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO Statement (MCE-TE-105)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-105.1.	2	3	1	2	1	-	2	2	1
MCE-TE-105.2.	2	3	2	2	1	2	-	2	-
MCE-TE-105.3.	2	3	3	2	-	-	2	3	2
MCE-TE-105.4.	3	3	3	2	2	-	3	2	2
MCE-TE-105.5.	3	2	2	1	1	-	2	2	-
MCE-TE-105.6.	3	2	3	2	2	2	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-106: ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	End Semester Exams	100

Course Type: Program Elective-II

Course outcomes: At the end of the course, the students will be able to

MCE-SE-106.1 Apply the fundamentals of Numerical Methods.
MCE-SE-106.2 Make use of curve fitting of equations.
MCE-SE-106.3 Develop constitutive relationships between non-linear equations.
MCE-SE-106.4 Formulate computer algorithms for solutions to structural problems
MCE-SE-106.5 Apply numerical methods to structural engineering problems
.

PART- A

Unit-1 Fundamentals of Numerical Methods

1.1 Error Analysis,
1.2 Polynomial Approximations and Interpolations,
1.3 Curve Fitting; Interpolation and extrapolation.

Unit-2 Solution of Nonlinear Algebraic and Transcendental Equations

2.1 Solution by graphical method
2.2 Bisection method
2.3 Newton Raphson Iterative method
2.4 Regula Falsi method

Unit-3 Elements of Matrix Algebra

3.1 Solution of Systems of Linear Equations
3.2 Eigen Value Problems
3.3 Applications to structural dynamic problems
3.4 Stress problems
3.5 Buckling of columns

PART- B

Unit-4 Numerical Differentiation & Integration

4.1 Solution of Ordinary and Partial Differential Equations
4.2 Euler's equations and other methods
4.3 Laplace equations
4.4 Fourier transform

Unit-5 Finite Difference Method

5.1 Finite difference technique
5.2 Applications to structural engineering problems

Unit-6 Computer Algorithms

6.1 Numerical Solutions for Different Structural Problems

Text Books/ Reference Books:

1. K.E. Atkinson,1989, An Introduction to Numerical Analysis, J. Wiley and Sons.
2. F. Scheid, 1988, Theory and Problems of Numerical Analysis, McGraw Hill Book Company, (Shaum Series).
3. S. S Sastry,1998, Introductory Methods of Numerical Analysis, , Prentice Hall of India.

Software required/Weblinks:

C++ Software recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-106)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-106.1	1	2	-	-	-	1	3	3	1
MCE-SE-106.2	1	2	-	-	-	-	3	3	2
MCE-SE-106.3	2	1	-	2	-	2	1	3	2
MCE-SE-106.4	3	2	2	-	-	2	2	1	3
MCE-SE-106.5	2	1	2	2	-	3	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-107: STRUCTURAL HEALTH MONITORING

Credits	3	Max. Marks	20
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

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

MCE-SE-107.1	Recall the fundamental concepts related to structural design and safety.
MCE-SE-107.2	Diagnose the distress in the structure understanding the causes and factors.
MCE-SE-107.3	Assess the health of structure using static and dynamic field methods.
MCE-SE-107.4	Apply the fundamental knowledge of materials and design concepts to interpret the test results.
MCE-SE-107.5	Suggest repairs and rehabilitation measures of the structure
MCE-SE-107.6	Conduct independent retrofitting and rehabilitation projects considering contemporary needs and societal ethics.

PART -A

Unit 1: Structural Health

1.1 Factors affecting Health of Structures
1.2 Causes of Distress
1.3 Regular Maintenance

Unit 2: Structural Health Monitoring

2.1 Concepts
2.2 Various Measures
2.3 Structural Safety in Alteration

Unit 3: Structural Audit

3.1 Assessment of Health of Structure
3.2 Collapse and Investigation
3.3 Investigation Management
3.4 SHM Procedures

PART -B

Unit 4: Static Field Testing

4.1 Types of Static Tests
4.2 Simulation and Loading Methods
4.3 Sensor systems and hardware requirements

4.4 Static Response Measurement

Unit 5: Dynamic Field Testing

5.1 Types of Dynamic Field Test
5.2 Stress History Data
5.3 Dynamic Response Methods
5.4 Hardware for Remote Data Acquisition Systems
5.5 Remote Structural Health Monitoring

Unit 6: Introduction to Repairs and Rehabilitations of Structures

6.1 Case Studies (Site Visits)
6.2 Piezo–electric materials and other smart materials
6.3 Electro–mechanical impedance (EMI) technique
6.4 Adaptations of EMI technique.

Text Books/ Reference Books:

1. Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes 2006, Structural Health Monitoring,JohnWiley and Sons.
2. Douglas E Adams, 2007, Health Monitoring of Structural Materials and Components_Methods with Applications, John Wiley and Sons.
3. J. P. Ou, H. Li and Z. D. Duan, 2006, Structural Health Monitoring and Intelligent Infrastructure, Vol1, Taylor and Francis Group, London, UK.
4. Victor Giurglutiu, 2007, Structural Health Monitoring with Wafer Active Sensors, Academic Press Inc.

Software required/Weblinks:
https://nptel.ac.in/courses/114106046/
https://nptel.ac.in/courses/112104160/3

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-107)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-107.1	-	2	-	-	-	-	3	2	-
MCE-SE-107.2	3	-	-	-	-	3	2	1	2
MCE-SE-107.3	3	2	2	-	-	2	1	2	-
MCE-SE-107.4	3	2	2	-	-	2	1	2	-
MCE-SE-107.5	2	2	2	2	2	2	1	2	3
MCE-SE-107.6	1	-	3	3	3	1	-	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-108: STRUCTURAL OPTIMIZATION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: At the end of course, the students will be able to

MCE-SE-108.1 Describe failure modes and design
MCE-SE-108.2 Apply calculus of variation with constraints
MCE-SE-108.3 Formulate optimization problems in linear and non-linear programming
MCE-SE-108.4 Justify the application of structural optimization in various members
MCE-SE-108.5 Design optimal structural layouts with a perspective of constraints

PART A

Unit 1: Introduction

1.1 Simultaneous Failure Mode and Design
1.2 Classical External Problems.

Unit 2: Calculus of Variation

2.1 Variational Principles with Constraints

Unit-3: Linear Programming

3.1 Integer Programming
3.2 Nonlinear Programming
3.3 Dynamic Programming,

PART- B

Unit 4: Programming

4.1 Geometric Programming
4.2 Stochastic Programming

Unit 5: Applications

5.1 Structural Steel
5.2 Concrete Members
5.3 Trusses
5.4Frames

Unit 6: Design

6.1Frequency Constraint
6.2Design of Layouts

References

1. Haftka, T. Raphael , Gürdal, Zafer, Elements of Structural Optimization, Springer.
2. Cherkaev Andrej, Variational methods for Structural optimization, Springer.
3. Kirsch, Uri, 1993, Structural Optimization: Fundamentals and Applications, Springer.
4. Spillers, R. William, MacBain, M. Keith, 2009, Structural Optimization, Springer.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests

Course Articulation Matrix

CO Statement MCE-SE-108	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-108.1	3	3	3	3	2	-	-	3	2
MCE-SE-108.2	3	3	3	3	2	-	-	3	2
MCE-SE-108.3	3	3	3	2	2	-	-	3	2
MCE-SE-108.4	3	3	3	2	2	-	-	3	1
MCE-SE-108.5	3	3	3	3	3	-	-	3	2

MCE-CM-106: ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: **At the end of course, the student will be able to**

MCE-CM-106.1. Demonstrate an understanding of economics of energy utilization in various sectors.
MCE-CM-106.2. Estimate the energy cost of projects
MCE-CM-106.3. Analyze energy projects and their impact on environment.
MCE-CM-106.4 State various solutions for energy minimisation.
MCE-CM-106.5. Choose option to employ solar utilisation in buildings.
MCE-CM-106.6. Develop various designs of energy efficient buildings.

PART- A

Unit- 1

1.1 Fundamentals of Energy
1.2 Energy production systems
1.3 Heating.

Unit- 2

2.1 Ventilating and Air conditioning
2.2 Solar Energy and conservation.

Unit- 3

3.1 Energy Economic Analysis Energy Conservation.
3.2 Energy and resource conservation Principles,
3.3 Design of green buildings-rating systems-LEED Standards.

PART- B

Unit- 4

4.1 Comfort and Indoor Air Quality
4.2 Visual and Acoustical Quality,
4.3Energy Efficient Design Strategies.

Unit- 5

5.1 Energy in Building Design,
5.2 Energy Efficient and Environmental Friendly Building- Climate.

Unit-6

6.1 Sun and solar radiation
6.2 Psychometrics
6.3 Passive Heating and Cooling Systems.
6.4 Air Conditioning Systems.

References:

1. F. Moore, 1994, Environmental control systems, McGraw Hill, Inc.
2. Brown, G.Z, Sun, 1985, Wind and Light: Architectural design Strategies, John Wiley &Sons.
3. J. Cook, 1984, Award - Winning Passive Solar Design, McGraw Hill.
4. Thorpe, 2013, Energy Management in Buildings: The Earthscan Expert Guide, Taylor and Francis.
5. S Ghosh , 2015, Green Structures Energy Efficiency in Buildings, Taylor and Francis.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-106)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-106.1	3	2	-	1	-	3	2	2	3
MCE-CM-106.2	2	2	-	2	1	3	3	2	3
MCE-CM-106.3	1	3	3	2	2	3	2	2	2
MCE-CM-106.4	3	1	1	-	2	3	3	3	3
MCE-CM-106.5	2	2	3	2	2	2	-	2	2
MCE-CM-106.6	3	2	3	3	-	2	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-107: HUMAN RESOURCE MANAGEMENT IN CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: At the end of course, the students will be able to

MCE-CM-107.1. Relate to the basic concepts, functions and processes of human resource management

MCE-CM-107.2. State challenges in managing people in construction.

MCE-CM-107.3. Utilize HRM processes such as Recruitment, Selection, Training, appraisals and Reward Systems.

MCE-CM-107.4. Examine the relationship between business strategy and HRM.

MCE-CM-107.5. Defend employee welfare schemes.

MCE-CM-107.6. Elaborate the legislations applicable to employees.

PART- A

Unit-1 Introduction

1.1 Necessity of HRD in Construction

1.2.Key elements of HRD

1.3 Challenges of managing people in construction.

Unit-2 Human Resource Theories and Approaches

2.1 Organization and management theory

2.2 HRM theory,

2.3 strategic HRM approaches, operational HRM approaches.

Unit-3 Human Resource Training

3.1 Employee Relations

3.2 Employee Empowerment

3.3 Diversity and Work/Life Balance.

PART-B

Unit-4 Employee Welfare

4.1 Introduction to Employee welfare.

4.2 Objectives of Employee Welfare

4.3 Types of Employee Welfare

4.4 Role of Employee Welfare in HRM

Unit-5 Strategic human resource development.

5.1 Introduction to SHRM

5.2 Key Steps/Element in SHRM

5.3 Process of SHRM

Unit-6 Employment Legislation

6.1 Meaning of Employment Legislation in HRM.

6.2 Features of Employment Legislation

6.3 The Payment of Wages Act, 1936

6.4 The Minimum Wages Act, 1948
6.5 The Payment of Bonus Act, 1965
6.6 The Equal Remuneration Act, 1976.

References

1. D.A Langfor, 1995, Human Resource Management in Construction, Longman.
2. Martin Loosemore, Andrew Dainty, Helen Lingard, Human Resource Management in Construction.
3. Projects, 2010, Strategic and Operational Approaches, Taylor and Francis.
4. D. A Decenzo,2015, Human Resource Management, 11th Edition, John Wiley.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement MCE-CM-107	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-CM-107.1	3	3	3	3	2	-	-	3	2
MCE-CM-107.2	3	3	3	3	2	-	-	3	2
MCE-CM-107.3	3	3	3	2	2	-	-	3	2
MCE-CM-107.4	3	3	3	2	2	-	-	3	1
MCE-CM-107.5	3	3	3	3	3	-	-	3	2
MCE-CM-107.6	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-108: PAVEMENT MATERIALS AND CONSTRUCTION TECHNIQUES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: At the end of the course, the students will be able to

MCE-CM-108.1. Utilize the various method of blending aggregate to find out the required grades of aggregate.
MCE-CM-108.2. Implement the various methods of bitumen mix design for its application in highway construction.
MCE-CM-108.3. Justify types of highway construction and its suitability under Indian conditions.
MCE-CM-108.4. Conduct field and laboratory tests for quality control
MCE-CM-108.5. Plan the effects of various interface treatment on the bituminous construction.
MCE-CM-108.6. Utilize IRC specification for selection of pavement materials and construction techniques.

PART-A

Unit- 1

1.1 Aggregate, Blending of aggregate by Rothfutch
1.2 Triangular chart, trial and error and mathematical proportioning methods
1.3 Classification, nomenclature, quality manufacture of aggregates with respect to WBM
1.4 Bituminous and concrete roads

Unit -2

2.1 Bituminous mixes, requirements of bituminous mixes
2.2 Methods of bituminous mix design
2.3 Their suitability, advantages and disadvantages
2.4 Design of bituminous mixes by Marshall
2.5 Hubbard FieldandHveem methods
2.6 Bituminous materials classification, uses and application of different bituminous material in highway construction
2.7 The Rheology of bituminous binders, Adhesion, failures, weathering of bituminous road materials

Unit -3

3.1 Classification of types of highway construction
3.2 Suitability of each type under Indian conditions
3.3 Selection of base course and surface course
3.4 Construction of earth roads, gravel roads
3.5 Soil stabilized roads, water bound macadam
3.6 Paved roads, bricks, stones

PART-B

Unit- 4

4.1Bituminous construction: properties, requirements and specifications of material, equipments and plants.
4.2 Detailed construction procedure of each type
4.3 Field and laboratory tests for quality control
4.4 Choice of binders under different conditions
4.5 IRC and MORTH specifications

Unit -5

5.1 Bituminous surface treatments
5.2 Interface treatments – prime, coat and tack-coat, surface dressing and seal-coat
5.3 Grouted or penetration macadam
5.4 Bituminous bound macadam
5.5 Bituminous concrete, mastic asphalt

Unit -6

6.1 Necessity of providing a base course under cement concrete road
6.2 Selection of materials, construction methods,
6.3 Classification of various types of joints
6.4 Necessity of providing each type, method of construction of joints
6.5 load transfer devices, dowel bars, tie bars
6.6 Joint filler and sealer materials, IRC specifications

Text Books/ Reference Books:

1. MORTH Roads and Bridge Specifications.
2. H.M.S.O. 1966, Bituminous Materials in Road Constructing, London.
3. F.N. Sparkes, and A.F Smith Concrete Road, Edwards Amola& Co., London.
4. E J Yoder, 2012, Principles of Pavement Design, 2nd edition, John Wiley.
5. Yang H Huang, 2008, Pavement Analysis and Design, 2nd edition, Pearson, Reprint.

Software required/Weblinks:

https://nptel.ac.in/courses/105101087/21
https://nptel.ac.in/courses/105101087/23

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-108)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-108.1	3	2	-	1	-	3	2	2	3
MCE-CM-108.2	2	2	-	2	1	3	3	2	3
MCE-CM-108.3	1	3	3	2	2	3	2	2	2
MCE-CM-108.4	3	1	1	-	2	3	3	3	3
MCE-CM-108.5	2	2	3	2	2	2	-	2	2
MCE-CM-108.6	3	2	3	3	-	2	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-106: ROAD CONSTRUCTION PLANNING AND MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: At the end of the course, the students will be able to

MCE-TE-106.1. Evaluate scope of various types of highway projects.
MCE-TE-106.2. Identify various machineries used in the Highway construction.
MCE-TE-106.3. Apply the concept of project management to highway construction
MCE-TE-106.4. Demonstrate knowledge about the software's for project management
MCE-TE-106.5. Identify various types of contracts
MCE-TE-106.6. Prepare basic components of tender documents

PART-A

UNIT-1

1.1 Various types of Highway Development Projects in Progress in India and their scope.
1.2 Planning of new highway projects,
1.3 Considerations of alternative alignments, horizontal
1.4 Consideration of alternative alignments vertical
1.5 Requirements of alternate construction materials
1.6 Availability of alternate of construction materials.

UNIT-2

2.1 Choice of Pavement type
2.2 Materials and Specifications of pavement layers
2.3 Planning different machinery for road project, their type, capacity and number
2.4 Optimum location of crushers
2.5 Optimum location of mixing plants

UNIT-3

3.1 Planning various Construction activities and their Sequence
3.2 Application of CPM & PERT
3.3 Network analysis
3.4 Project management

PART-B

UNIT-4

4.1 Planning of road improvement and up-gradation projects
4.2 Planning and construction method for road projects
4.3 Widening and Strengthening of existing road pavements
4.4 Construction of new carriageway for six-lane divided highway
4.5 Construction of new carriageway for four-lane divided highway

UNIT-5

5.1 Use of project management software
5.2 Primavera
5.3 MS Project
5.4 Preparation of BOQ
5.5 Preparation of estimates and tender documents.

UNIT-6

6.1 Road contracts, different types
6.2 Procurement guidelines
6.3 Contract documentation
6.4 Legal issues in contract management
6.5 Value engineering, contract maintenance
6.6 BOOT and BOT Projects

References

1. R. L.Peurifoy ,Construction, Planning, Equipment and Method,McGraw Hill Book Co.
2. IRC Codes and MoRTH Specifications.
3. B. C. Punmia and Khandelwala – CPM & PERT, Laxami Publications.
4. Gould, 1999, Construction Project Management, Prentice Hall.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-106)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-106.1	3	2	-	1	-	3	2	2	3
MCE-TE-106.2	2	2	-	2	1	3	3	2	3
MCE-TE-106.3	1	3	3	2	2	3	2	2	2
MCE-TE-106.4	3	1	1	-	2	3	3	3	3
MCE-TE-106.5	2	2	3	2	2	2	-	2	2
MCE-TE-106.6	3	2	3	3	-	2	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-107: TRANSPORTATION ECONOMICS AND FINANCE

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: At the end of course, the students will be able to

MCE-TE-107.1 Summarize the basic concepts, functions and economics of transportation
MCE-TE-107.2 State economic challenges of transportation projects
MCE-TE-107.3. Apply economic evaluation methods to real life problems
MCE-TE-107.4. State the social and environmental impact of the transportation Projects.
MCE-TE-107.5. Utilize the knowledge of project financing.

PART-A

UNIT-1

1.1 Principles of Economics: Supply and demand models,
1.2 Consumer's surplus and social surplus criteria,
1.3 Framework for social accounting, accounting rate of interest,
1.4 Social opportunity cost, rate of interest, social time preference rate of interest,
1.5 Accounting prices of goods and services,
1.6 Measuring input costs, applications of social accounting frame work.

UNIT-2

2.1 Transport Costs and Benefits,
2.2 Fixed and variable cost,
2.3 Cost of improvement, maintenance cost,
2.4 Cost estimating methods,
2.5 Accounting for inflation,
2.6 External costs,

UNIT-3

3.1 Direct benefits
3.2 Reduced vehicle operation costs,
3.3 Value of travel time savings,
3.4 Value of increased comfort and convenience,
3.5 Cost of accident reduction,
3.6 Reduction in maintenance cost.

PART-B

UNIT-4

4.1 Economic Analysis,
4.2 Generation and screening of project alternatives,
4.3 Different methods of economic analysis,
4.4 Annual cost and benefit ratio methods,
4.5 Discounted cash flow methods,
4.6 Shadow pricing techniques.

UNIT-5

5.1 Determination of IRR and NPV,
5.2 Examples of economic analysis,
5.3 Application of economic theory in traffic assignment problem.

UNIT-6

6.1 Project Evaluation: Framework of evaluation,
6.2 Transport planning evaluation at urban and regional levels,
6.3 Other evaluation procedures – achievement matrices,
6.4 Factor profiles, plan ranking,
6.5 Environmental evaluation, safety evaluation,
6.6 Project financing.

Reference Books:

1. R. Winfrey, Highway Economic Analysis, International Textbook Company.
2. J. Kenneth Button, Transport Economics, Elgar.
3. A. David Hensher, and M. Brewer, Transport: An Economics and Management Perspective, Oxford University Press.
4. Emile Quinet and Roger Vickerman, Principles of Transport Economics, Edward Elgar Publications.
5. Road User Cost Study, Central Road Research Institute.
6. J.W Dickey, Project Appraisal for Developing Countries, JohnWiley.
7. Ian G. Heggie, Transportation Engineering Economics, McGraw Hill.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-107)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-107.1	3	2	-	1	-	3	2	2	3
MCE-TE-107.2	2	2	-	2	1	3	3	2	3
MCE-TE-107.3	1	3	3	2	2	3	2	2	2
MCE-TE-107.4	3	1	1	-	2	3	3	3	3
MCE-TE-107.5	3	2	3	3	-	2	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-108: PAVEMENT MATERIALS AND CONSTRUCTION TECHNIQUES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- II

Course outcomes: At the end of the course, the students will be able to –

MCE-CM-108.1. Utilize the various method of blending aggregate to find out the required grades of aggregate.
MCE-CM-108.2. Implement the various methods of bitumen mix design for its application in highway construction.
MCE-CM-108.3. Justify types of highway construction and its suitability under Indian conditions.
MCE-CM-108.4. Conduct field and laboratory tests for quality control
MCE-CM-108.5. Plan the effects of various interface treatment on the bituminous construction.
MCE-CM-108.6. Utilize IRC specification for selection of pavement materials and construction techniques.

PART-A

Unit- 1

1.1 Aggregate, Blending of aggregate by Rothfutch
1.2 Triangular chart, trial and error and mathematical proportioning methods
1.3 Classification, nomenclature, quality manufacture of aggregates with respect to WBM
1.4 Bituminous and concrete roads

Unit -2

2.1 Bituminous mixes, requirements of bituminous mixes
2.2 Methods of bituminous mix design
2.3 Their suitability, advantages and disadvantages
2.4 Design of bituminous mixes by Marshall
2.5 Hubbard FieldandHveem methods
2.6 Bituminous materials classification, uses and application of different bituminous material in highway construction
2.7 The Rheology of bituminous binders, Adhesion, failures, weathering of bituminous road materials

Unit -3

3.1 Classification of types of highway construction
3.2 Suitability of each type under Indian conditions
3.3 Selection of base course and surface course
3.4 Construction of earth roads, gravel roads
3.5 Soil stabilized roads, water bound macadam
3.6 Paved roads, bricks, stones

PART-B

Unit- 4

4.1Bituminous construction: properties, requirements and specifications of material, equipments and plants.
4.2 Detailed construction procedure of each type
4.3 Field and laboratory tests for quality control
4.4 Choice of binders under different conditions
4.5 IRC and MORTH specifications

Unit -5

5.1 Bituminous surface treatments
5.2 Interface treatments – prime, coat and tack-coat, surface dressing and seal-coat
5.3 Grouted or penetration macadam
5.4 Bituminous bound macadam
5.5 Bituminous concrete, mastic asphalt

Unit -6

6.1 Necessity of providing a base course under cement concrete road
6.2 Selection of materials, construction methods,
6.3 Classification of various types of joints
6.4 Necessity of providing each type, method of construction of joints
6.5 load transfer devices, dowel bars, tie bars
6.6 Joint filler and sealer materials, IRC specifications

Text Books/ Reference Books:

6. MORTH Roads and Bridge Specifications.
7. H.M.S.O. 1966, Bituminous Materials in Road Constructing, London.
8. F.N. Sparkes, and A.F Smith Concrete Road, Edwards Amola& Co., London.
9. E J Yoder, 2012, Principles of Pavement Design, 2nd edition, John Wiley.
10. Yang H Huang, 2008, Pavement Analysis and Design, 2nd edition, Pearson, Reprint.

Software required/Weblinks:

https://nptel.ac.in/courses/105101087/21

https://nptel.ac.in/courses/105101087/23

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%

Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-108)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-108.1	3	2	-	1	-	3	2	2	3
MCE-CM-108.2	2	2	-	2	1	3	3	2	3
MCE-CM-108.3	1	3	3	2	2	3	2	2	2
MCE-CM-108.4	3	1	1	-	2	3	3	3	3
MCE-CM-108.5	2	2	3	2	2	2	-	2	2
MCE-CM-108.6	3	2	3	3	-	2	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-151: STRUCTURAL DESIGN LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course Type: Program Core

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

MCE-SE-151.1 Utilize relevant IS Codes and software's for building design
MCE-SE-151.2 Analyze the different structural elements of design problem
MCE-SE-151.3 Generate 3D models of design problem
MCE-SE-151.4 Design complete Multi-Storey Frame Buildings
MCE-SE-151.5 Detail all the Structural Components of Frame Buildings.
MCE-SE-151.6 Develop Parametric design and the conventions of formal engineering drawing

List of Drawing Experiments:

1. Analysis of G+3 structures
2. Design of G+3 structures
3. Preparation of detailed drawing structures by individual student using latest relevant IS codes

.

Text/Reference Books:

1. Subhash C Sharma &Gurucharan Singh, 2005, Civil Engineering Drawing, Standard Publishers
2. V.B Sikka, 2013, A Course in Civil Engineering Drawing, S.K.Kataria& Sons.
3. S.S.Bhavikatti for RCC Design.

Distribution of Continuous Evaluation Table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement (MCE-SE-151)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-151.1	1	1	2	1	-	1	3	3	2
MCE-SE-151.2	1	2	2	1	-	3	3	2	3
MCE-SE-151.3	1	1	2	1	-	3	1	2	3
MCE-SE-151.4	1	1	2	1	-	3	3	1	3
MCE-SE-151.5	1	2	2	1	-	2	3	3	3
MCE-SE-151.6	1	1	2	1	1	2	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCE-CM-151A: PLANNING & SCHEDULING LAB

Credits	: 2	Max. Marks	:100
Periods/Week	: 2 hrs	Internal/Continuous Evaluation	: 50
Examination Duration	: 2 hrs	External/End Semester Exams	: 50

Course Type: Program Core

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

MCE-CM-151.1. Compare the activity logic / dependencies
MCE-CM-151.2. Develop plans using appropriate tools like bar chart, line of balance, network etc
MCE-CM-151.3. Make use of software application for preparation of schedules
MCE-CM-151.4. Demonstrate the planning of construction project
MCE-CM-151.5. Identify the WBS in scheduling of the project activities

List of Experiments/Assignments

1. To acquaint with Software Applications M.S. Project and Primavera
2. To prepare the different types of Schedule Charts for a specific Project.
3. An overview of Job Cost Report of a G+5 Commercial Project.
4. To plan and schedule the activities for a G+3 Residential Project.
5. To plan and schedule the activities for a G+10 Commercial Project.

Software required/Weblinks:
https://nptel.ac.in/courses/105102199/
https://nptel.ac.in/courses/105/106/105106149/
M.S.Project
Primavera

Distribution of Continuous Evaluation:

Viva-I	30%
Viva-II	30%
File/Records	20%
Class Work/ Performance	20%

Evaluation Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

Course Articulation Matrix

CO Statement (MCE-CM-151A**)**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**
MCE-CM-151A.1	3	3	3	3	1	-	1	3	2
MCE-CM-151A.2	2	3	2	2	-	-	1	2	3
MCE-CM-151A.3	3	3	2	3	3	-	-	3	2
MCE-CM-151A.4	3	2	2	3	1	-	1	2	3
MCE-CM-151A.5	2	3	2	2	-	1	-	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-151: TRAFFIC ENGINEERING LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-TE-151.1 Survey traffic volume studies to analyze the field data
MCE-TE-151.2 Conduct O & D studies in the field
MCE-TE-151.3 Utilize signalised and non-signalised intersection studies
MCE-TE-151.4. Design service volume and capacity studies
MCE-TE-151.5. Apply field studies in designing the existing and new infrastructure capacity.
MCE-TE-151.6. Utilize MX-Road software

List of Experiments/Assignments

1. Traffic volume studies
2. Speed studies
3. O & D studies
4. Signalised and non-signalised intersection studies
5. Parking surveys
6. Design service volume and capacity studies

Distribution of Continuous Evaluation Table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement (MCE-TE-151)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-TE-151.1	1	2	3	2	1	2	3	1	2
MCE-TE-151.2	1	2	3	2	-	2	3	2	2

MCE-TE-151.3	2	2	3	2	-	2	3	2	2
MCE-TE-151.4	3	3	3	2	1	2	3	2	2
MCE-TE-151.5	3	3	3	2	1	2	3	2	2
MCE-TE-151.6	3	1	1	2	2	-	3	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-151: CONSTRUCTION MATERIALS LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course outcomes: At the end of the course, the students will be able to

MCE-151.1 Design high grade concrete
MCE-151.2 Analyze the strength and durability parameters
MCE-151.3 Conduct Non Destructive Tests on existing concrete structures
MCE-151.4 Draw inferences about the structural health
MCE-151.5 Apply engineering principles to understand behaviour of structural members

List of Experiments

1. Study of stress-strain curve of high strength concrete, Correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture
2. Effect of cyclic loading on steel
3. Non-Destructive testing of existing concrete members
4. Behaviour of Beams under flexure, Shear and Torsion

References Books:

1. A. M. Neville, 2012, Properties of Concrete, 5th Edition, Prentice Hall,.
2. M.S. Shetty, 2006, Concrete Technology, S. Chand and Co., 2006.

Distribution of Continuous Evaluation Table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement MCE-151	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2

MCE-151.1	3	3	3	3	2	-	-	3	2
MCE-151.2	3	3	3	3	2	-	-	3	2
MCE-151.3	3	3	3	2	2	-	-	3	2
MCE-151.4	2	-	-	-	-	2	1	2	3
MCE-151.5	2	-	-	-	-	1	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M- MC-100: RESEARCH METHODOLOGY AND IPR

Credits	2	Max. Marks	100
Lectures/Week	2 hrs	Continuous Evaluation	50
Examination Duration	3 hrs	End Semester Exams	50

Course Type: Program Core

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

- M- MC-100.1 Formulate contemporary research problems in Civil Engineering Domain
- M- MC-100.2 Analyse research related information
- M- MC-100.3 Follow research ethics
- M- MC-100.4 Demonstrate that today's world is controlled by Computer, Information Technology ruled by ideas, concept, and creativity.
- M- MC-100.5 Emphasise the need of information about Intellectual Property Rights to be promoted among students in engineering.
- M- MC-100.6 Promote that IPR protection provides an incentive to inventors for further research work and investment in R & D

PART -A

Unit 1:

1.1 Meaning of research problem
1.2 Sources of research problem
1.3 Criteria Characteristics of a good research problem
1.4 Errors in selecting a research problem
1.5 Scope and objectives of research problem
1.6 Approaches of investigation of solutions for research problem, data collection, analysis, interpretation
1.7 Necessary instrumentations

Unit 2:

2.1 Effective literature studies approaches
2.2 Analysis
2.3 Plagiarism
2.4 Research ethics

Unit 3:

3.1 Effective technical writing, how to write report
3.2 Paper Developing a Research Proposal
3.3 Format of research proposal
3.4 Presentation and assessment by a review committee

PART -B

Unit 4:

4.1 Nature of Intellectual Property: Patents, Designs, Trade and Copyright
4.2 Process of Patenting and Development
4.3 Technological research, innovation, patenting, development.
4.4 International Scenario: International cooperation on Intellectual Property
4.5 Procedure for grants of patents, Patenting under PCT

Unit 5:

5.1 Patent Rights: Scope of Patent Rights
5.2 Licensing and transfer of technology
5.3 Patent information and databases
5.4 Geographical Indications

Unit 6:

6.1 New Developments in IPR: Administration of Patent System
6.2 New developments in IPR
6.3 IPR of Biological Systems, Computer Software etc.
6.4 Traditional knowledge
6.5 Case Studies, IPR and IITs

Text Books/ Reference Books:

1. Stuart Melville and Wayne Goddard, Research methodology: an introduction for science & engineering students'
2. Wayne Goddard and Stuart Melville, Research Methodology: An Introduction
3. Ranjit Kumar, Research Methodology: A Step by Step Guide for beginners, 2nd Edition
4. Halbert, 2007, Resisting Intellectual Property, Taylor & Francis Ltd.
5. Mayal, 1992 Industrial Design, McGraw Hill,.
6. Niebel, 1974, Product Design, McGraw Hill,.
7. Asimov, 1962, Introduction to Design, Prentice Hall,.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, 2016, Intellectual Property in New Technological Age,.
9. T. Ramappa, 2008, Intellectual Property Rights Under WTO, S. Chand.

Software required/Weblinks:

https://nptel.ac.in/courses/109103024
https://nptel.ac.in/courses/121106007/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%

Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M- MC-100)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
M- MC-100.1	3	2	3	2	-	1	1	2	2
M- MC-100.2	3	-	-	-	-	2	2	1	1
M- MC-100.3	-	1	1	1	3	3	-	-	-
M- MC-100.4	3	1	-	-	-	-	2	2	2
M- MC-100.5	-	3	3	3	3	-	-	1	1
M- MC-100.6	-	3	2	2	2	1	1	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-003: DISASTER MANAGEMENT

Credits	AP	Max. Marks	100
Lectures/Week	2 hrs	Continuous Evaluation	50
Examination Duration	3 hrs	End Semester Exams	50

Course Type: Program Core

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

M-MC-003.1 Describe foundations of hazards, disasters and associated natural/social phenomena
M-MC-003.2 Demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
M-MC-003.3 Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
M-MC-003.4 Exhibit standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
M-MC-003.5 Assess strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in
M-MC-003.6 Conduct independent DM study including data search, analysis and presentation of disaster case study

PART -A

Unit 1: Introduction

1.1 Disaster: Definition, Factors and Significance
1.2 Difference Between Hazard and Disaster
1.3 Natural And Manmade Disasters: Difference, Nature, Types and Magnitude

Unit 2: Repercussions of Disasters and Hazards

2.1 Economic Damage, Loss of Human and Animal Life
2.2 Destruction of Ecosystem
2.3 Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches
2.4 Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts

Unit 3: Disaster Prone Areas in India

3.1 Study of Seismic Zones
3.2 Areas Prone to Floods and Droughts, Landslides and Avalanches
3.3 Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami
3.4 Post-Disaster Diseases and Epidemics

PART -B

Unit 4: Disaster Preparedness and Management

4.1 Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard
4.2 Evaluation of Risk: Application of Remote Sensing, Data From Meteorological And Other Agencies
4.3 Media Reports: Governmental and Community Preparedness

Unit 5: Risk Assessment

5.1 Disaster Risk: Concept and Elements
5.2 Disaster Risk Reduction, Global and National Disaster Risk Situation
5.3 Techniques Of Risk Assessment
5.4 Global Co-Operation in Risk Assessment and Warning
5.5 People's Participation in Risk Assessment
5.6 Strategies for Survival

Unit 6: Disaster Mitigation

6.1 Meaning, Concept and Strategies of Disaster Mitigation
6.2 Emerging Trends in Mitigation
6.3 Structural Mitigation and Non-Structural Mitigation
6.4 Programs Of Disaster Mitigation in India

Text Books/ Reference Books:

1. R. Nishith, AK Singh, Disaster Management in India: Perspectives, issues and strategies 'New Royal book Company.
2. P. Sahni, Disaster Mitigation Experiences and Reflections, Prentice Hall Of India, New Delhi.
3. S.L Goel, Disaster Administration And Management Text And Case Studies ,Deep & Deep Publication Pvt. Ltd., New Delhi.

Software required/Weblinks:
https://nptel.ac.in/courses/105104183/7
https://nptel.ac.in/courses/124107007/35

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (M-MC-003)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
M-MC-003.1	1	-	3	2	-	1	-	1	1
M-MC-003.2	3	3	2	2	1	1	2	1	1
M-MC-003.3	3	-	-	-	-	-	-	3	1
M-MC-003.4	-	1	1	2	3	2	1	-	-
M-MC-003.5	3	-	2	2	2	-	1	1	1
M-MC-003.6	2	1	1	1	-	1	2	3	3

SEMESTER-II

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-201: FINITE ELEMENT METHOD IN STRUCTURAL ENGINEERING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Core

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

MCE-SE-201.1 Utilize Finite Element Method for analysis of structures
MCE-SE-201.2 Contrast solution to problems using finite element analysis and classical methods
MCE-SE-201.3 Compute local and global coordinate
MCE-SE-201.4. Apply numerical methods to solve shape functions
MCE-SE-201.5 Make use of FEA softwares

PART-A

Unit-I: Introduction

1.1 History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle,
1.2 Direct Stiffness Method, Nodal Equilibrium equations,
1.3 Assembly of Global Stiffness Matrix, Element Strain and Stress.

Unit-II: Beam Elements

2.1 Flexure Element, Element Stiffness Matrix,
2.2 Element Load Vector

Unit-III: Method of Weighted Residuals

3.1 Galerkin Finite Element Method, Application to Structural Elements,
3.2 Interpolation Functions, Compatibility and Completeness Requirements,
3.3 Polynomial Forms, Applications

PART-B

Unit-IV: Types

4.1 Triangular Elements, Rectangular Elements, Three-Dimensional Elements,
4.2 Iso parametric
4.3 Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature

Unit-V : Application to Solid Mechanics

5.1 Plane Stress, CST Element, Plane Strain Rectangular Element,

5.2 Iso parametric Formulation of the Plane Quadrilateral Element,
5.3 Axi- Symmetric Stress Analysis, Strain and Stress Computations

Unit-VI: Computer Implementation

6.1 Computer Implementation of FEM procedure, Pre-Processing, Solution, Post-Processing,
6.2 Use of Commercial FEA Software

Text Books/ Reference Books:

1. P.Seshu, 2005, Finite Element Analysis, Prentice-Hall of India.
2. R.D. Cook., Wiley J., 1995, Concepts and Applications of Finite Element Analysis, New York.
3. Hutton David, 2004 Fundamentals of Finite Element Analysis, Mc-Graw Hill.
4. G.R. Buchanan.,1995, Finite Element Analysis, McGraw Hill Publications, New York.
5. O.C. Zienkiewicz & Taylor R.L., 2000, Finite Element Method Vol. I, II & III, Elsevier.
6. A.D. Belegundu, Chandrupatla, T.R., 1991 Finite Element Methods in Engineering Prentice Hall India.

Software required/Weblinks:

NIL

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-201)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-201.1	2	3	-	1	-	1	3	3	1
MCE-SE-201.2	1	2	-	-	-	-	3	3	2
MCE-SE-201.3	1	1	-	2	-	2	1	3	1
MCE-SE-201.4	3	2	2	2	-	2	2	1	2
MCE-SE-201.5	2	1	2	2	2	3	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-201: RESOURCE MANAGEMENT AND CONTROL IN CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Core

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

MCE-CM-201.1. Relate the principles of organizational structures for construction field
MCE-CM-201.2. Utilize the concept of material management and its field application
MCE-CM-201.3. Make use of Personnel Management Functions in Manpower planning & Recruitment
MCE-CM-201.4. Contrast sampling techniques and standards for Quality Management
MCE-CM-201.5. Defend the safety Requirements in construction.

PART-A

Unit-1 Site Organization

1.1 Organizational structures for construction field
1.2 Site layout, Services required on site

Unit-2 Material Management

2.1 Functions, Inventory control
2.2 EOQ,ABC analysis, Estimating requirements
2.3 Procurement and Storage of materials

Unit-3 Personnel Management Functions

3.1 Manpower planning, Recruitment
3.2 Placement, Training and induction
3.3 Performance appraisal, Relevant labour laws

PART-B

Unit-4 Construction Quality Management

4.1 SQC charts, Sampling techniques
4.2 Quality circles, ISO 9000, Management aspects

Unit-5 Safety in Construction

5.1 Safety Requirements, Safety and health codes
5.2 Occupational diseases, Economic aspects
5.3 Management of accidents, Safety department

Unit-6 Work Study

6.1 Method study and Work measurement, Definitions, Objectives, Basic procedure
6.2 Standard time, Performance rating, Computers in Construction Management
6.3 Application in office, Field Computerized construction management

Text Books/ Reference Books:

M. James . Antill, Ronald W. Woodhead, 1990, Critical path methods in construction, practice Wiley,
J. James , O'Brien, CPM in Construction Management, McGraw-Hill Education
A.S.Deshpande,2001, Principles of management and personal management, Laxmi Publication
Edwin B. Flippo, Principles of Personnel Management,McGraw-Hill International Editions
S.K. BHATTARCHARYA, Accounting for management, S Chand Publication

Software required/Web links:

https://nptel.ac.in/courses/105104161/5
https://nptel.ac.in/courses/105106149/37
https://nptel.ac.in/courses/105104161/14

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-201)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-201.1	2	-	3	3	3	-	3	3	2
MCE-CM-201.2	2	-	3	2	3	-	3	2	1
MCE-CM-201.3	2	-	3	3	2	-	3	3	3
MCE-CM-201.4	2	-	3	1	2	-	3	3	2
MCE-CM-201.5	2	-	3	3	3	-	3	3	2

MCE-TE-201: GEOMETRIC DESIGN OF STREETS AND HIGHWAYS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Core

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

MCE-TE-201.1. Recall principles of geometric design.
MCE-TE-201.2. Apply concept of geometric design to contemporary problems
MCE-TE-201.3. Defend principles of geometric design in context of transportation planning and traffic design
MCE-TE-201.4. Examine highway designs problems.
MCE-TE-201.5. Design intersections using various principals associated to it.

PART-A

Unit I: Introduction

1.1 Classification of rural highways and urban roads.
1.2 Geometric design provision for various transportation facilities as per IRC guidelines.
1.3 Objectives and requirements of highway geometric design.
1.4 Design Control and Criteria.

Unit 2: Design Elements

2.1 Sight distances, types, analysis, factors affecting, measurements,
2.2 Horizontal alignment, design considerations,
2.3 Stability at curves, super elevation, widening, transition curves; curvature at intersections, vertical alignment, grades, ramps, design of summit and valley curves,
2.4 Combination of vertical and horizontal alignment including design of hair pin bends,
2.5 Design of expressways,
2.6 IRC standards and guidelines for design problems.

Unit 3: Cross Section Elements

3.1 Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads;
3.2 Facilities for pedestrians, bicycles, buses and trucks,
3.3 Pavement surface characteristics, types, cross slope, skid resistance, unevenness.

PART-B

Unit 4: Design Considerations

4.1 Design considerations for rural and urban arterials, freeways, and other rural and urban roads,
4.2 Design speeds, volumes, levels of service and other design considerations.

Unit 5: Design of Intersections

5.1 Characteristics and design considerations of at-grade intersections;
5.2 Different types of islands, channelization; median openings;
5.3 Rotary intersections; Grade separations and interchanges, types, warrants, adaptability and design details;
5.4 Interchanges, different types, ramps.

Unit 6: Design of drainage facilities

6.1 Importance, Principles, drainage of various geometric elements, surface and subsurface drainage.

Text Books/ Reference Books:

1. AASHO, A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, Washington D.C.
2. S.K. Khanna and Justo, 2000, C.E.G. Highway Engineering, Nem Chand and Bros
3. Jack Eleish and Associates, Planning and Design Guide: At-Grade Intersections. Illinios.
4. Relevant IRC Codes.
5. L.R. Kadyali and N.B.Lal., 2006 Principles and Practices of Highway Engineering, Khanna Publishers
6. O Flaherty, A. Coleman, 2006, Highways: the Location, Design, Construction and Maintenance of Road Pavements, 4th Ed., Elsevier
7. C. JotinKhistya and B. Kent Lall, 2006 Transportation Engineering, Prentice Hall of India Private Limited.

Software required/Web links:

1. https://nptel.ac.in/courses/105101087/11

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-201)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-201.1	1	1	2	-	-		-	2	3
MCE-TE-201.2	1	1	2	-	1	-	-	2	3
MCE-TE-201.3	1	2	2	-	-	-	1	3	3
MCE-TE-201.4	1	2	2	1	-	-	-	3	3
MCE-TE-201.5	2	2	2	1	1	1	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-202A: STRUCTURAL DYNAMICS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

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

MCE-SE-202A.1 Study dynamics response of single degree freedom system using fundamental theory and equation of motion.
MCE-SE-202A.2 Analyze dynamics response of Multi degree freedom system using fundamental theory and equation of motion.
MCE-SE-202A.3 Interpret dynamic analysis results for design, analysis and research purposes.
MCE-SE-202A.4 Create simple computer models for Civil Engineering structures using knowledge of structural dynamics
MCE-SE-202A.5 Apply structural dynamics theory to earthquake analysis, response, and design of structures

PART-A

Unit 1: Introduction

1.1 Objectives
1.2 Importance of Vibration Analysis
1.3 Nature of Exciting Forces
1.4 Mathematical Modeling of Dynamic Systems

Unit 2: Free Vibration of Single Degree of Freedom System

2.1 Undamped free Vibration
2.2 Solution, Natural Period/Frequency, Energy in Free Vibration
2.3 Damped Free Vibration
2.4 Logarithmic decrement equation

Unit 3: Forced Vibration of SDOF

3.1 Undamped Forced vibration
3.2 Amplitude & Phase Angle, Dynamic amplification factor for deflection (Rd)
3.3 Damped Forced vibration
3.4 Relationship between Rd, Rv and Ra
3.5 Resonant frequency and Half power band width
3.6 Response to Arbitrary Force (Duhamel's Integral)

Part B

Unit 4: Numerical Methods of Solution and Response Spectrum

4.1 Time Stepping Methods
4.2 Central Difference Method
4.3 Concept of Response Spectrum

4.4 Development of Tripartite Plot
4.5 Response of Structure in Frequency Domain

Unit 5: Multiple Degree of Freedom System and Earthquake Response

5.1 Equation of Motion for MDOF System
5.2 Solution of Equation, Natural Frequencies and mode Shapes
5.3 Modal Orthogonality
5.4 Approximate Method for finding Natural frequency
5.5 Time History Analysis
5.6 Response Spectrum Analysis

Unit 6: Special Topics in Structural Dynamics (Concepts only)

6.1 Vibration of Continuous systems
6.2 Introduction to Vibration Control, Active Control, Passive Control
6.3 Blasting and Pile Driving
6.4 Foundations for Industrial Machinery
6.5 Base Isolation

Text Books/ Reference Books:

1. Dynamics of Structures, Clough R. W. and Penzien J., McGraw Hill.
2. Structural Dynamics and Introduction to Earthquake Engineering, Chopra A. K.
3. Vibration of Structures - Application in Civil Engineering Design, Smith J. W., Chapman and Hall.
4. Dynamics of Structures, Humar J. L., Prentice Hall.
5. Structural Dynamics - Theory and Computation, Paz Mario, CBS Publication.
6. Dynamics of Structures, Hart and Wong.

Software required/Weblinks:

1. https://nptel.ac.in/courses/105101006/
2. https://nptel.ac.in/courses/105106151/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-202A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-202A.1	3	-	-	3	-	3	3	2	2
MCE-SE-202A.2	3	-	2	3	-	3	2	2	2
MCE-SE-202A.3	1	3	2	2	2	2	1	3	3
MCE-SE-202A.4	3	3	3	-	2	-	1	3	3
MCE-SE-202A.5	3	1	2	3	3	1	1	3	3

MCE-CM-202: CONSTRUCTION ECONOMICS AND FINANCE

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

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

MCE-CM-202.1 Utilize the concept of construction accounting
MCE-CM-202.2 Develop an understanding of the engineering economics.
MCE-CM-202.3 Compare various alternatives of a project.
MCE-CM-202.4 Elaborate the requirements of working capital for a project.
MCE-CM-202.5 Prioritize the best among financial plans.

PART A

Unit 1: Construction accounting

1.1 Construction accounting
1.2 Income statement
1.3 Cash Flow diagrams

Unit 2 : Engineering economics

2.1Depreciation and amortization,
2.2Engineering economics,
2.3Time value of money,
2.4 Discounted cash flow,
2.5Net Present Value, Rate of return
2.6Bases of comparison

Unit 3 Economic Analysis

3.1Incremental rate of return,
3.2Benefit-cost analysis,
3.3 Replacement analysis,
3.4Break even analysis.

PART B

Unit 4 Risks and Uncertainties

4.1Risks and uncertainties and management decision in capital budgeting
4.2Taxation and inflation.
4.3Work pricing,
4.4 Cost elements of contract,
4.5 Bidding and award, revision due to unforeseen causes,
4.6 Escalation.

Unit 5 Capital Management

5.1Turnkey activities,
5.2 Project appraisal and project yield,
5.3 Working capital management,
5.4 Financial plan and
5.5 Multiple sources of finance.

Unit 6 Budgeting

6.1 Introduction to National and International finance,
6.2 Budgeting and budgetary control, performance budgeting,
6.3 Appraisal through financial statements,
6.4 Practical problems and case studies.

Text Books/ Reference Books:

1. K.N. Jha, 2011, Construction Project Management, First Edition, Pearson Publishers
2. Eugene F. Brigham, Michael C. Ehrhardt, 2010 Financial Management Theory and Practice, Cengage Learning,
3. A. Simon Burtonshaw-Gunn, 2009 Risk and Financial Management in Construction, Gower Publishing, Ltd.
4. Z. Warneer, Hirsch, 1993 Urban Economics, Macmillan, New York.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-202)	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PS O 1	PS O 2

MCE-CM-202.1	3	3	3	3	2	-	-	3	2
MCE-CM-202.2	3	2	3	3	2	-	-	3	2
MCE-CM-202.3	3	3	3	2	2	-	-	3	2
MCE-CM-202.4	3	3	3	2	2	-	-	4	1
MCE-CM-202.5	3	3	3	3	3	-	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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MCE-TE-202: INTELLIGENT TRANSPORTATION SYSTEM

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-TE-202.1. Comprehend the latest techniques of transportation systems.

MCE-TE-202.2. Implement the various data collection technique to determine real problem of transport system.

MCE-TE-202.3. Identify importance of telecommunication in ITS system.

MCE-TE-202.4. Categorize various functional areas of ITS.

MCE-TE-202.5.Recommend needs and uses of ITS in public transportation management.

MCE-TE-202.6. Distinguish ITS system between developing and developed countries.

PART-A

Unit-1 Introduction to Intelligent Transportation Systems

1.1 Definition of ITS and Identification of ITS Objectives
1.2 Historical Background,
1.3 Benefits of ITS

Unit-2 Data Collection Techniques

1.4 ITS Data collection techniques
1.5 Detectors, Automatic Vehicle Location (AVL)
1.6 Automatic Vehicle Identification (AVI)
1.7 Geographic Information Systems (GIS)

Unit-3 Telecommunications in ITS

3.1 Importance of telecommunications in the ITS system
3.2 Information Management, Traffic Management Centres (TMC)
3.3 Vehicle, Road side communication
3.4 Vehicle Positioning System

PART-B

Unit-4

4.1 Advanced Traffic Management Systems (ATMS)
4.2 Advanced Traveller Information Systems (ATIS), Commercial Vehicle Operations (CVO)
4.3 Advanced Vehicle Control Systems (AVCS)
4.4 Advanced Public Transportation Systems (APTS

4.5 Advanced Rural Transportation Systems (ARTS)

Unit-5 ITS User Needs and Services

5.1 Travel and Traffic management
5.2 Public Transportation Management, Electronic Payment
5.3 Commercial Vehicle Operations, Emergency Management
5.4 Advanced Vehicle safety systems, Information Management

Unit-6 Automated Highway System

6.1 Vehicles in Platoons, Integration of Automated Highway Systems
6.2 ITS Programs in the World
6.3 Overview of ITS implementations in developed countries
6.4 ITS in developing countries

Text Books/ Reference Books:

1. Chen Kan Paul , Miles J. ITS Hand Book 2000: Recommendations for World Road Association
2. Sussman, J. M., 2005 Perspective on ITS, Artech House Publishers.
3. Chowdhury, M. A., and Sadek, A., 2003, Fundamentals of Intelligent TransportationSystems Planning, Artech House
4. E. Turban and J.E. Aronson, 2004, Decision Support Systems and Intelligent Systems, 5th Edition, Prentice Hall

Software required/Weblinks:

1. https://nptel.ac.in/courses/105101008/48

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Attempt any Four from rest. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-202)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-TE-202.1	3	3	2	2	2	3	3	2	3
MCE-TE-202.2	3	3	3	2	2	1	3	3	2
MCE-TE-202.3	3	3	3	2	2	3	2	-	2
MCE-TE-202.4	3	2	3	2	-	3	3	3	3
MCE-TE-202.5	3	2	3	2	-	-	2	2	2
MCE-TE-202.6	3	3	3	3	1	-	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-201: NUMERICAL METHODS IN CIVIL ENGINEERING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-201.1	Apply statistical methods for data analysis
MCE-201.2	Solve algebraic equations, numerical differentiation & integration problems
MCE-201.3	Evaluate numerical solution for ordinary & partial differential equations
MCE-201.4	Develop characteristic equations related to civil engineering
MCE-201.5	Formulate Linear programming problem

PART-A

UNIT-1

1.1 Solution of linear simultaneous equations
1.2 direct and iterative algorithms based on Gauss elimination
1.3 Gauss Jordan method
1.4 Gauss Seidel method.

UNIT-2

2.1 Numerical solution to non-linear system of equations
2.2 bisection method, false position method
2.3 Newton-Raphson method
2.4 Secant method
2.5 fixed point method.

UNIT-3

3.1 Interpolation formulae
3.2 Polynomial forms
3.3 linear interpolation
3.4 lagrange interpolation polynomial
3.5 Newton interpolation polynomial
3.6 forward and backward differences.

PART-B

UNIT-4

4.1 Numerical differentiation by forward difference quotient
4.2 Central difference quotient,
4.3 Richardson extrapolation and numerical integration by Trapezoidal rule

4.4 Simpson's 1/3 rule
4.5 Romberg integration
4.6 Gaussian integration.

UNIT-5

5.1 Numerical solution of ordinary differential equations by Taylor series method
5.2 Euler's method
5.3 Runge-kutta method
5.4 Picard's method, Heun's method
5.5 polygon Method.

UNIT-6

6.1 Linear Programming: Formulation of Linear programming problems
6.2 Solving Linear programming problem using Graphical method
6.3 Simplex method and Dual simplex method.

Text Books/ Reference Books:

1. Terrence J.Akai , 1994, 'Numerical Methods', John Wiley & Sons Inc, Singapore,
2. S.S. Shastry, 1997, Introductory Method of Numerical Analysis, PHI Pvt.Ltd.
3. H.C.Saxena, 2001, Finite Differences and Numerical Analysis', S. Chand &Co.Delhi
4. M.L.Baron & M.G.Salvadori, 1963 'Numerical Methods in Engineering', PHI Pvt.Ltd.
5. Curtis F.Gerald&Patricks.O. Wheately, 1994 'Applied Numerical Analysis', 5th Ed., Addison Wesley
6. E. Balagurusamy,2001 'Numerical Methods', TMH Pub.Co.Ltd.

Software required/Weblinks:

Nil

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering the entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-201)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-201.1	3	3	2	2	2	3	3	2	3
MCE-201.2	3	3	3	2	2	1	3	3	2
MCE-201.3	3	3	3	2	2	3	2	-	2
MCE-201.4	3	2	3	2	-	3	3	3	3
MCE-201.5	3	2	3	2	-	-	2	2	2
MCE-201.6	3	3	3	3	1	-	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-203: ADVANCED STEEL DESIGN

Credits	3	Max. Marks	200
Periods/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-SE-203.1 Describe about the temperature effects on steel
MCE-SE-203.2 Determine local and global drift
MCE-SE-203.3 Develop constitutive relationships between beam and columns.
MCE-SE-203.4 Analyze theory of plasticity for structures.
MCE-SE-203.5 Examine the strength criteria for structure.
MCE-SE-203.6 Apply numerical methods to solve bucklings.

PART-A

Unit-1: Properties of Steel

1.1 Mechanical Properties, Hysteresis, Ductility.
1.2 Hot Rolled Sections**:** compactness and non-compactness,
1.3 Slenderness, residual stresses

Unit-2: Design of Steel Structures

2.1 Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, Drift

Unit-3: Stability of Beams

3.1 Local Buckling of Compression Flange &Web, Lateral Torsional Buckling

PART-B

Unit-4: Stability of Columns

4.1 Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis

Unit-5 : Method of Designs

5. Allowable Stress Design, Plastic Design, Load and Resistance Factor Design

Unit-6: Strength Criteria

6.1 Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length,

6.2 PM Interaction, Biaxial Bending, Joint Panel Zones. Drift Criteria: P Effect,

6.3 Deformation Based Design; Connections: Welded, Bolted, Location Beam Column, Column Foundation, Splices

Text Books/ Reference Books:

1. Ramchandra, Design of Steel Structures - Vol. II. Standard Book House, Delhi.
2. A.S.Arya, J.L. Ajmani, Design of Steel Structures, Nemchand and Bros., Roorkee.
3. J.F. Baker, M.R.Horne, J. Heyman,The Steel Skeleton- Vol. II, Plastic Behaviour and Design , ELBS.
4. B.G.Neal, Plastic Methods of Structural Analysis., Chapman and Hall London.
5. IS 800: 2007 – General Construction in Steel - Code of Practice, BIS.
6. SP – 6 – 1987, Handbook of Structural Steel Detailing, BIS

Software required/Weblinks:

1. Staad Pro.V8i

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-203)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-203.1	3	2	1	-	-	1	3	3	2
MCE-SE-203.2	1	2	-	-	1	-	3	3	1
MCE-SE-203.3	2	1	-	2	-	2	1	3	1
MCE-SE-203.4	3	2	-	2	-	2	2	1	3
MCE-SE-203.5	2	1	2	2	2	3	3	1	2
MCE-SE-203.6	1	-	2	2	1	1	3	2	3

MCE-SE-204: DESIGN OF FORMWORK

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

Course outcomes:

MCE-SE-204.1- Summerize the requirements and selection of formwork
MCE-SE-204.2- Select appropriate material and accessories of formwork
MCE-SE-204.3- Apply design of formwork for structural elements
MCE-SE-204.4- Develop design of formwork for special structures
MCE-SE-204.5- Justify requirement of Flying formwork
MCE-SE-204.6 Judge the formwork failures through case studies.

PART A

Unit-1: Introduction

1.1 Requirements of Formwork
1.2 Selection of Formwork

Unit-2: Formwork Materials

2.1 Timber,
2.2 Plywood, Steel,
2.3 Aluminium, Plastic, and Accessories.
2.4 Horizontal and Vertical Formwork Supports

Unit- 3: :Formwork Design

3.1 Concepts,
3.2 Formwork Systems and Design for Foundations,
3.3 Walls, Columns,
3.4 Slab and Beams

PART B

Unit-4: Formwork Design for Special Structures

4.1 Shells, Domes,
4.2 Folded Plates,
4.3 Overhead Water Tanks,
4.4 Natural Draft Cooling Tower, Bridges

Unit-5: Flying Formwork

5.1 Table Form, Tunnel Form,
5.2 Slip Form, Formwork for Precast Concrete,
5.3 Formwork Management Issues –Pre- and Post-Award

Unit-6: Formwork Failures

6.1 Causes and Case studies in Formwork Failure,
6.2 Formwork Issues in Multi-Story Building Construction.

Reference

1. Peurify,2015, Formwork for Concrete Structures,McGraw Hill India
2. Kumar Neeraj Jha, 2012, Formwork for Concrete Structures, Tata McGraw Hill Education
3. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Attempt any Four from rest. Each question will be of 15 marks

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-204)	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-204.1	3	3	3	3	2	-	-	3	2
MCE-SE-204.2	3	3	3	3	2	-	-	3	2
MCE-SE-204.3	3	3	3	2	2	-	-	3	2
MCE-SE-204.4	3	3	3	2	2	-	-	3	1
MCE-SE-204.5	3	3	3	3	3	-	-	3	2
MCE-SE-204.6	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-205: DESIGN OF HIGH-RISE STRUCTURES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Elective-III

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

MCE-SE-205.1 Describe the loading effects on high-rise structures
MCE-SE-205.2 Determine forces on chimney structures
MCE-SE-205.3 utilize appropriate IS Codes in the analysis and design
MCE-SE-205.4 Analyze theory braces structures.
MCE-SE-205.5 Examine the tall structures.
MCE-SE-205.6 Apply numerical methods to wind forces on towers.

Unit-I Design of transmission/ TV tower

1.1 Mast and trestles: Configuration, bracing system,
1.2 analysis and design for vertical transverse and longitudinal loads

Unit-II Analysis and Design of RC Chimney

2.1 Foundation design for varied soil strata

Unit-III Analysis and Design of Steel Chimney

3.1 Foundation design for varied soil strata

Part-B

Unit-IV Tall Buildings

4.1 Structural Concept, Configurations, various systems, Wind and Seismic loads,
4.2 Dynamic approach, structural design considerations and IS code provisions.

Unit-V Tall Buildings Fire fighting

5.1 Approximate method of Analysis of multi-storey framed, Fire fighting design provisions

Unit-VI Application of software in analysis and design

6.1 Analysis for drift and shear wall Using software and manual verifications of results.

Text Books/ Reference Books:

1. U.H. Varyani , 2002, Structural Design of Multi-storeyed Buildings,., 2nd Ed., South Asian Publishers, New Delhi
2. B.S. Taranath 1988, Structural Analysis and Design of Tall Buildings, McGraw Hill.

3. Shah V. L. & Karve S. R., 2013, Illustrated Design of Reinforced Concrete Buildings(GF+3storeyed), Structures Publications, Pune
4. Design of Multi Storeyed Buildings, Vol. 1 & 2, 1976, CPWD Publications.
5. S.Smith Byran and Coull Alex, 1991, Tall Building Structures, Wiley India.
6. Wolfgang Schueller, 1971, High Rise Building Structures, Wiley
7. Tall Chimneys, S.N. Manohar, Tata McGraw Hill Publishing Company, New Delhi

Software required/Weblinks:

1. Staad pro and auto cad

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-205)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**
MCE-SE-205.1	2	2	1	1	-	1	3	3	1
MCE-SE-205.2	3	2	-	-	-	-	3	3	2
MCE-SE-205.3	2	1	-	2	-	2	1	3	2
MCE-SE-205.4	3	2	2	1	-	2	2	1	3
MCE-SE-205.5	2	1	2	2	2	3	3	1	2
MCE-SE-205.6	1	-	2	2	1	1	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-206: DESIGN OF MASONRY STRUCTURES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

Course outcomes: At the end of the course, students will be able to

MCE-SE-206.1 Correlate the masonry design approaches.
MCE-SE-206.2 Analyse Reinforced Masonry Members.
MCE-SE-206.3 Relate to interactions between members.
MCE-SE-206.4 Determine shear strength and ductility of Reinforced Masonry members.
MCE-SE-206.5 Check the stability of walls
MCE-SE-206.6 Perform Elastic and Inelastic analysis of masonry walls.

PART-A

UNIT 1:

1.1 Introduction, Historical Perspective
1.2 Masonry Materials
1.3 Masonry Design Approaches,
1.4 Overview of Load Conditions
1.5 Compression Behaviour of Masonry, Masonry Wall Configurations,
1.6 Distribution of Lateral Forces.

UNIT 2:

2.1 Flexural Strength of Reinforced Masonry Members
2.2 In plane loading
2.3 Out-of-plane Loading.

UNIT 3:

3.1 Interactions
3.2 Structural Wall
3.3 Columns and Pilasters
3.4 Retaining Wall
3.5 Pier and Foundation.

PART-B

UNIT 4:

4.1 Shear Strength of Reinforced Masonry Members

4.2 Ductility of Reinforced Masonry Members.

UNIT 5:

5.1 Prestressed Masonry
5.2 Stability of Walls
5.3 Coupling of Masonry Walls
5.4 Openings
5.5 Columns
5.6 Beams.

UNIT 6:

6.1 Elastic and Inelastic Analysis,
6.2 Modeling Techniques
6.3 Static Pushover Analysis
6.4 Use ofCapacity Design Spectra.

Text Books/ Reference Books:

1. NarendraTaly ,Design of Reinforced Masonry Structures, ICC, 2nd Edn,
2. Hamid Ahmad A. and Drysdale Robert G., 1994, Masonry Structures: Behavior& Design,.
3. Maurizio Angelillo, 2014, Mechanics of Masonry Structures, Editor:.
4. Toma_evi_Miha , 1999, Earthquake-resistant Design of Masonry Buildings, , Imperial College Press.

Software required/Weblinks:

1. https://swayam.gov.in/nd1_noc19_ce21
https://nptel.ac.in/courses/105102088

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-206)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-206.1	3	1	-	-	-	2	2	1	1
MCE-SE-206.2	3	-	2	2	-	2	2	2	2
MCE-SE-206.3	3	-	-	-	-	1	1	3	3
MCE-SE-206.4	1	-	-	-	-	-	2	2	2
MCE-SE-206.5	2	1	2	2	2	-	1	1	1
MCE-SE-206.6	3	-	-	-	-	-	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-202: AIRPORT PLANNING AND DESIGN

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-202.1 Describe the components of airport and aircrafts
MCE-202.2 Analyse the requirements of an airport layout with respect to international regulations
MCE-202.3 Explain the airport runway design
MCE-202.4 Design Taxiways & Aprons.
MCE-202.5 Summarize the concepts of the terminal service facilities.

PART-A

Unit -1: Introduction

1.1 Classification of airports
1.2 Aircraft characteristics
1.3 Aircraft Controls, Airport Site and Size selection
1.4 Airport Obstructions

Unit -2: Runway Orientation

2.1 Runway orientation
2.2 Wind rose diagram
2.3 Runway configurations

Unit -3: Runway Geometric And Length

3.1 Runway geometric elements
3.2 Runway width, the transverse grade, the longitudinal grade, the rate of change longitudinal grade, sight distance requirements
3.3 Basic runway length
3.4 Corrections to basic runway length.

PART-B

Unit -4: Taxiways

4.1 taxiway requirements- alignment geometry
4.2 Length and the width of the taxiway,
4.3 The transverse and the longitudinal grades, the sight distance and the design of the turning radius

4.4 Exit taxiway, the turnaround taxiway and taxi lane.

Unit -5: Aprons and Parking

5.1 Types of aprons
5.2 Aprons- planning and design
5.3 Design principles of critical, semi-critical, non-critical airport pavements- FAA and PCA methods
5.4 Aircraft parking

Unit -6: Terminal Planning and Hangers

6.1 Airport terminal and amenities ; Airport lighting and marking
6.2 Airport landscaping, grading and drainage general
6.3 Air traffic control lighting and signing;
6.4 Airport safety; Environmental impact of airports;

References:

1. N.J. Ashford, P.H. Wright, 1992Airport Engineering, 3rd Edition, John Wiley
2. R.M. Horonjeff, F.X. McKelvey, W.J Sproule, Seth Young, 2009,Planning and Design ofAirports, TMH International Publishers, Fifth Edition
3. Khanna, Arora and Jain, 2001, Planning and Design of Airports, Nemchand Bros
4. Wells, Alexander; Young, Seth, 2009, Airport Planning & Management, McGraw Hill,5thEdition
5. De N. Richard, & Odoni, 2004, Airport Systems: Planning, Design, and Management,McGraw Hill Amedeo, 1st Edition,
6. May, 1989,Traffic Flow Fundamentals, Prentice Hall
7. F. L. Mannering, 2008, Principles of Highway Engineering and Traffic Analysis, 4th Edition,, John Wiley.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B(one from each unit).Students need attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests

Course Articulation Matrix

CO Statement (MCE-202)	**PO1**	**PO2**	**PO 3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**

MCE-202.1	3	3	3	3	2	-	-	-	-	3	2
MCE-202.2	3	3	3	3	2	-	-	-	-	3	2
MCE-202.3	3	3	3	2	2	-	-	-	-	3	2
MCE-202.4	3	3	3	2	2	-	-	-	-	3	1
MCE-202.5	3	3	3	3	3	-	-	-	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-203: ADVANCED CONSTRUCTION TECHNOLOGY

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-203.1 Relate to construction technologies in RC Buildings
MCE-203.2Identify appropriate construction equipments
MCE-203.3Utilize safety measures while handling the equipments.
MCE-203.4Analyze construction loads
MCE-203.5Implement top down construction technology

PART-A

Unit -1 Introduction

1.1 Introduction and role of technologies,
1.2Construction technologies in RC Buildings for Reinforcement,

Unit -2 Formwork

2.1Formwork, and concreting activities, Excavation and Concreting equipment,
2.2Formwork material and Design Concepts, Formwork system for Foundations, walls
2.3 Formworks for Columns, slab and beams and their design

Unit -3 Flying Formwork

1.1 Table form
1.2 Tunnel form
1.3 Slip form,

PART-B

Unit -4 Shoring

4.1 Temporary structures failure,
4.2Determining construction loads and ensuring safety of slabs during construction of high rise buildings-shoring,
4.3 Re shoring, pre shoring and back shoring technology,

Unit -5 Top-Down Construction Technology

5.1 Introduction to top-down construction technology
5.2 High Rise
5.2 Underground construction,

Unit -6: Bridge Construction

6.1 Bridge construction including segmental construction,
6.2 Incremental construction and
6.3 Push launching techniques
6.4 Prefab construction.

Text Books/ Reference Books:

1. K.N. Jha,2012., Formwork for Concrete Structures, First Edition, McGraw Hill.
2. Peurifoy, R.L. and Oberlender, G.D., 2011,Formwork for concrete structures, McGraw Hill.
3. Robinson, J.R., Piers, abutments, and formwork for bridges.
4. Austin, C.K., Formwork to concrete.
5. Moore, C.E., Concrete Form Construction.

Software required/Weblinks:
NIL

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-203)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-203.1	2	2	-	1	-	1	-	3	1
MCE-203.2	3	2	-	-	-	-	3	3	2
MCE-203.3	2	1	-	2	-	2	1	3	2
MCE-203.4	3	2	2	2	-	2	2	1	3
MCE-203.5	2	1	2	2	2	3	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-203: FORMWORK AND SHUTTERING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-CM-203.1. Relate the working of basic system units and objectives of building formwork
MCE-CM-203.2. Describe the various material handling and other miscellaneous purposes
MCE-CM-203.3. Differentiate the forms and shores used in construction
MCE-CM-203.4. Justify the scientific concept of erecting the form work in field applications
MCE-CM-203.5. Utilize the various forms for domes and tunnels, slip forms and scaffolds in construction
MCE-CM-203.6. Develop the project report

PART-A

Unit-1: Planning, Site Equipment & Plant for Form Work

1 Introduction, Forms for foundations, columns, beams walls etc.,
2 General objectives of formwork building, Planning for safety, Development of a Basic System
3 Key Areas of cost reduction, Planning examples, Overall Planning, Detailed planning
4 Standard unit , Cornerunits, Pass units, Calculation of labour constants, Formwork hours
5 Labour Requirement, Overall programme, Detailed programme Costing
6 Planning crane arrangements, Site layout plan, Transporting plant , Formwork beams
7 Scaffold frames, Framed panel, formwork, Formwork accessories

Unit-2: Materials Accessories Proprietary Products & Pressures

2 Lumber, Types, Finish Sheathing boards working stresses, Repetitive member stress, Plywood
3 Types and grades, Jointing Boarding, Textured surfaces and strength, Reconstituted wood
4 Steel, Aluminum, Hardware and fasteners, Nails in Plywood, Allowable withdrawal load and lateral load.
5 Pressures on formwork, Vertical loadsf or design of slab forms, Uplift on shores, Laterals loads on slabs and walls.

Unit-3: Design of Forms And Shores

3.1 Duty props, Basic simplification Beam formulae, Allowable stresses, Deflection, Bending Lateral stability, Shear, Bearing
3.2 Design of Wall forms, Slab forms, Beam forms, Column forms, Examples in each. Simple wood stresses, Slenderness ratio, Allowable load vs length behavior of wood
3.3 Form lining, Design Tables for Wall form work, Slab Formwork, Column Formwork, Slab props,
3.4 Stacking Towers, Free standing and restrained, Rosette Shoring, Shoring Tower Heavy Duty props

PART-B

Unit-4: Building and Erecting the Form Work

4.1 Carpentry Shop and job mill, Forms for Footings, Wall footings, Column footings
4.2 Sloped footing form, Customized slab table, Standard Table module forms
4.3 Swivel head and uniportal head, Assembly sequence, Cycling with lifting fork Moving with table trolley and table prop, various causes of failures, Design deficiencies, Permitted and gradual irregularities.

Unit-5: Forms for Domes and Tunnels, Slip Forms and Scaffolds

5.1 Hemispherical, Parabolic, Translational shells, Typical barrel vaults Folded plate roof details
5.2 Forms for Thin Shell roof slabs design considerations, Building the forms Placing concrete
5.3 Form removed, Strength requirements, Tunnel forming components, Curb forms invert forms, Arch forms, Concrete placement methods
5.4 Cut and cover construction, Bulk head method, Pressures on tunnels Continuous Advancing Slope method, Form construction Shafts, Slip Forms
5.5 Principles, Types, advantages, Functions of various components, planning desirable Characteristics of concrete, Common problems faced, Safety in slip forms special structures

Unit-6: Project Reporting & Project Close-out

6.1 Putlog and independent scaffold, Single pole scaffold, Truss suspended
6.2 Gantry and system scaffolds, Managing Contractors at Site, Work Planning, Resources
6.3 Site Instructions and Compliance, Measurement Book, Running Bills Preparation
6.4 Decision Support, the power of Option Analysis and Logic Notes, Communication and Report
6.5 Agenda and Minutes of Meeting, Daily Site Report-back, Monthly Project Review
6.6 Project Close Out tying up all loose ends properly and securely, Documents to be completed and archived

Text Books/ Reference Books:

1. Austin, C.K., 1996, Formwork for Concrete, Cleaver -Hume Press Ltd., London
2. Hurd, M.K., 1996, Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit,
3. Michael P. Hurst, 2003, Construction Press, London and New York
4. Robert L. Peurifoy and Garold D. Oberlender, 1996, Formwork For Concrete Structures, McGraw-Hill

Software required/Weblinks:

1. https://nptel.ac.in/courses/105104030/31
2. https://nptel.ac.in/courses/105103093/pdf/concrete_uc.pdf
3. http://web.iitd.ac.in/~bishwa/LEC_PDF_774/LEC18.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%

Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-203)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-203.1	1	-	3	2	3	1	3	3	2
MCE-CM-203.2	1	-	3	1	3	3	3	3	3
MCE-CM-203.3	1	-	3	2	3	2	3	3	2
MCE-CM-203.4	1	-	3	1	3	3	3	3	3
MCE-CM-203.5	1	-	3	2	3	3	3	2	2
MCE-CM-203.6	1	-	3	2	3	1	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-204: RELIABILITY ANALYSIS IN CONSTRUCTION MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-CM-204.1. Describe the laws of probability for effectively utilizing them.
MCE-CM-204.2. Summarize the functions of random variables and conditional distribution
MCE-CM-204.3. Relate the statistics of properties of concrete, steel, bricks and mortar
MCE-CM-204.4. Explain the scientific concept Monte Carlo study of reliability and its application to columns beams and frames
MCE-CM-204.5. Utilize the partial safety checking formats based on standards
MCE-CM-204.6. Develop the understanding of reliability of structural systems analysis on its related

PART-A

UNIT 1

1.1 Probability Theory: Mutually exclusive events
1.2 Set theory, sample points and sample space
1.3 Laws of probability, total probability theorem

UNIT 2

2.1 Baye's rule, random variables-discrete and continuous
2.2 Jointly distributed discrete variables marginal distribution, conditional distribution
2.3 Jointly distribution continuous variables, functions of random variables
2.4 Moments and expectations, common probability distribution normal

UNIT 3

3.1 Lognormal, Gamma and Beta distribution, external distribution
3.2 Resistance Distribution and Parameters: Statistics of properties of concrete and steel
3.3 Statistics of strength of bricks and mortar, Characterization of variables, allowable stresses based on specified reliability

PART-B

UNIT 4

4.1 Monte Carlo Study of Reliability: Monte Carlo Method Inverse transformation technique
4.2 Application to columns beams and frames
4.3 Level 2 Reliability Methods**:** Basic variables and failure surface, first order second moment methods, Hasofer and Lind's method

UNIT 5

5.1 Non-normal distributions; determination of reliability index B of structural elements
5.2 Determination of partial safety checking formats
5.3 Development of reliability based criteria, optimal safety factors, and calibration of IS 456 and IS 800

UNIT 6

6.1 Reliability of Structural Systems: System reliability, modeling of structural systems
6.2 Bounds on system reliability, automatic generation of a mechanism
Generation of dominant mechanism, reliability analysis of R.C.C. and steel frames

Text Books/ Reference Books:

1. R.Ranganathan, 'Reliability Analysis and Design of Structures' Tata McGraw Hill Delhi.
2. S.S.Rao, 1990, 'Reliability based Design' Tata McGraw Hill Delhi,
3. D.I.Ghosh 1989,. 'A Primer of Reliability Theory', John Wiley, New York,
4. E.E. Lewis, 1987 Introduction to Reliability Engineering' John Wiley, New York,.

Software required/Weblinks:

1. https://nptel.ac.in/courses/105103140/
2. https://nptel.ac.in/courses/105108128/
3. https://nptel.ac.in/courses/105101002/35

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-204)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-CM-204.1	3	3	2	3	-	-	2	3	3

MCE-CM-204.2	3	3	-	2	-	-	-	2	2
MCE-CM-204.3	3	3	-	3	-	-	2	3	3
MCE-CM-204.4	3	3	-	3	-	-	-	2	3
MCE-CM-204.5	3	3	-	2	-	-	-	3	2
MCE-CM-204.6	3	3	3	3	-	-	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-205: APPLIED STATISTICS & QUEUING THEORY

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-CM-205.1. Explain the working basic concepts of Queuing Theory
MCE-CM-205.2. Apply the functions of Random Variables, Estimation Theory
MCE-CM-205.3. Relate the principles of Least squares and Method of moments
MCE-CM-205.4. Make use of the scientific concept of sampling of distributions
MCE-CM-205.5. Utilize ANNOVA

PART-A

Unit-1

1.1 Basic Concepts of Queuing Theory

Unit-2

2.1 Probability, Random variables, Moments
2.2 Moment generating functions, standard distributions
2.3 Functions of Random Variables, Estimation Theory

Unit-3

3.1 Principles of Least squares, Multiple and partial Correlation
3.2 Regression, Estimation of parameters, Maximum likelihood estimates
3.3 Method of moments, Testing of Hypothesis

PART-B

Unit-4

4.1 Sampling of distributions
4.2 Test based on Normal, t-, chi-square and F distributions
4.3 Analysis of variance-one way and two way classifications

Unit-5

5.1 Design of Experiments & Queuing Theory
5.2 Completely Randomized Design randomized Block Design
5.3 Latin square design-2 square Factorial design

Unit-6

6.1 Single and Multiple server Markovian Queuing Models

Text Books/ Reference Books:

1. H.A. Taha1997.,Operations Research: An Introduction, Prentice - Hall of India, 6th Edition, New Delhi
2. J.E.Freund, and Miller, I.R.,1994, Probability and Statistics for Engineers, Prentice - Hall of India, 5th Edition, New Delhi
3. S.C. Gupta, and Kapur, V.K., 1999, Fundamentals of Mathematical Statistics, Sultan Chand &Sons,New Delhi
4. B.S. Goel , and S.K. Mittal.,2000, Operations Research, PragatiPrakashan, Meerut

Software required/Weblinks:

1. https://nptel.ac.in/courses/110105082/20
2. https://nptel.ac.in/courses/112106131/30
3. https://nptel.ac.in/courses/117103017/21

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-205)	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-CM-205.1	3	3	2	3	-	-	-	3	2
MCE-CM-205.2	3	3	2	2	-	-	-	2	3
MCE-CM-205.3	3	3	3	2	-	-	-	1	3
MCE-CM-205.4	3	3	1	3	-	-	-	2	2
MCE-CM-205.5	3	3	2	2	-	-	-	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-206: CONSTRUCTION PROJECT MANAGEMENT AND BOT SYSTEM

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

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

MCE-CM-206.1 Relate to the importance of construction contracts
MCE-CM-206.2 Explain the elements of contracts
MCE-CM-206.3. Describe tendering and contractual procedures
MCE-CM-206.4. Evaluate Feasibility of projects.
MCE-CM-206.5. Analyze contractual practices.

PART-A

Unit -1 Indian Contracts Act

1.1 Indian Contracts Act - Indian contract act 1872,
1.2 definition of contract and its applicability,

Unit -2 Contracts

2.1 Elements of Contracts
2.2 Types of contracts,
2.3 International contracts, condition
2.4 Specification of contract.

Unit -3 Bidding

3.1 Qualification of bidders-Pre qualification - Bidding
3.2 Two Cover System
3.3 Tender documents- Evaluation of Tender
3.4 Technical &financial aspects,
3.5 Tendering and contractual procedures.

PART-B

Unit -4 Arbitration Act

4.1 Arbitration and conciliation act 1996,
4.2 Violations
4.3 Appointment of arbitrator
4.4 Power and duties of arbitrator

Unit -5 Labour Laws

5.1 Dispute review board
5.2 Labour laws, Workmen compensation act
5.3 Minimum wages Act
5.4 Child labour Act

Unit -6 Industrial Dispute Act

6.1 Industrial dispute Act
6.2 Value engineering

References :

1. K.N. Jha, K.N., 2011, Construction Project Management, First Edition, Pearson Publishers
2. G.T. Gajaria , 1982, Laws Relating to Building and Engineering Contracts in India, M. M. Tripathi Private Ltd., Bombay, Tamilnadu PWD Code
3. Jimmie Hinze, 2001, Construction Contracts, McGraw Hill
4. T. Joseph. Bockrath, 2004,Contracts, the Legal Environment for Engineers and Architects, McGraw Hiii, Oxley Rand

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B(one from each unit).Students need attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-206)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-CM-206.1	3	3	3	3	2	-	-	3	2
MCE-CM-206.2	3	3	3	2	2	-	-	3	2
MCE-CM-206.3	3	3	3	2	2	-	-	3	1
MCE-CM-206.4	3	3	3	3	3	-	-	3	2
MCE-CM-206.5	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-203: HIGHWAY SUB-GRADE AND FOUNDATION ANALYSIS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Core

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

MCE-TE-203.1. Relate to the importance of soil survey.
MCE-TE-203.2. Utilize soil properties for pavement design.
MCE-TE-203.3. Correlate between soil moisture and effect of water table on foundation analysis.
MCE-TE-203.4. Analyze and design subgrade
MCE-TE-203.5. Develop methods to deal with weak soils.

PART-A

Unit 1: Subgrade

1.1 Soil Mechanics applications to Highway Engg.
1.2 Soil formations, Types, Regional Soil deposits of India,
1.3 Index properties, their determination,
1.4 Soil survey, Soil Survey procedure for highways and ground water investigations,

Unit 2: Soil Classification for highway engineering purpose

2.1 Casagrande, U.S.P.R.A., Unified, CAA, Burmister, HRB, FAA
2.2 Compaction classifications and their limitations,
2.3 Chemical test for soils.

Unit 3: Soil Moisture

3.1 Movement, Ground water, gravitational water, held water, soil suction.
3.2 Sub soil drainage, General principles,
3.3 Elementary groundwater hydrology,
3.4 Control of high water table and seepage flow,
3.5 Drainage of fine grained soils.
3.6 Frost action in soils,

PART-B

Unit 4:Settlement Analysis

4.1 Evaluation and design of Sub-Grade laboratory strength elevations

4.2 Settlement analysis.
4.3 Stress-strain relationship in soils.
4.4 Compaction of soil, field and laboratory methods, equipments, field control,
4.5 Sub-Grade and embankment compaction.

Unit 5: Foundation

5.1 Methods of reducing settlements,
5.2 Consolidation of compressible soils, estimation of rate of settlement due to consolidation in foundation of road embankments.
5.3 Construction of high embankments over weak foundations.
5.4 Various methods of excavation displacement of soft and swampy soil for the construction of embankments.

Unit 6: Reinforced Earth structures

6.1 Introduction, Components, Advantages,
6.2 Types of stability – external, Internal, (No problems),
6.3 Geo textiles – types, Functions, their uses in road embankments and railway works, other uses.

Text Books/ Reference Books:

1. B.M. Das , Advanced Soil Mechanics, Taylor and Francis.
2. Mitchell, James K, Fundamentals of Soil Behavriour, John Wiley &Sons.,
3. N.P. Kurien, Design of Foundation Systems., Principles and Practices, Narosa New Delhi.
4. B.M. Das, Principles of Foundation Engineering

Software required/Weblinks:
http://textofvideo.nptel.ac.in/105105107/lec37.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-203)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-203.1	1	2	1	-	-		-	2	2
MCE-TE-203.2	2	3	2	-	-	-	-	2	2
MCE-TE-203.3	2	3	3	-	-	-	-	2	2
MCE-TE-203.4	3	3	3	-	-	-	-	3	3
MCE-TE-203.5	2	3	3	1	1	1	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-204: ADVANCED ENGINEERING GEOLOGY

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-III

Course outcomes: At the end of the course, students will be able to

MCE-TE-204.1. Identify various elements of rock and their features
MCE-TE-204.2. Utilize megascopic and microscopic knowledge of mineral and rocks
MCE-TE-204.3. Make use of geomorphic principles operated in the past
MCE-TE-204.4. Evaluation of aerial photo-interpretations and its use in identification of different landforms.
MCE-TE-204.5. Examine the knowledge of landslides in engineering construction.
MCE-TE-204.6. Make up the geological consideration in selection of Structural features of various construction.

PART-A

Unit-1: Introduction

1.1 Introduction
1.2 Outline classification
1.3 Mode of formation
1.4 Occurrence of important Rock groups (Sedimentary, Igneous and Metamorphic)

Unit-2: Minerology and Geomechanics

2.1Important rock forming minerals
2.2 Megascopic properties
2.3 Microscopic properties

Unit-3: Geomorphology

3.1 Principles of geomorphology
3.2 Occurrence of ground water in different rock types

Unit-4: Aerial photograph

4.1 Geophoto interpretation of Aerial photograph
4.2 Application in highway planning
4.3 Analysis of land forms
4.4 Soil types, vegetative cover, Land forms (glacial, arid and fluvial)
4.5 Snow cover features from aerial photographs

Unit-5:Landslides

5.1 Causes of Landslides
5.2 Classification, zonation and protection
5.3 Subsidence and related phenomenon
5.4 Structure of rocks (folds, faults, joints, unconformity) and their significance in Engineering
5.5 Construction, foundation problems in different types rocks

Unit-6: Geological considerations

6.1 Geological considerations in the selection of site for buildings
6.2 Dams, reservoirs
6.3 Tunnels, abutments
6.4 Air fields
6.5 Road stones and suitability of various rocks for road use

Text Books/ Reference Books:

1. F.G.H. Blyth, and de Freitas, M.H. ,1994, Geology for Engineers, ELBS
2. R.E. Goodman R.E.1993, Engineering Geology, John Wiley and Sons, NY
3. Skinner, B.J. and Porter, S.C. 1989, The Dynamic Earth-An Introduction to Physical Geology, John Wiley and Sons, N.Y

Software required/Weblinks:

1. https://nptel.ac.in/courses/105/105/105105106/
2. https://nptel.ac.in/courses/105/104/105104147/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-204)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-204.1	1	2	3	2	3	2	3	3	2
MCE-TE-204.2	3	2	3	3	3	-	2	3	2

MCE-TE-204.3	1	3	2	2	2	1	2	3	2
MCE-TE-204.4	1	2	3	3	2	2	2	3	2
MCE-TE-204.5	2	3	3	2	2	1	1	3	2
MCE-TE-204.6	3	3	3	3	3	1	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-207: DESIGN OF ADVANCED CONCRETE STRUCTURES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

Course outcomes: At the end of the course, students will be able to

MCE-SE-207.1 Apply advanced structural design and calculations for structural analysis
MCE-SE-207.2 Design special structures by understanding their behaviour.
MCE-SE-207.3 Test the serviceability criteria of various reinforced concrete members.
MCE-SE-207.4 Discuss the behavior and failure modes of different reinforced concrete members.
MCE-SE-207.5 Utilize the relevant software in the analysis and design of reinforced concrete or steel members.
MCE-SE-207.6 Prepare detail structural drawings for execution citing relevant IS codes

PART-A

Unit 1: Introduction and Philosophies

1.1 Design philosophy
1.2 Modeling of Loads
1.3 Material Characteristics.

Unit 2: Deep Beam and Corbel

2.1 Reinforced Concrete
2.2 P-M, M-phi Relationships
2.3 Strut-and- Tie Method
2.4 Design of Deep Beam and Corbel

Unit 3: Shear Walls

3.1 Design of Shear Walls
3.2 Compression Field Theory for Shear Design

PART-B

Unit 4: Torsion

4.1 Design against Torsion
4.2 IS, ACI and Eurocode provisions

Unit 5: Stability of Structures

5.1 Steel Structures
5.2 Stability Design
5.3 Torsional Buckling - Pure, Flexural and Lateral
5.4 Design of Beam-Columns

Unit 6: Fatigue Resistance and Codal Provisions

6.1 Fatigue Resistant Design
6.2 IS code, AISC Standards and Eurocode provisions

Text Books/ Reference Books:

1. S.U. Pillai. and D. Menon, 1999,Reinforced Concrete Design, 3rd Edition,Tata McGraw-Hill.
2. Subramaniam N, 2008, Design of Steel Structures, Oxford University Press.
3. R.Park and Paulay T, 1995, Reinforced Concrete Structures, John Wiley & Sons.
4. Varghese P. C, Advanced Reinforced Concrete Design, Prentice Hall of India, New Delhi.
5. Hsu T. T. C. and Mo Y. L, 2010, Unified Theory of Concrete Structures, John Wiley & Sons.
6. Salmon C. G., Johnson J. E. and Malhas F. A., 2009 Steel Structures Design and Behavior Emphasizing Load and Resistance Factor Design,5th Ed, Pearson Education.
7. Ramchandra, Design of Steel Structures - Vol. II, Standard Book House, Delhi.

B.G.Neal , Plastic Methods of Structural Analysis, Chapman and Hall London.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-207)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-207.1	3	-	1	-	2	2	2	1	1
MCE-SE-207.2	3	-	-	2	1	2	2	2	2
MCE-SE-207.3	2	-	-	-	2	2	2	3	3
MCE-SE-207.4	2	-	2	2	-	1	1	3	3
MCE-SE-207.5	-	2	-	-	-	-	3	3	3
MCE-SE-207.6	3	-	2	-	-	-	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-208: ADVANCED DESIGN OF FOUNDATIONS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

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

MCE-SE-208.1 Describe the suitability of soil strata for different projects
MCE-SE-208.2 Determine shallow foundations based on the bearing capacity of soil
MCE-SE-208.3 Correlate constructions of tunnels in different soil types
MCE-SE-208.4 Analyze the pile foundation.
MCE-SE-208.5 Examine the analysis methods for well foundation

PART-A

Unit-1: Planning of Soil Exploration

1.1 Planning of Soil Exploration for Different Projects,
1.2Methods of Subsurface Exploration,
1.3Methods of Borings along with Various Penetration Tests

Unit-2 : Shallow Foundations

2.1Requirements for Satisfactory Performance of Foundations,
2.2Methods of Estimating Bearing Capacity,
2.3Settlements of Footings and Rafts,
2.4Proportioning of Foundations using Field Test Data,
2.5Pressure - Settlement Characteristics from Constitutive Laws

Unit-3: Pile Foundations

3.1Methods of Estimating Load Transfer of Piles,
3.2Settlements of Pile Foundations, Pile Group Capacity and Settlement,
3.3Laterally Loaded Piles, Pile Load Tests,
3.4Analytical Estimation of Load- Settlement Behavior of Piles,
3.5Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles

PART-B

Unit-4: Well Foundation

4.1IS and IRC Code Provisions,
4.2Elastic Theory and Ultimate Resistance Methods

Unit-5 : Tunnels

5.1Tunnels and Arching in Soils, Pressure Computations around Tunnels.
5.2Open Cuts, Sheeting and Bracing Systems in Shallow and
5.3Deep Open Cuts in Different Soil Types

Unit-6: Coffer Dams

6.1 Various Types, Analysis and Design
6.2 Foundations under uplifting loads, Soil-structure interaction

Text Books/ Reference Books:

1. N.P. Kurian,Design of foundation system, Narosa Publishing House.
2. J. E. Bowles, Foundation Analysis and Design, Tata McGraw Hill New York.
3. Sawmi Saran, Analysis and Design of Substructures, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-208)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-208.1	2	2	-	1	-	-	3	3	1
MCE-SE-208.2	3	2	-	-	-	-	3	3	3
MCE-SE-208.3	1	1	-	2	-	2	1	3	2
MCE-SE-208.4	3	2	2	2	-	2	2	1	3
MCE-SE-208.5	2	1	2	2	2	2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-209: SOIL STRUCTURE INTERACTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

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

MCE-SE-209.1- Describe soil structure interaction concept and complexities involved.
MCE-SE-209.2- Evaluate soil structure interaction for different types of structure under various conditions of loading and subsoil characteristics
MCE-SE-209.3- Prepare comprehensive design oriented computer programs for interaction problems based on theory of sub grade reaction
MCE-SE-209.4-Analyze different types of frame structure founded on stratified natural deposits with linear and non-linear stress-strain characteristics
MCE-SE-209.5-Evaluate action of group of piles considering stress-strain characteristics of real soils.

PART A

Unit-1: Foundation Design

1.1 Critical Study of Conventional Methods of Foundation Design
1.2 Nature and Complexities of Soil Structure Interaction.

Unit-2: Finite Element Method

2.1 Application of FEM
2.2 Finite Difference Method

Unit-3: Soil Structure Interaction

3.1 Relaxation and Interaction for the Evaluation of Soil Structure Interaction for Different Types of Structure under various Conditions of Loading and Subsoil Characteristics

PART B

Unit-4: Design Oriented Computer Program

4.1 Preparation of Comprehensive Design Oriented Computer Programs for Specific Problems,
4.2 Interaction Problems based on Theory of Sub Grade Reaction Such as Beams, Footings, Rafts

Unit-5: Frame Structure

5.1 Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Linear Stress-Strain Characteristics
5.2Analysis of Different Types of Frame Structures Founded on Stratified Natural Deposits with Non-Linear Stress-Strain Characteristics

Unit-6: Piles

6.1Determination of Pile Capacities and Negative Skin Friction Action of Group of Piles Considering Stress-Strain Characteristics of Real Soils,
6.2Anchor Piles
6.3Determination of Pull out Resistance.

Reference

1. J.E. Bowels., 1974, Analytical and Computer Methods in Foundation, McGraw Hill Book Co., New York.
2. C.S. Desai and Christian J.T., Numerical Methods in Geotechnical Engineering, McGraw Hill Book Co., New York.
3. Soil Structure Interaction - The real behaviour of structures, Institution of Structural Engineers.
4. Elastic Analysis of Soil Foundation Interaction, Developments in Geotechnical Engg. Vol-17, Elsevier Scientific Publishing Company.
5. Selvadurai A.P.S., Elastic Analysis of Soil-Foundation Interaction, Elsevier ScientificPublishing Company.
6. Swami Saran, Analysis & Design of substructures, Oxford & IBH Publishing Co. Pvt. Ltd.
7. N.P. Kuria., Design of Foundation System- Principles & Practices, Narosa Publishing

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-209)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-209.1	2	2	-	1	-	-	3	3	1
MCE-SE-209.2	3	2	-	-	-	-	3	3	3
MCE-SE-209.3	1	1	-	2	-	2	1	3	2
MCE-SE-209.4	3	2	2	2	-	2	2	1	3
MCE-SE-209.5	2	1	2	2	2	2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-204: MODERN CONSTRUCTION TECHNIQUES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

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

MCE-204.1 Relate to the advantages of Prefab construction
MCE-204.2Classify different types of Prefabrication
MCE-204.3Design Prefabricated Elements
MCE-204.4Identify different construction Techniques
MCE-204.5Categorise Fabrication and Erection of Structural Steel work

PART-A

UNIT-1: Prefabricated Construction

1.1 Necessity, advantages and disadvantages
1.2 Prefabrication and its relevance to housing problems in India
1.3 Mass produced steel, reinforced concrete and masonry systems.

UNIT-2: Classification of Prefabricates

2.1 Foundation, columns,
2.2 Beams & roof panels, wall panels,
2.3 Box prefabricates, erection & assembly, partial prefabrication.
2.4 Composite system, steel intensive-Construction.

UNIT 3: Design of Prefabricated Elements

3.1 Lilt points, beams, steps,
3.2 Columns, wall panels, footings
3.3 Design of joints to transfer axial forces
3.4 Moments & shear forces, design examples.

PART-B

UNIT-4: Construction Techniques

4.1 Large Panel Constructions, Lift Slab System
4.2 Glover System, Constrain's Jack-Block System
4.3 Tunnel Form System
4.4 Bison system
4.5 Innovative applications of precast concrete.

UNIT-5: Control of Construction Processes

5.1 Horizontal & vertical transportation
5.2 Construction equipment: cranes, hoists, mixers, vibrators, scaffolding, shuttering, conveyors (performance and their applications to construction).

UNIT-6: Fabrication & Erection of Structural Steel Work

6.1 Fabrication procedure,
6.2Residual welding stresses & distortion
6.3Quality Control in fabrication, Erection as per IS-7205-1974.

Books:

1. C.W.Glower, 1964, Structural Precast Concrete C.R. Books Ltd. London.
2. R.L. Peurifo., Construction Planning, Equipment & Methods McGraw Hill, Co. Inc.
3. Verma Mahesh, Construction Equipments and its planning and application Metropolition Book Co., N.Delhi.
4. 1983, National Building Code.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-204)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-204.1	2	2	-	1	-	-	3	3	1
MCE-204.2	3	2	-	-	-	-	3	3	3
MCE-204.3	1	1	-	2	-	2	1	3	2
MCE-204.4	3	2	2	2	-	2	2	1	3
MCE-204.5	2	1	2	2	2	2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-207: LEGAL ASPECTS IN CONSTRUCTION ENGINEERING

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

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

MCE-CM-207.1. Relate to the principles for Indian contract act, Arbitration act and contract administration
MCE-CM-207.2. Utilize the Arbitration and Award in contract management application
MCE-CM-207.3. Describe bailment and FIDIC features
MCE-CM-207.4. Apply the concept and field applications of Guarantee and Indemnity
MCE-CM-207.5. Assess the labor laws and Industrial act followed in construction Industry

PART-A

Unit-1: Professional Practice and Administration Contracts

1.1 The standard form of building contracts
1.2 The right of building owner, Third parties
1.3 Indian contract Act, Professional Ethics

Unit-2: Arbitration and Award

2.1 Indian Arbitration Act, Arbitration Agreement
2.2 Conduct of Arbitration, Power and Duties of Arbitration, Rules of Evidence
2.3 Preparation and publication of ward, Methods of Enforcement impending and Awards

Unit-3: Bailment

3.1 Nature of Transactions, Delivery of Bailee, care to be taken
3.2 Bailee's Responsibility, Termination, Bailment of pledges
3.3 International Contracting: Meaning Scope, Nature, Distinctive Features of FIDIC

PART-B

Unit-4: Injunction

4.1 Types Temporary, Perpetual, and Mandatory when referred
4.2 Indemnity and Guarantee: Difference between the two,The Contract of Guarantee and Indemnity
4.3 Consideration of Guarantee, Surety's Liability, Discharge of Surety

Unit-5: Industrial Act and Labour Laws

5.1 Industrial Dispute Act, Payment of Wages Act

Unit-6: Safety Engineering

6.1 Sources, Classification, Cost of Accident and Injury, Workmen's Compensation Act
6.2 Safety Programme, Safety Organization. Employers Liability Act, Employers Insurance Act
6.3 Safety and Health Standards Occupations Hazards, personal Protective equipments
6.4 Preventive measures Factory Act, Fatal accidents

Text Books/ Reference Books:

1. B. S. Patil, Indian arbitration Act
2. Indian Contract Act.
3. Safety Engineering, Govt. of India Publication
4. Roshan Namavati, Professional Practice.
5. B. S. Pati, Legal Aspects of building and Engineering Contracts

Software required/Weblinks:

https://nptel.ac.in/courses/105104161/
https://nptel.ac.in/downloads/105104161/
https://nptel.ac.in/courses/105104161/32

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-207)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-207.1	3	-	3	3	-	3	3	3	2
MCE-CM-207.2	3	2	3	3	-	3	3	3	3
MCE-CM-207.3	2	-	3	3	-	3	3	3	2
MCE-CM-207.4	3	1	3	3	-	3	3	3	3
MCE-CM-207.5	3	-	3	2	-	3	3	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-208: MANAGEMENT INFORMATION SYSTEMS FOR CONSTRUCTION MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

Course Outcomes At the end of the course, student will be able to

MCE-CM-208.1. Apply fundamentals of engineering economics and scientific principles
MCE-CM-208.2. Influence the decision making process involved in various stages of management
MCE-CM-208.3. Differentiate the Hardware, Software applications in MIS
MCE-CM-208.4. Relate the applications of MIS in construction finance and Marketing and Service sector
MCE-CM-208.5. Develop the understanding of major Quality assurance of MIS

PART-A

Unit-1: Introduction

1.1 Definition Role, Impact
1.2 Evolution, Structure of MIS in organization

Unit-2: Decision Making

2.1 Programmed and Non programmed decisions, Stages in decision making
2.2 Concepts of Information, Systems Theory
2.3 Decision Support System

Unit-3: Computers in MIS

3.1 Hard ware, Software
3.2 Communication networks Office automation

PART-B

Unit-4: Data Management

4.1 Collection and analysis of data
4.2 Database Management system

Unit-5: Applications of MIS

5.1 Materials, Finance
5.2 HRD, Marketing and Service sector

Unit-6: Implementation and Maintenance of MIS

6.1 Socio-technical approach
6.2 Factors of success and failure
6.3 Quality assurance of MIS

Text Books/ Reference Books:

1. W.S Jawadekar , Management Information System, Tata McGraw Hill.
2. Robert G. Murdick. Joel E Ross, Janes R. Claggeett, Information System for Modern Management, Management Information System, Jerome Kanter.
3. W. Gary. Dickson Janes C. Weatherbe, The Management Information System, McGraw Hill Book Company.
4. S. Sadagopan, Management Information System.
5. George Scoff, Management Information System, McGraw Hill Book Company.
6. Ward Jonh, Principles of Information System Management, Routledge.

Software required/Weblinks:

1. https://nptel.ac.in/courses/122105022/
2. http://www.nptelvideos.in/2012/11/management-information-system.html
3. https://nptel.ac.in/courses/105103093/29

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-208)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-208.1	3	3	-	3	3	-	3	1	3
MCE-CM-208.2	3	3	-	2	3	-	3	3	3
MCE-CM-208.3	2	2	-	3	3	-	3	2	1
MCE-CM-208.4	3	3	-	3	3	-	3	2	2
MCE-CM-208.5	2	2	-	3	3	-	3	2	1

MCE-CM-209: ENTREPRENEURSHIP IN CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

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

MCE-CM-209.1 Relate to the importance of entrepreneurship
MCE-CM-209.2 Write a project feasibility report.
MCE-CM-209.3 Determine Financial feasibility of projects.
MCE-CM-209.4 Apply knowledge about appraisal of projects.
MCE-CM-209.5 Choose between various alternatives related to business purchases.
MCE-CM-209.6 Evaluate risk associated with different types of business.

PART-A

Unit-1:General

1.1 Meaning and importance of entrepreneurship.
1.2 Objectives of industrial estates, awareness and requirements of an entrepreneur,
1.3 Organization dealing with entrepreneurship Govt. and private.
1.4 Socio-economic bases: Occupation Impact on line of manufacture,
1.5 The impact of education.

Unit-2: Project

2.1 Selection by identification, size appropriate technology, Cost and time scheduling.
2.2 Project Report:
2.3 Backing market survey, demand and supply relation
2.4 Equipment cost space and merit analysis recommendations.

Unit-3: Project Appraisal

3.1 Technical feasibility
3.2 Commercial soundness
3.3 Financial capability, economic viability
3.4 Managerial aspects

PART-B

Unit-4 Financial Analysis:

4.1 Resources, loans
4.2 Terms and conditions
4.3 Working capital, repayment
4.4 Security, Financial institutes

Unit-5 Problems Faced by an Enterprise:

5.1 Marketing, finance and taxes,

5.2 Raw and finished materials etc.

Unit-6 Civil Engineering Entrepreneurship:

6.1 Small scale, large scale, optimum size,
6.2 Typical areas and preparation of specialized aspects.

Text Books

1. Dr. N. Gangadhar Rao, Entrepreneurship & growth of enterprise in industrial estates, Deep & Deep Publ.
2. G.N. Pandey, A complete guide to successful entrepreneurship, Vikas Publ. House.
3. Project Appraisal Prasanna Chandra.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-209)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-209.1	3	3	3	3	2	-	-	3	2
MCE-CM-209.2	3	3	3	3	2	-	-	3	2
MCE-CM-209.3	3	3	3	2	2	-	-	3	2
MCE-CM-209.4	3	3	3	2	2	-	-	3	1
MCE-CM-209.5	3	3	3	3	3	-	-	3	2
MCE-CM-209.6	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-207: GEOGRAPHIC INFORMATION SYSTEMS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Course Type: Program Elective-IV

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

MCE-TE-207.1. Utilize the basic concepts of Geoinformatics in the context of spatial and temporal modeling.
MCE-TE-207.2. Process data and their analysis in spatial projection.
MCE-TE-207.3 Create models and predictions for data.
MCE-TE-207.4. Analyse the error is source data and difference between spatial and raster analysis.
MCE-TE-207.5. Build the concepts of transportation networks and algorithms incorporated into GIS.
MCE-TE-207.6. Interpret role of GPS in transportation engineering.

PART-A

Unit-1 Geographic information concepts and spatial models

1.1 Introduction, spatial information, temporal information
1.2 Conceptual models of spatial information
1.3 Representation of geographic information

Unit-2 GIS Functionality

2.1 Data acquisition and processing, data storage and retrieval
2.2 Spatial search and analysis, graphics and interaction
2.3 Coordinate systems and map projection: Rectangular
2.4 Polar and spherical coordinates
2.5 Types of map projections, choosing a map projection

Unit-3 GIS Data models and structures

3.1 Cartographic map model, Geo- relation model
3.2 Non – spatial data base structure viz. Hierarchal network
3.3 Relational structures. Digitizing Editing and Structuring map data
3.4 Entering the spatial (Digitizing), the non- spatial, associated attributes
3.5 Linking spatial and non- spatial data
3.6 Use of digitizers and scanners of different types

PART-B

Unit-4 Data quality and sources of error

4.1 Sources of errors in GIS data
4.2 Obvious sources, natural variations and the processing errors and accuracy
4.3 Principles of Spatial data access and search, regular and object oriented decomposition
4.4 Introduction to spatial data analysis and overlay analysis
4.5 Raster analysis, and network analysis in GIS

Unit-5 GIS and remote sensing data

5.1 Integration techniques in spatial decision support system land suitability and multioriteria evaluation
5.2 Rule based systems, network analysis
5.3 Special interaction modeling, Virtual GIS

Unit-6 Data base positioning systems

6.1 Desirable characteristics of data base management systems
6.2 Components of a data base management system
6.3 Understanding the data conceptual modeling
6.4 Global positioning system, hyper spectral remote sensing, DIP techniques
6.5 Hardware and software requirements for GIS, overview of GIS software

Text Books/ Reference Books:

1. F.G.H. Blyth, and de Freitas, 1994, M.H. Geology for Engineers, ELBS.
2. R.E Goodman.1993, Engineering Geology, John Wiley and Sons, NY.
3. B.J. Skinner, and Porter, S.C.1989, The Dynamic Earth-An Introduction to Physical Geology, John Wiley and Sons, NY.

Software required/Weblinks:
1. ARCGIS
2. GPS
3. https://nptel.ac.in/courses/105102015/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests

Course Articulation Matrix

CO Statement (MCE-TE-207)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-207.1	3	3	3	3	2	-	-	3	2
MCE-TE-207.2	3	3	3	3	2	-	-	3	2
MCE-TE-207.3	3	3	3	2	2	-	-	3	2
MCE-TE-207.4	3	3	3	2	2	-	-	3	1
MCE-TE-207.5	3	3	3	3	3	-	-	3	2
MCE-TE-207.6	1	1	1	1	2	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-208: ADVANCED DESIGN OF BRIDGES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Course Type: Program Elective-IV

Course outcomes: At the end of the course, students will be able to

MCE-TE-208.1 Characterize the types, suitability, selection, design criteria of various types of Bridges
MCE-TE-208.2 Outline the various types of loads in design of bridges
MCE-TE-208.3 Analyse various types of bridges and their construction methods.
MCE-TE-208.4 Discuss sub-surface investigations required for bridge construction and standard specifications of bridge design
MCE-TE-208.5 Design bridges, sub-structures, bearings and joints.
MCE-TE-208.6 Specify quality control and maintenance aspects of bridges

PART-A

Unit 1: Introduction

1.1 Components of Bridges
1.2 Classification, Importance of Bridges
1.3 Investigation for Bridges, Selection of Bridge site
1.4 Economical span, Location of piers and abutments
1.5 Subsoil exploration, Scour depth, Traffic projection, Choice of bridge type

Unit 2: Specifications

2.1 Specification of road bridges
2.2 Width of carriageway
2.3 Loads to be considered, dead load, IRC standard live load
2.4 Impact effect**.**

Unit 3: Design Consideration

3.1 General design considerations
3.2 Design of culvert
3.3 Foot Bridge, Slab Bridge, T-beam Bridge
3.4 Pre-stressed concrete bridge
3.5 Box Culvert-Fly over bridges.

PART-B

Unit 4: Sub-structures

4.1 Evaluation of sub structures
4.2 Pier and abutments caps
4.3 Design of pier, Abutments

4.4 Type of foundation.

Unit 5: Bearings

5.1 Importance of Bearings
5.2 Bearings for slab bridges
5.3 Bearings for girder bridges
5.4 Electrometric bearing
5.5 Joints, Expansion joints.

Unit 6: Bridge Maintenance

6.1 Construction and Maintenance of bridges
6.2 Lessons from bridge failures.

Text Books/ Reference Books:

1. S. Ponnuswamy, 1997, Bridge Engineering, Tata McGraw Hill, New Delhi.
2. D.J.Victor,1980,Essentials of Bridge Engineering, Oxford & IBH Publishers Co., New Delhi.
3. N. Rajagopalan, 2006, BridgeSuperstructure, Narosa Publishing House, New Delhi.

Software required/Weblinks:

1. https://nptel.ac.in/courses/nptel_download.php?subjectid=105999906
2. https://nptel.ac.in/courses/105105165/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-208)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-208.1	3	-	-	-	-	1	3	1	1
MCE-TE-208.2	2	-	-	-	-	-	2	1	1

MCE-TE-208.3	3	-	-	-	-	-	3	2	2
MCE-TE-208.4	1	2	1	-	-	1	2	1	1
MCE-TE-208.5	1	-	2	1	1	2	3	2	2
MCE-TE-208.6	-	1	2	2	-	3	1	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-209: TRANSPORTATION SAFETY AND ENVIRONMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-IV

Course outcomes: At the end of the course, students will be able to

MCE-TE-209.1 Extend the causes of accident through collection of accidental data and their analysis.
MCE-TE-209.2 Make use of accidental data by using various planning for prevention of accidents.
MCE-TE-209.3 Demonstrate road safety measures by using 3 E's.
MCE-TE-209.4 Examine various economic evaluation measures of improvement by before and after studies.
MCE-TE-209.5 Utilize traffic management techniques to control the traffic.
MCE-TE-209.6 Communicate the effectiveness and benefits of different traffic management measures on road safety.

PART-A

Unit-1 Introduction

1.1 Road accidents, causes, scientific investigations and data collection
1.2 Analysis of individual accidents to arrive at real causes
1.3 Statistical methods of analysis of accident data
1.4 Application of computer analysis of accident data

Unit-2 Traffic Planning

2.1 Accident prevention through better planning and design of roads
2.2 Planning road networks by land use planning, route planning
2.3 Designing for safety through link design
2.4 Design of road geometrics
2.5 Junction design for safety, operating the road network for safety

Unit-3 Road Safety

3.1 Road safety issues and various measures for road safety
3.2 Engineering, education and enforcement measures for improving road safety
3.3 Short term and long term measures,
3.4 Traffic calming techniques and innovative ideas in road safety

PART-B

Unit-4: Economic Evaluation

4.1 Economic evaluation of improvement measures by before and after studies
4.2 Counter measures at hazardous locations – accident investigation

4.3 Problem diagnosis, development of counter measures
4.4 Checklists for counter measures, highway operation and counter-measures
4.5 Road safety audit, principles- procedures and practice
4.6 Code of good practice and checklists

Unit-5 Traffic Management

5.1 Traffic management techniques
5.2 Local area management, Transportation system management
5.3 Low cost measures, area traffic control
5.4 Various types of medium and long term traffic management measures and their uses

Unit-6 Traffic and the Environment

6.1 Detrimental effects of Traffic on the Environment
6.2 Noise, Air pollution and Vibration
6.3 Visual intrusion and degrading the Aesthetics
6.4 Situation in India

Text Books/ Reference Books:

1. BABKOV V.F,1975, Road conditions and Traffic Safety, MIR publications.
2. K.W. Ogden, 1996, Safer Roads A Guide to Road Safety Engineering Averbury Technical, Ashgate Publishing Ltd., Aldershot, England.
3. L.R. Kadiyali, Traffic Engineering and Transport Planning, Khanna Publications.
4. Pignataro, Louis, Traffic Engineering, Theory and Practice, John Wiley.
5. RRL, DSIR, Research on Road Safety,HMSO London.
6. IRC Third Highway Safety Workshop, Lecture Notes 1978 and other IRC publications.

Software required/Weblinks:
1. https://nptel.ac.in/courses/105101008/42

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-209)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-209.1	3	3	3	2	2	-	3	3	3
MCE-TE-209.2	3	2	2	2	2	2	3	3	2
MCE-TE-209.3	3	-	-	3	2	3	2	1	2
MCE-TE-209.4	3	3	-	2	1	1	-	1	1
MCE-TE-209.5	3	-	3	2	1	-	2	2	2
MCE-TE-209.6	3	2	2	3	2	2	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-251: MODEL TESTING LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-SE-251.1. Evaluate the response of structures.
MCE-SE-251.2. Prepare the models.
MCE-SE-251.3 Conduct model testing for static loading
MCE-SE-251.4. Experiment with model testing for free and forced vibrations
MCE-SE-251.5. Develop Shear wall building model

Syllabus Content

1. Response of structures and its elements against extreme loading events.
2. Model Testing: Static - testing of plates, shells, and frames models.
3. Model Testing: Free and forced vibrations, Evaluation of dynamic modulus.
4. Beam vibrations, Vibration isolation, Shear wall building model, Time and frequency-domain study, Vibration Characteristics of RC Beams using Piezoelectric Sensors etc

Text Books/ Reference Books:

Software required/Weblinks:

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement (MCE-SE-251)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO**

														2
MCE-SE-251.1	1	1	2	1	-	1	3	1	-	-	-	2	3	2
MCE-SE-251.2	1	2	2	1	-	3	3	1	-	-	-	1	2	3
MCE-SE-251.3	1	1	2	1	-	3	1	2	-	1	-	-	2	3
MCE-SE-251.4	1	1	2	1	-	3	3	2	-	-	1	1	1	3
MCE-SE-251.5	1	2	2	1	-	2	3	2	1	-	-	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-251: COMPUTATIONAL LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-CM-251.1. Apply construction management principles to contemporary scenarios
MCE-CM-251.2. Make the use of project planning techniques
MCE-CM-251.3. Develop the schedule for construction projects
MCE-CM-251.4. Utilize MS-Project & Primavera to real life projects
MCE-CM-251.5. Examine the delays in project execution

List of Experiments/Assignments

1. Preparation of Bid/ Proposal of an engineering project.
2. Planning of projects
3. Scheduling of projects
4. Updating of projects using MS-Project & Primavera

Text Books/ Reference Books:

1. Hinz, 2013, Construction Planning and Scheduling Pearson Education India
2. Andrew Baldwin, David Bordoli, A Handbook for Construction Planning and Scheduling John Wiley & Sons, Ltd.
3. P. Vinayagam. , Vimala A., 2017 Planning and Managing Projects with PRIMAVERA (P6) Project Planner

Software required/Weblinks:

https://nptel.ac.in/courses/105106149/
https://nptel.ac.in/courses/110104073/
https://nptel.ac.in/courses/112102107/mod4/mod44/p8.htm

Instructions for paper setting: External will set up the experiment for conduction of experiment of computational lab and the students have to perform the examination in the lab for two hours including viva voce,etc.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement (MCE-CM-251)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-251.1	3	3	3	3	1	-	1	3	2
MCE-CM-251.2	2	3	2	2	-	-	1	2	3
MCE-CM-251.3	3	3	2	3	3	-	-	3	2
MCE-CM-251.4	1	2	-	-	1	-	-	2	3
MCE-CM-251.5	2	1	1	-	-	2	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-251: COMPUTATIONAL LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-TE-251.1. Make use of basics of geometric design of pavements
MCE-TE-251.2. Apply basic knowledge of horizontal and vertical curves for finalizing the alignment
MCE-TE-251.3. Analyze the different parameters of intersections
MCE-TE-251.4. Decide the thickness of overlays as per codal provisions
MCE-TE-251.5. Develop the design for road construction project

List of Experiments/Assignments

1. Geometric design
2. Intersection design
3. Alignment design
4. Overlay design using MX Road Software

Software required/Weblinks:

MX-ROAD software

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement (MCE-TE-251)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-251.1	3	3	3	-	-	-	3	1	2

MCE-TE-251.2	3	3	3	1	-	-	3	2	1
MCE-TE-251.3	3	3	3	1	-	-	3	3	2
MCE-TE-251.4	3	3	3	-	-		3	2	1
MCE-TE-251.5	3	3	3	2	2	2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-251: NUMERICAL ANALYSIS LAB

Credits	2	Max. Marks	100
Periods/Week	2 hrs	Continuous Evaluation	50
Examination Duration	2 hrs	End Semester Exams	50

Course Type: Program Core

Course outcomes: At the end of the course, students will be able to

MCE-251.1	Find Roots of non-linear equations by Bisection method and Newton's method.
MCE-251.2	Make use of Turbo C & C++ compiler
MCE-251.3	Perform curve fitting by least square approximations
MCE-251.4	Solve the system of Linear Equations using Gauss - Elimination/ Gauss – Seidal Iteration/Gauss - Jorden Method
MCE-251.5	Integrate Numerically Using Trapezoidal and Simpson's Rules
MCE-251.6	Develop Numerical Solution of Ordinary Differential Equations by Euler's Method, Runge- Kutta Method.

Syllabus Content

1.1 Find the Roots of Non-Linear Equation Using Bisection Method.
1.2 Find the Roots of Non-Linear Equation Using Newton's Method.
1.3 Curve Fitting by Least Square Approximations.
1.4 Solve the System of Linear Equations Using Gauss - Elimination Method.
1.5 Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.
1.6 Solve the System of Linear Equations Using Gauss - Jorden Method.
1.7 Integrate numerically using Trapezoidal Rule.
1.8 Integrate numerically using Simpson's Rules.
1.9 Numerical Solution of Ordinary Differential Equations By Euler's Method.
1.10 Numerical Solution of Ordinary Differential Equations ByRunge- Kutta Method.

Text Books/ Reference Books:

1. S.S. Shastri, 2007, Introductory Method of Numerical Analysis

Software required/Weblinks:

1- C++

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Examination

Course Articulation Matrix

CO Statement (MCE-251)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-251.1	3	3	3	2	2	2	3	2	3
MCE-251.2	2	2	1	-	-	-	-	2	2
MCE-251.3	3	2	-	1	-	2	-	2	2
MCE-251.4	2	3	1	-	-	-	1	3	2
MCE-251.5	2	2	-	1	-	2	-	2	2
MCE-251.6	-	3	2	-	2	1	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-200: MINI PROJECT

Credits	4	Max. Marks	150
Periods/Week	4 hrs	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Exams	50

Course Type: Project

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

MCE-200.1	Identify structural engineering/construction management/transportation engineering problems.
MCE-200.2	Demonstrate a sound technical knowledge of their selected project topic.
MCE-200.3	Describe different techniques used to analyze complex systems.
MCE-200.4	Work on the solutions given by applying engineering principles.
MCE-200.5	Design engineering solutions to complex problems utilising a systems approach.
MCE-200.6	Undertake a real time engineering project.

Syllabus Content

1. Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

2. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.
3. Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by the
4. departmental committee.

Software required/Weblinks:

Appropriate software related to the area of interest.

Course Articulation Matrix

CO Statement (MCE-200)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-200.1	1	1	1	1	-	1	1	1	2
MCE-200.2	2	2	-	-	-	-	3	2	1
MCE-200.3	2	2	-	-	-	-	2	2	2
MCE-200.4	3	2	2	1	1	1	2	2	3
MCE-200.5	2	-	-	2	1	1	1	1	3
MCE-200.6	1	2	2	2	2	2	1	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-002: ENGLISH FOR RESEARCH PAPER WRITING

Credits	AP	Max. Marks	100
Periods/Week	2hrs	Continuous Evaluation	50
Examination Duration	3 hrs	End Semester Exams	50

Course Type: Audit Pass Course

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

M-MC-002.1	Demonstrate how to apply technical information and knowledge in practical documents for professional audiences and public audiences.
M-MC-002.2	Develop writing skills and level of readability
M-MC-002.3	Distinguish the section details of a research paper
M-MC-002.4	Develop professional format features in print, html, and multimedia modes with appropriate nonverbal cues and visual aids.
M-MC-002.5	Frame a good quality of research paper

PART-A

Unit 1

1.1 Planning and Preparation
1.2 Word Order
1.3 Breaking up long sentences, Structuring Paragraphs and Sentences
1.4 Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2

2.1 Clarifying Who Did What, Highlighting Your Findings
2.2 Hedging and Criticising
2.3 Paraphrasing and Plagiarism
2.4 Sections of a Paper
2.5 Abstracts
2.6 Introduction.

Unit 3

3.1 Review of the Literature
3.2 Methods
3.3 Results and Discussion
3.4 Conclusions
3.5 The Final Check

PART-B

Unit 4

4.1 Key skills needed when writing a Title
4.2 Key skills needed when writing an Abstract
4.3 Key skills needed when writing an Introduction
4.4 Skills needed when writing a Review of the Literature

Unit 5

5.1 Skills needed when writing the Methods
5.2 Skills needed when writing the Results
5.3 Skills needed when writing the Discussion
5.4 Skills needed when writing the Conclusions

Unit 6

6.1 Useful phrases
6.2 How to ensure paper is as good as it could possibly be the first- time submission

Text Books/ Reference Books:

1. R.Goldbort , 2006, Writing for Science, Yale University Press (available on Google Books)
2. R.Day , 2006, How to Write and Publish a Scientific Paper, Cambridge University Press
3. N. Highman, 1998, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book
4. Adrian Wallwork ,2011, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London

Software required/Weblinks:

1. https://nptel.ac.in/courses/109106094/
2. https://nptel.ac.in/courses/102104061

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-002)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-MC-002.1	1	3	3	2	1	2	1	2	2
M-MC-002.2	-	3	1	1	1	-	1	-	-
M-MC-002.3	2	-	-	-	-	-	2	2	2
M-MC-002.4	1	1	1	1	-	1	1	2	2
M-MC-002.5	2	2	2	2	2	-	2	-	-

SEMESTER-III

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-301A: DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, students will be able to

MCE-SE-301A.1. Acquire the knowledge of evolution of process of prestressing

MCE-SE-301A.2. Describe the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.

MCE-SE-301A.3. Find out losses in the prestressed concrete

MCE-SE-301A.4. Analyse prestressed concrete axial, flexure members for Flexure, Shear and Torsion.

MCE-SE-301A.5. Design prestressed concrete deck slab, beam/ girders, end blocks etc.

MCE-SE-301A.6. Develop skills to satisfy the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).

PART -A

Unit-1 Introduction to prestressed concrete

1.1 Terminology
1.2 Basic Concepts of Prestressing
1.3 Types of prestressing-Pretensioning and Post Tensioning
1.4 Systems and devices, materials
1.5 Code provisions

Unit-2 Losses in prestress

2.1. Nature of losses of Prestress
2.2. Loss due to Elastic Deformation of Concrete
2.3. Loss due to Shrinkage of Concrete
2.4. Loss due to Creep of Concrete
2.5. Loss due to Relaxation of stress in steel
2.6. Total losses allowed for in Design

Unit-3 Analysis of PSC flexural members

3.1. basic concepts
3.2. Analysis of members under flexure at service loads
3.3. Based on stress concept; force concept; load balancing concept
3.4. Cracking moment
3.5. Kern points; Pressure line
3.6. Analysis for ultimate strength
3.7. Variation of stress in steel

PART -B

Unit-4 Statically determinate PSC beams

4.1. Design of members for flexure
4.2. Preliminary design; Final design for type I members
4.3. Design for ultimate and serviceability limit states for flexure
4.4. Code provisions

Unit-5 Consideration for Shear, Torsion

5.1. Modes of failure
5.2. Crack pattern
5.3. Analysis and design for shear
5.4. Analysis and design and torsion

Unit-6 Transmission of Prestress and Crack Width

6.1 Transmission of prestress in pre-tensioned members
6.2 Anchorage zone stresses for post-tensioned members
6.3 Introduction to design of continuous beams
6.4 Choice of cable profile
6.5 Linear transformation and concordancy
6.6 Crack width calculations

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Text Books/ Reference Books:

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 1955.
2. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 1981.
3. Limited State Design of Prestressed Concrete, Guyan Y., Applied Science Publishers, 1972.
4. IS: 1343- Code of Practice for Prestressed Concrete
5. IRC: 112 Code of Practice for Concrete Road Bridges

Software required/Weblinks:

https://nptel.ac.in/courses/105106117/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools

Assignment/Tutorials

Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-301A)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-SE-301A.1	3	-	-	-	-	-	2	2	2
MCE-SE-301A.2	2	2	-	-	-	-	3	2	2
MCE-SE-301A.3	2	-	-	-	-	-	2	2	2
MCE-SE-301A.4	3	-	-	-	-	-	3	3	3
MCE-SE-301A.5	2	1	1	1	-	2	2	2	2
MCE-SE-301A.6	-	1	1	1	2	1	1	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-302: ANALYTICAL AND FINITE ELEMENT ANALYSIS OF LAMINATED COMPOSITE PLATES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, the students will be able to

MCE-SE-302.1 Describe the Classical Laminated Plate Theory
MCE-SE-302.2 Determine applicability of Rectangular Laminated Plates
MCE-SE-302.3 Develop constitutive relationships between boundary conditions.
MCE-SE-302.4 Analyze Finite Element Solutions for Bending of Rectangular Laminated plates
MCE-SE-302.5 Evaluate the Stiffness Matrix.
MCE-SE-302.6 Apply numerical methods to stress computation.

PART-A

Unit-1 Introduction

1.1 Displacement Field Approximations for Classical Laminated Plate Theory (CLPT) and
1.2 First Order Shear Deformation Theory (FSDT),
1.3 Analytical Solutions for Bending of Rectangular Laminated Plates using CLPT.

Unit-2 Governing Equations

2.1 Governing Equations. Navier Solutions of Cross-Ply and Angle-Ply
2.2 Laminated Simply- Supported Plates, Determination of Stresses.
2.3 Levy Solutions for Plates with Other Boundary Conditions,
2.4 Analytical Solutions for Bending of Rectangular Laminated Plates Using FSDT.

Unit-3 Finite Element Solutions for Bending of Rectangular Laminated Plates

3.1 Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT

PART-B

Unit-4 Finite Element Method

4.1 Introduction to Finite Element Method, Rectangular Elements,
4.2 Formation of Stiffness Matrix,
4.3 Formation of Load Vector, Numerical Integration, Post Computation of Stresses

Unit-5 Finite Element Solutions

5.1 Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT.

5.2 Finite Element Model, Element Formulation, Post Computation of Stresses.

Unit-6 Analysis and design

6.1 Analysis of Rectangular Composite Plates using Analytical Methods.

Text Books/ Reference Books:

1. J.N. Reddy, Mechanics of Laminated Composites Plates and Shells, CRC Press

Software required/Weblinks:

ANSYS software recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-302)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-302.1	2	3	-	1	-	1	3	3	-
MCE-SE-302.2	3	2	-	-	-	-	3	3	2
MCE-SE-302.3	2	1	-	2	-	-	1	3	2
MCE-SE-302.4	3	-	2	2	-	2	2	1	3
MCE-SE-302.5	2	1	2	2	2	3	3	1	2
MCE-SE-302.6	1	-	2	2	1	1	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-303: FRACTURE MECHANICS OF CONCRETE STRUCTURES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of course, the students will be able to

MCE-SE-303.1 Identify cracking of concrete structures based on fracture mechanics.
MCE-SE-303.2 Utilize stress intensity factor for notched members
MCE-SE-303.3 Apply fracture mechanics models to high strength concrete and FRC structures.
MCE-SE-303.4 Compute J-integral for various sections understanding the concepts of LEFM
MCE-SE-303.5 Apply concepts of fracture mechanics to special concretes

Part A

Unit 1: Introduction

1.1 Basic Fracture Mechanics
1.2 Crack in a Structure
1.3 Mechanisms of Fracture and Crack Growth

Unit-2 Fractures

2.1 Cleavage Fracture
2.2 Ductile Fracture
2.3 Fatigue Cracking and Environment assisted Cracking
2.4 Service Failure Analysis

Unit-3: Stress at Crack Tip

3.1 Stress at Crack Tip
3.2 Linear Elastic Fracture Mechanics
3.3 Griffith's Criteria
3.4 Stress Intensity Factors
3.5 Crack Tip Plastic Zone

PART- B

Unit-4: Analysis of Crack Tip

4.1 Erwin's Plastic Zone Correction
4.2 R curves, Compliance
4.3 J Integral
4.4 Concept of CTOD and CMD

Unit-5: Material Models

5.1 General Concepts, Crack Models
5.2 Band Models, Models based on Continuum Damage Mechanics

Unit-6: Applications

6.1Applications to High Strength Concrete
6.2Fibre Reinforced Concrete
6.3Crack Concepts
6.4Numerical Modeling

Reference

1. C.T.Suri and Jin Z.H., 2012, Fracture Mechanics, 1st Edition, Elsevier Academic Press.
2. Broek David, 1982, Elementary Engineering Fracture Mechanics, 3rd Rev. Ed. Springer.
3. L.Elfgreen, 1989, Fracture Mechanics of Concrete Structures – Theory and Applications, Chapman and Hall.
4. Victor, Li C., Bazant Z. P., 1989, Fracture Mechanics – Applications to Concrete, ACI SP 118, ACI Detroit.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests

Course Articulation Matrix

CO Statement MCE-SE-303	**PO 1**	**PO2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**
MCE-SE-303.1	3	3	3	3	2	-	-	3	2
MCE-SE-303.2	3	3	3	3	2	-	-	3	2
MCE-SE-303.3	3	3	3	2	2	-	-	3	2
MCE-SE-303.4	3	3	3	2	2	-	-	3	1
MCE-SE-303.4	3	3	2	2	-	2	-	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-SE-304: DESIGN OF PLATES AND SHELLS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Elective-V

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

MCE-SE-304.1 Describe the prismatic folded plate systems
MCE-SE-304.2 Analyze shells using approximate solutions
MCE-SE-304.3 Develop constitutive relationships for Cylindrical Shells.
MCE-SE-304.4 Examine Doubly Curved Shells using Approximate Solutions
MCE-SE-304.5 Justify the Bending Theories for Circular Cylindrical Shells.
MCE-SE-304.6 Apply numerical methods to folded plates**.**

Part A

Unit 1: Classical Plate Theory

1.1 Classical Plate Theory –
1.2 Assumptions Differential Equation
1.3 Boundary Conditions.

Unit 2: Plates of Various Shades

2.1 Navier's Method of Solution for Simply Supported Rectangular Plates
2.2 Leavy's Method of Solution for Rectangular Plates under Different Boundary Conditions.
2.3 Governing Equation – Solution for Axi- symmetric loading –
2.4 Annular Plates – Plates of other shapes.

Unit 3: Eigen Value Analysis

3.1 Stability and free Vibration Analysis of Rectangular Plates.

Part B

Unit 4: Approximate Methods

4.1 Rayleigh – Ritz, Galerkin Methods– Finite Difference Method –
4.2 Application to Rectangular Plates for Static, Free Vibration and Stability Analysis.

Unit 5: Shells

5.1 Basic Concepts of Shell Type of Structures –
5.2 Membrane and Bending Theories for Circular Cylindrical Shells.

Unit-6: Design of Shells

6.1 Design of spherical dome –
6.2 Cylindrical shells – folded plates

Text Books/ Reference Books:

1. Timoshenko and Woinowsky-Krieger S., 2010, Theory of Plates and Shells, Tata Mc Graw Hill Edition.
2. G.S. Ramaswamy, 2005, Design and Construction of Concrete Shell Roofs, 1st Edition.
3. P.C. Varghese, Design of Reinforced Concrete Shells & Folded Plate, 1st Edition, PHI.
4. H. Jawad Maan., Design of Plate and Shell Structures, Springer Science.

Software required/Weblinks:

NIL

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-SE-304)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-SE-304.1	1	2	1-	1	-	1	3	1	1
MCE-SE-304.2	3	2	-	-	-	-	3	3	2
MCE-SE-304.3	2	1	-	2	-	2	1	3	2
MCE-SE-304.4	1	2	2	2	-	3	2	1	3
MCE-SE-304.5	2	1	2	2	2	3	3	1	2
MCE-SE-304.6	1	-	2	2	1	1	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-301: PRECAST CONSTRUCTION TECHNOLOGY

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of course, the students will be able to

MCE-301.1 Enumerate the design principles of precast construction technology
MCE-301.2Analyze prefabricated structures
MCE-301.3 Develop design of prefabricated slabs, stairs and roofs
MCE-301.4 Apply the concept of load transfer from floor to wall panels
MCE-301.5 Justify precast construction in industrial buildings
MCE-301.6 Recommend prefabricated bridges

PART-A

Unit 1: Design Principles

1.1 Civil engineering requirements for planning and layout of prefabrication plant
1.2 I. S code specifications. Modular co-ordination standardization,
1.3 Disuniting of prefabricates, production, transportation, erection
1.4 Stages of loading and code provisions, safety factors, material properties,
1.5 Deflection control, lateral load resistance
1.6 Location and types of shear walls.

Unit 2: Reinforced Concrete

2.1 Prefabricated structures - long wall and cross-wall large panel buildings
2.2 One way and two way prefabricated slabs
2.3 Framed buildings with partial and curtain walls, -connections
2.4 Beam to column and column to column.

Unit 3: Floors, Stairs and Roofs

3.1 Types of floor slabs, analysis and design example of cored and panel types
3.2 Two-way systems, staircase slab design
3.3 Types of roof slabs and insulation requirements
3.4 Description of joints, their behavior and reinforcement requirements
3.5 Deflection control for short term and long term loads
3.6 Ultimate strength calculations in shear and flexure.

PART-B

Unit 4: Walls

4.1 Types of wall panels, blocks and large panels
4.2 Curtain, partition and load bearing walls
4.3 Load transfer from floor to wall panels
4.4 Vertical loads, eccentricity and stability of wall panels
4.5 Design curves, types of wall joints, their behaviour and design
4.6 Leak prevention, joint sealants, sandwich wall panels
4.7 Approximate design of shear walls.

Unit 5: Industrial Buildings and Shell Roofs

5.1 Components of single-storey industrial sheds with crane gantry systems
5.2 R.C. Roof Trusses, Roof Panels, corbels and columns wind bracing design.
5.3 Cylindrical, Folded plate and hyper-prefabricated shells
5.4 Erection and jointing, joint design, hand book-based design.

Unit 6: Bridges

6.1 Bridge Designs, Hollow Slabs, fully Precast bridges
6.2 Sliding Methods, Glued Construction,
6.3 Composite Construction,
6.4 Introductions to Large span bridges floated into place

References:

1. T. Koncz, 1971,Manual of Precast Concrete Construction, Vol.I II and III & IV Bauverlag, GMBH.
2. Laszlo Mokk,2007, Prefabricated Concrete for Industrial and Public Structures, AkademiaiKiado, Budapest.
3. B. Lewicki, 1998,Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam/ London/New York.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precase Concrete, Netherland Betor Verlag.
5. A.Warszawski, 1990, Industrialization and Robotics in Building - A managerial approach, Harper and Row.
6. A.M.Haus, 1983, Precast Concrete: Design and Applications, Applied Science Publishers,London and New York.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests

Course Articulation Matrix

CO Statement MCE-301	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2
MCE-301.1	3	3	3	3	2	-	-	-	-	3	2
MCE-301.2	3	3	3	3	2	-	-	-	-	3	2
MCE-301.3	3	3	3	2	2	-	-	-	-	3	2
MCE-301.4	3	3	3	2	2	-	-	-	-	3	1
MCE-301.5	3	3	3	3	3	-	-	-	-	3	2
MCE-301.6	1	1	1	1	2	3	3	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-302: RETROFITTING AND REHABILITATION OF STRUCTURES

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Duration of Examination	3 hrs	External/ End Semester Exam	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, the students will be able to

MCE-302.1 Identify the need for rehabilitation of structures
MCE-302.2 Describe the various criteria and applicability of repair materials
MCE-302.3 Recommend different types of grouting materials
MCE-302.4 Apply NDT for damage assessment
MCE-302.5 Suggest crack repair methodologies

PART-A

UNIT-1: Introduction

1.1 Maintenance, rehabilitation, repair, retrofit and strengthening,
1.2 Need for rehabilitation of structures. Cracks in R.C. buildings, causes and effects,
1.3 Importance of maintenance, routine and preventive maintenance, Damages to masonry structures, causes

UNIT-2: Repair materials

2.1 Various repair materials, Criteria for material selection, Methodology of selection,
2.2 Health and safety precautions for handling and applications of repair materials,
2.3 Special mortars and concretes, Polymer Concrete and Mortar, Quick setting compounds

UNIT-3: Grouting materials

3.1 Gas forming grouts, Salfoalumate grouts,
3.2 Polymer grouts, Acrylate and Urethane grouts, Bonding agents, Latex emulsions,
3.3 Epoxy bonding agents, Protective coatings for Concrete and Steel, FRP sheets

PART-B

UNIT-4: Damage diagnosis and assessment

4.1 Visual inspection, Non Destructive Testing using Rebound hammer,
4.2 Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement,
4.3 Substrate preparation, General surface preparation methods and procedures,
4.4 Reinforcing steel cleaning

UNIT-5: **Crack repair**

5.1 Various methods of crack repair, Grouting, Routing and sealing, Stitching,
5.2 Dry packing, Autogenous healing, Overlays, Repair to active cracks,
5.3 Repair to dormant cracks. Corrosion of embedded steel in concrete,
5.4 Mechanism, Stages of corrosion damage, Repair of various corrosion damaged structural elements (slab, beam and columns)

UNIT-6: Jacketing

6.1 Jacketing, Column jacketing, Beam jacketing,
6.2 Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing,
6.3 FRP jacketing, Strengthening, Beam shear strengthening, Flexural strengthening

Text Books/ Reference Books:

1. P.Noel.Mailvaganam, 1991, Repair and protection of concrete structures by CRC Press.
2. Peter.H.Emmons, Concrete repair and maintenance Illustrated, Galgotia publications Pvt.
3. Pankaj agarwal, Manish shrikande, 2006, Earthquake resistant design of structures.
4. S.Champion, 1961, Failures and repair of concrete structures, John Wiley and Sons.
5. R.N.Raikar,Diagnosis and treatment of structures in distress.
6. Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India.

Software required/Weblinks:

NIL

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-302)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**

MCE-302.1	1	3	-	1	1-	1	3	3	1
MCE-302.2	1	2	-	-	-	-	3	3	2
MCE-302.3	2	1	-	2	-	2	1	3	2
MCE-302.4	3	2	2	2	-	2	2	1	3
MCE-302.5	2	1	2	3	2	3	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-303A: ENVIRONMENTAL IMPACT ASSESSMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- V

Course outcomes: At the end of the course, the students will be able to -

MCE-303A.1 Apply the concept of EIA to real life problems
MCE-303A.2 Access different case studies/examples of EIA in practice
MCE-303A.3 Relate to public participation in environmental decisions
MCE-303A.4 Predict the impact of project on environment
MCE-303A.5 Learn to write EIA report

PART-A

Unit 1: Introduction

1.1 Need of EIA, EIA cycle & procedures
1.2 Screening, scoping, baseline data
1.3 Utility and scope of EIA process
1.4 Monitoring the clearance conditions, projects requiring EIA
1.5 Strategic Environmental Assessment (SEA)
1.6 EIA & Sustainable Development

Unit 2: Environmental Impact Studies

2.1 Conceptual approach for environmental impact studies
2.2 Criteria for selection of methodology
2.3 Planning and management of impact studies
2.4 Matrix and network methodologies for impact identification
2.5 Description of the affected environment
2.6 Construction stage impacts, post project impacts

Unit 3: Prediction and Assessment

3.1 Prediction and assessment of impact on air environment
3.2 Basic information on air quality, sources & effects
3.3 Air- pollution dispersion
3.4 Key legislations and regulations
3.5 Impact prediction approaches
3.6 Identification and incorporation of mitigation measures.

PART-B

Unit-4 Noise Pollution & Public Participation

4.1 Basic information on noise and noise generation, measurement, propagation and mitigation
4.2 Noise measures, mathematical models of transportation noise
4.3 Key legislation and guidelines, impact prediction methods
4.4 Publica participation, its objective in environmental decision making
4.5 Selection of public participation techniques, conflict resolution, techniques of conflict management

Unit 5: Environmental Management Plan

5.1 EMP Preparation
5.2 Monitoring EMP
5.3 Identification of significant and unacceptable impacts
5.4 Mitigation plans & relief & rehabilitation
5.5 Monitoring methods, pre-appraisal and appraisal

Unit 6: EIA and Construction

6.1 Evaluation of environmental impact due to construction and Widening of Roads, case studies
6.2 Grade separators or co-ordinate signal system on urban
6.3 Arterial road intersections to reduce air pollution.
6.4 Plan for mitigation of adverse impacts on environment
6.5 Understanding of the strengths and limitations of EIA

References:

1. CANTER, L.W., Environmental impact assessment, McGraw-Hill, 1997.
2. Betty Bowers Marriott, Environmental Impact Assessment: A Practical Guide, McGraw-Hill. .
3. Peter Morris & Riki Therivel, Methods of Environmental Impact Assessment, Routledge, 2001.
4. Denver Tolliver, Highway Impact Assessment, Greenwood Publishing Group, 1993.
5. R. K. Jain, L. V. Urban, G. S. Stacey, H. E. Balbach, Environmental Assessment, McGraw-Hill.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement MCE-303A	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-303.1A	2	3	-	3	3	3	2	2	-
MCE-303.2A	1	2	2	-	-	2	2	-	3

MCE-303.3A	3	3	3	3	2	2	-	2	2
MCE-303.4A	3	3	-	2	3	2	3	3	3
MCE-303.5A	2	2	-	2	3	2	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-301: CONSTRUCTION EQUIPMENTS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- V

Course Outcomes: At the end of course, the students will be able to

MCE-CM-301.1. Relate to the concept of equipment management.
MCE-CM-301.2. Recommend different types of earthwork equipment
MCE-CM-301.3. Explain the pumps and handling equipments used for dredging and other miscellaneous purposes.
MCE-CM-301.4. Discuss the field applications of lifting and conveying equipments.
MCE-CM-301.5. Utilize the various screening equipments used in concrete plants
MCE-CM-301.6. Propose pile driving equipments that are used in the erection of piles.

PART-A

Unit 1: Equipment Management

1.1 Identification, Planning, Equipment Management in Projects
1.2 Maintenance Management, Replacement, Cost Control of Equipment
1.3 Depreciation Analysis, Methods of calculation of depreciation, Safety Management.

Unit 2: Earthwork Equipment

2.1 Fundamentals of Earth Work Operations, Earth Moving operations
2.2 Types of Earthwork Equipment, Tractors, Motor Graders, Scrapers
2.3 Front end Loaders, Earth Movers, capacity calculations.

Unit 3: Dredging and Tunnelling Equipments &Pumps Used in Construction

3.1 Equipment for Dredging, Trenching, Tunnelling
3.2 Drilling and Blasting, Equipment for compaction
3.3 Types of pumps used in Construction, Equipment for Grouting.

PART-B

Unit 4: Forklifts Equipments

4.1 Forklifts and related equipment, Portable Material Bins
4.2 Conveyors, equipment used in demolition
4.3 Chain Pulley Blocks

Unit 5: Screening Equipments

5.1 Crushers, Feeders, Screening Equipment
5.2 Batching and Mixing Equipment, Hauling equipment

5.3 Pouring and Pumping Equipment, Ready mixed concrete carriers

Unit-6: Pile driving equipments

6.1 Types, Pile driving hammers, Single acting and double acting
6.2 Differential acting hammers, Hydraulic and diesel hammers
6.3 Vibratory drivers, Equipment of Erection and demolition

Text Books/ Reference Books:

1. R.L. Peurifoy, Ledbetter, W.B. and Schexnayder.C, 2005, Construction Planning Equipment and Methods, McGraw Hill. Singapore.

2. S.C. Sharma 2008, Construction Equipment and Management, Khanna Publishers, Delhi.

3. S.V. Deodhar, 2008,Construction Equipment and Job Planning, Khanna Publishers Delhi.

4. Mahesh Varma., 2003, Construction Equipment and its planning and application, Metropolitan Book Company, New Delhi.

Software required/Web links:

https://nptel.ac.in/courses/105103093/6
https://nptel.ac.in/courses/105104161/12
https://nptel.ac.in/courses/105103093/22

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Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-301)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-301.1	3	-	3	3	-	3	3	3	2
MCE-CM-301.2	3	-	3	2	-	3	3	2	2
MCE-CM-301.3	2	-	3	3	-	3	3	3	2
MCE-CM-301.4	3	-	3	3	-	3	3	2	1
MCE-CM-301.5	3	-	3	3	-	3	3	3	2
MCE-CM-301.6	2	-	3	3	-	3	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-302: TOTAL QUALITY MANAGEMENT IN CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective- V

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

MCE-CM-302.1. Relate to the concept of quality management in construction
MCE-CM-302.2. Demonstrate Quality Control Inspection Program
MCE-CM-302.3. Make the use of various Control Charts for quality control & monitoring
MCE-CM-302.4. Apply the standard codes for quality
MCE-CM-302.5. Utilize the concept of life cycle costing

PART-A

Unit 1: Introduction

1.1. Concept of quality control ,Quality assurance
1.2. Quality management, Aims of TQM
1.3. Development and design Concept of TQM, Accuracy and precision in observation
1.4. Reading, calibration, testing, measurements, recording of data and information etc.
1.5. Accuracy in calculation, finding area, volume, etc.

Unit 2: Construction Quality Control Inspection Program

2.1. Duties and Responsibilities, Qualification of staff in organization
2.2. Checklists for Quality of Materials, Masonry, Plastering
2.3. Concrete construction, Batching, Mixing, Transporting
2.4. Placing, Compaction, Finishing, Curing, Reinforcement Work
2.5. Formwork Timber & steel construction, Doors & windows, Plumbing & drainage

Unit 3: Statistical Quality Control& Monitoring

3.1. Statistical Quality Control, Quality Measurement
3.2. Attributes and Variables, Statistical Process Control (SPC) Methods
3.3. Control Charts for Attributes P-Charts, Proportion Defective C-Charts
3.4. Number of Defects Per Unit, Control Charts for Variables
3.5. Other Types of Attribute-Sampling Plans, Acceptance Sampling

PART-B

Unit 4: Quality Standards

4.1. Quality standards in construction related to Building materials and other inputs for construction processes

4.2. Quality standards for Construction outputs, products and services
4.3. Indian Standard Code, Methods of referring it Use of IS for quality references
4.4. National Building code (NBC 2005), Why to refer & How to refer Methods of referring it application
4.5. Study of International Organization for Standardization (ISO) ISO-9000, ISO14000 & certification procedures

Unit 5: Quality Management Systems

5.1. Types of organizations Inspection, control and enforcement
5.2. Quality Management Systems and method
5.3. Responsibilities and authorities In quality assurances and quality Control
5.4. Architects, engineers, contractors, and special consultants, Quality circle

Unit-6: Construction Activity

6.1. Construction activity, Environmental safety
6.2. Social and environmental factors
6.3. Natural causes and speed of Construction
6.4. Life cycle costing, Reliability and Probabilistic methods
6.5. Value engineering and value analysis

Text Books/ Reference Books:

1. James, J.O Brian,2009, Construction Inspection Handbook -Quality Assurance and:Quality Control, Van Nostrand, New York.
2. Kwaku, A., Tenah, Jose. M. Guevara, 2005, Fundamentals of Construction Management and Organization, Reston Publishing Co., Inc., Virginia.
3. Juran Frank, J.M. and Gryna, F.M. 2002,Quality Planning and Analysis, Tata McGraw Hill, New Delhi.
4. Clarkson H. Oglesby, 2009, Productivity Improvement in Construction, McGraw-Hill.
5. John L. Ashford, 2009, The Management of Quality in Construction, New York.
6. Steven McCabe, 2008, Quality Improvement Techniques In Construction, Addison Wesley Longman Ltd, England.

Software required/Web links:

https://nptel.ac.in/courses/110104080/
https://nptel.ac.in/courses/110104085/
https://swayam.gov.in/nd1_noc20_mg34/preview

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Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement MCE-CM-302	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-CM-302.1	3	3	3	3	2	-	-	3	2
MCE-CM-302.2	3	2	3	3	2	-	-	2	3
MCE-CM-302.3	3	3	2	2	2	-	-	3	2
MCE-CM-302.4	3	3	3	2	2	-	-	3	1
MCE-CM-302.5	1	2	1	2	2	2	3	1	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-303: SUSTAINABLE BUILDING CONSTRUCTION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

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

MCE-CM-303.1. Relate to the idea of utilizing low carbon emission materials
MCE-CM-303.2. Make the use of sustainable materials in construction
MCE-CM-303.3. Compare the embodied energy on different materials
MCE-CM-303.4. Design energy efficient strategies for smart buildings
MCE-CM-303.5. Explain the environmental aspects of non-renewable sources of energy

PART-A

Unit 1: Introduction

1.1. Introduction, Definition of Sustainability
1.2. Carbon cycle, Role of construction material such as concrete and steel, etc.
1.3. CO2 contribution from cement and other construction materials

Unit 2: Sustainable Materials

2.1. Construction materials, Indoor air quality
2.2. No/Low cement concrete, Recycled and manufactured aggregate
2.3. Role of QC and durability, Life cycle and sustainability

Unit 3: Energy Components

3.1. Components of embodied energy, calculation of embodied energy for construction materials
3.2. Energy concept and primary energy
3.3. Embodied energy via-a-vis operational energy in conditioned building, Life Cycle energy use

PART-B

Unit 4: Sustainable Building Performance

4.1. Control of energy use in building, ECBC code, codes in neigh boring tropical countries
4.2. OTTV concepts and calculations, Features of LEED and TERI Griha ratings
4.3. Role of insulation and thermal properties of construction materials
4.4. Influence of moisture content and modelling, Performance ratings of green buildings, Zero energy building.

Unit 5: Design Consideration

5.1. Natural building design consideration, Energy efficient design strategies
5.2. Contextual factor, Longevity and process Assessment
5.3. Renewable Energy Sources and design, Advanced building Technologies
5.4. Smart buildings, Economics and cost analysis

Unit-6: Sustainable Resources and Environmental Impacts

6.1. Non-renewable sources of energy, Environmental aspects energy norm, coal, oil, natural gas
6.2. Nuclear energy, Global temperature
6.3. Green house effects, global warming, Acid rain Causes, effects and control methods
6.4. Regional impacts of temperature change

Text Books/ Reference Books:

1. William P Spence, 2012, Construction Materials, Methods & Techniques(3e) by, Yesdee Publication Pvt. Ltd, Chennai, India
2. P.K. Mehta &Mantreio P.J.M, Concrete Structure properties & Materials, Prentice hall
3. M L Gambhir, Neha Jamwal, Building Materials, Tata McGraw Hill Publ.
4. New Building Materials and Construction World magazine
5. C.J.Kibert , 2008, Sustainable Construction: Green Building Design and delivery, 3rd Ed., John Wiley, Hoboken, New Jersey
6. Energy Conservation Building Code (ECBC)
7. 2010, Sustainable Engineering Practice ASCE Publication
8. 2010, Hagger Sustainable Industrial Design and Waste Management, Techniz Book
9. T. Willan Mayer Energy economics and building design.
10. National Building Code 2005, Part 0-10, Bureau of Indian Standards
11. G.T. Miller Jr. , 2004, Living in the Environment: Principles, Connections, and Solutions, 14th Ed., Brooks Cole, Pacific Grove, California, Washington DC.

Software required/Web links:

https://nptel.ac.in/courses/105107156/12

https://nptel.ac.in/syllabus/syllabus_pdf/105102195.pdf

https://nptel.ac.in/courses/120108004/module9/lecture11.pdf

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Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests

Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-CM-303**)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-CM-303.1	3	-	3	-	3	3	3	3	2
MCE-CM-303.2	3	-	2	2	-	2	3	2	2
MCE-CM-303.3	2	-	3	-	3	3	3	2	1
MCE-CM-303.4	1	-	3	-	3	3	3	3	2
MCE-CM-303.5	2	-	3	3	3	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-CM-304: THRUST AREA IN PROJECT MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course Outcomes: At the end of course, the students will be able to

MCE-CM-304.1. Identify the thrust areas of project management
MCE-CM-304.2. Develop project plan and objectives
MCE-CM-304.3. Implement the work break down system (WBS)
MCE-CM-304.4. Monitor the overall project progress and control
MCE-CM-304.5. Utilize the financial concepts involved in construction management at various levels.

PART-A

Unit 1: Introduction to Project

Concept of a Project – Characteristic features – Project Life cycle – Phases – Project Management – tools and techniques for project management – role of project managers.

Unit 2: Role of Project Management

Development of project plan and objectives – programming – scheduling – project organization and project team – role of communication in project management – controlling systems.

Unit 3: Working Systems

Working systems – Characteristics – class of systems – design of systems – work break down system (WBS) – project execution plan – project procedure manual –sub systems of project management- monitoring of projects- networks – monitoring contracts.

PART-B

Unit 4: Project Direction

Project direction – direction during production stage – value engineering review – stages –directives – project coordination – procedure – interface management – project control –scope for progress control – overall project progress control – stages – methods.

Unit 5: Construction Finance

Accounting information and application - Financial versus economic evaluation- Financial statements and project appraisal - Project yield - Taxation and inflation - Risk and uncertainty -Turnkey activities - Finance and working capital, depreciation and amortization - Cost control, performance budgeting, equipment rentals.

Unit-6: Resource Management

Basic concept – Labour requirements – Labour productivity – Site productivity – Equipment Management – Material management- Procurement organization – Procurement planning – Functions of material management – Inventory control.

Text Books/ Reference Books:

1. Prasanna Chandra, 2009, Project Planning, Analysis, Selection, Implementation and review, Tata Mcgraw Hill.
2. K.K. Chitkara, 2008, Construction Project Management: Planning Scheduling and control, Tata McGraw-Hill Publishing Company, New Delhi.
3. E Frederick Gould, 2000, Construction Project Management, Went worth Institute of Technology; Vary E. Joyce, Massachusetts Institute of Technology.
4. S. Choudhury, 2008, Project Management, Tata McGraw-Hill Publishing Company New Delhi.
5. B. Sengutha , Guha .H, 2001, Construction Management and Planning, Tata Mc Graw Hill.
6. H.C. Peterson, Lewis, W.C. 2001, Managerial Economics, Prentice Hall of India Pvt. Ltd.
7. Werther & Davis, 1996, Human Resources & Personnel Management, McGraw Hill.
8. Koontz O'Donnel, 1982, Essentials of Management; Tata McGraw Hill.
9. Parkin, M. & Bade R., 1996, Modern Macroeconomics 4th Edition, Prentice Hall.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement MCE-CM-304	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-CM-304.1	3	3	3	3	2	-	-	3	2
MCE-CM-304.2	3	3	3	3	2	-	-	3	2
MCE-CM-304.3	3	3	3	2	2	-	-	3	2
MCE-CM-304.4	3	3	3	2	2	-	-	3	1
MCE-CM-304.5	3	3	3	3	3	-	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-301: TRANSPORTATION SYSTEM PLANNING AND MANAGEMENT

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, the students will be able to

MCE-TE-301.1. Justify the importance of transportation planning methodology on socio-economic characteristics of land use.
MCE-TE-301.2. Explain the principles of various mass transit techniques
MCE-TE-301.3. Recommend various techniques of transportation management
MCE-TE-301.4. Apply knowledge of route spacing techniques.
MCE-TE-301.5. Implement various operational and management issues in transit planning.
MCE-TE-301.6. Identify different land use transport model by using transport planning software.

PART-A

Unit-1: General

1.1 Importance of transportation, transportation planning methodology
1.2 Hierarchical levels of planning and its relation to rural, urban areas
1.3 Long range planning, passenger and goods transportation
1.4 General concept and process of transport planning
1.5 Land-use transport interactions
1.6 Socio-economic characteristics of land use

Unit-2: Mass Transportation Systems

2.1 Introduction to various types of mass transportation systems
2.2 Need of mass transportation, recent trends in transit
2.3 Mass transportation characteristics, multi modal transportation system
2.4 Characteristics of mass transit systems including technical, demand operational and economic problems
2.5 Fixed track facility, express bus system
2.6 Integrated operating characteristics of terminal and transfer facilities

Unit-3: Urban Transportation Planning

3.1 Studies urban travel characteristics
3.2 Private and public behaviour analysis
3.3 Transportation demand surveys, delineation of the urban area
3.4 Zoning, origin-destination studies, home interviews
3.5 Trip classification and socio- economic variables in trip making projections
3.6 Selection of mass transportation system, economic evaluation methods

PART-B

Unit-4: Terminals and their functions

4.1 Conceptual design
4.2 Typical requirement, scheduling
4.3 Vehicle dispatch policy
4.4 Spacing of stops
4.5 Route spacing and performance

Unit-5: Operational and management issues

5.1 Operational and management issues in transit planning
5.2 Priority measures and their implementation

Unit-6: Land use transport models.

6.1 Lowry model, lowrygarin model.
6.2 Iterative solutions.
6.3 Introduction to transport planning software.

References

1.L.R. Kadiyali, 2011, Traffic Engineering and Transport Planning, Khanna Publishers.
2.S.K. Khanna and Justo C. E. G., 2008 Highway Engg.-, New Chand Publication.
3. C A O'Flaherty, 2006, Transport Planning and Traffic Engineering, Butterworth Heinemann,Elsevier, Burlington, MA.
4.C. S. Papacostas and P. D. Prevedouros, 2001, Transportation Engineering and Planning, PrenticeHall of India Private Limited.
5. S.K.Sharma, 2010, Principles, Practice and design of Highway Engg.
6. John W.Dickey Taylor & Francis, 1983,Metropolitan Transportation Planning.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Instructions for Paper-setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-301)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
MCE-TE-301.1	3	3	3	2	2	-	3	3	3
MCE-TE-301.2	3	2	3	2	2	2	3	3	2
MCE-TE-301.3	3	3	3	3	2	3	2	1	2
MCE-TE-301.4	3	3	3	2	1	1	2	1	1
MCE-TE-301.5	3	3	3	2	1	2	2	2	2
MCE-TE-301.6	3	2	3	3	2	2	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-302: TRAFFIC SIMULATION MODELLING AND APPLICATION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, the students will be able to

MCE-TE-302.1. Define the basic principles of simulation.
MCE-TE-302.2. Identify the structure of MonteCarlo techniques to determine the random number.
MCE-TE-302.3. Contrast the different techniques to generate random variety to be used in traffic engineering.
MCE-TE-302.4. Implement the different types of traffic simulation models and the underlying assumptions that govern their behaviour.
MCE-TE-302.5. Justify applications for which simulation is the appropriate model for use.

PART-A

Unit-1: Introduction:

1.1 Definitions, advantages and disadvantages, different types
1.2 Simulation languages-Statistical models in simulation
1.3 Overview of probability and statistics, useful statistical model
1.4 Discrete distribution, continuous distribution

Unit-2: Monte Carlo techniques, stochastic simulations:

2.1 Random Number Generation: Properties of random numbers
2.2 Generation of true and pseudo random numbers
2.3 Techniques for generating random numbers
2.4 Hypothesis testing, various tests for uniformity (Kolmogorov-Smirnov and Chi-Square)
2.5 Independence (runs, autocorrelation, gap, poker)

Unit-3: Random Variate Generation

3.1 Different techniques to generate random variate- inverse transform technique
3.2 Direct transformation technique
3.3 Convolution method and acceptance rejection techniques
3.4 Algorithms for generation of random variates for different distributions used in traffic engineering

PART-B

Unit-4: Queueing Models

4.1 Queueing theory concepts
4.2 Characteristics of queueing systems,
4.3 Queueing notations, measures of performance of queueing systems,
4.4 Steady state behaviour of Markovian models (M/G/1, M/M/1, M/M/c).

Unit-5: Simulation in Traffic Engineering

5.1 Application of traffic simulation models for analysis of dynamic traffic systems and design
5.2 Input data preparation, calibration, validation, analysis of output
5.3 Models for vehicle arrival and related models for development of complete simulation models for midblock and intersections under homogenous and mixed traffic

Unit-6: Simulation of queueing models

6.1 Discrete simulation models: Cellular automata concepts
6.2 Discretization of time and space, rules for acceleration
6.3 Deceleration, randomization, and vehicle updation
6.4 Simple examples from traffic engineering

Text Books/ Reference Books:

1. Law, Averill, Kelton, W. David, Simulation Modeling and Analysis, McGraw Hill Higher Education.
2. Deo, Narasingh, System Simulation by Digital Computer, Prentice Hall India.
3. D.R.Drew, Traffic Flow Theory and Control, McGraw Hill.
4. A.D.May, Traffic Flow Fundamentals, Prentice Hall.
5. S. M. Ross Elsevier, 2006, Simulation, 4th edition.
6. R. Dowling, A. Skabardonis, and V. Alexiadis, Traffic Analysis Toolbox Volume III:Guidelines for Applying Traffic MicrosimulationModeling Software, FHWA-HRT-04-040.
7. R. Roess, E. Prassas, and W. McShane 2004, Traffic Engineering, 3rd edition, Prentice Hall.
8. S. Washington, M. Karlaftis, and F. Mannering, 2003, Statistical and Econometric Methods for Transportation Data Analysis, Chapman & Hall/CRC.
9. S. Ólafsson (2006). Metaheuristics,‖ in B.L. Nelson and S. Henderson (eds.). Handbook on Simulation, Handbooks in Operations Research and Management Science VII, Elsevier, 633-654.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials

Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-302)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-TE-302.1	2	3	3	2	-	1	3	2	3
MCE-TE-302.2	2	3	-	2	2	-	2	3	3
MCE-TE-302.3	2	3	1	2	2	-	2	2	2
MCE-TE-302.4	3	3	2	3	2	1	2	2	2
MCE-TE-302.5	3	2	3	3	2	2	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

MCE-TE-303: APPLICATION OF GEOSYNTHETICS IN PAVEMENTS

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, the students will be able to

MCE-TE-303.1. Propose the various types of geotextiles and their functions.
MCE-TE-303.2. Identify the various types of natural geosynthetics.
MCE-TE-303.3. Relate to the basic properties of geosynthetics
MCE-TE-303.4. Describe various sampling and testing methods to determine strength properties of geosynthetics material.
MCE-TE-303.5. Analyze the effect of geosynthetic material on bearing capacity of soil and their other applications.

PART-A

Unit-1: Geotextiles

1.1 Overview, introduction, types including natural geotextiles
1.2 Manufacturing methods, Functions of Geotextiles- fluid transmission
1.3 Filtration, separation, protection, Sediment Control, Reinforcement
1.4 Design principles and influencing factors

Unit-2: Natural Geotextiles:

2.1 Factors governing the usage of natural geotextiles
2.2 Types and applications- jute fibres, coir geotextiles
2.3 Bamboo/timber, combination of geotextiles

Unit-3: Basic Properties

3.1 Physical (Mass per unit area, thickness, compressibility, apparent opening size, width and length),
3.2 Mechanical (Tensile strength, narrow strip tensile test, grab test, strip and wide width tensile test, seam testing,
3.3 Interface friction, creep resistance), hydraulic, constructability/survivability (puncture test, CBR push through test,
3.4 Trapezoidal tear test, diaphragm bursting strength test, cone drop test),
3.5 abrasion resistance, ultraviolet resistance, temperature stability, chemical stability

PART-B

Unit-4: Testing and Evaluation

4.1 Importance of testing, test conditions, sampling, testing methods
4.2 Techniques for testing of different index properties
4.3 Strength properties, Apparent Opening Size, In-plane and cross-plane permeability tests

4.4 Assessment of construction induced damage
4.5 Extrapolation of long term strength properties from short term tests

Unit-5: Pavement Applications

5.1 Paved Surface Rehabilitation, Reflective Crack Treatment for Pavements
5.2 Geotextiles for separation and reinforcement in flexible pavements
5.3 Design by Giroud-Noiray, improvement of bearing capacity using geotextiles
5.4 Use of geotextiles for construction of heavy container yards and railway lines
5.5 Applications in Bituminous Pavements Model study on Geotextile Reinforced Asphaltic Concrete

Unit-6: Filtration and Drainage

6.1 Geotextile filter requirements drain and filter properties, design criteria
6.2 Embankments in soft soil: stability analysis, influence of reinforcement extensibility
6.3 Relationships for design, settlement analysis
6.4 Soil retaining walls: components, principles of design
6.5 Reinforcement design applications in rigid and flexible pavements
6.6 AASHTO design criteria; construction methods

References

1. R.M. Koerner, 1999, Designing with Geosynthetics, Prentice Hall, New Jersey, USA, 4th edition.
2. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, 2004. Geosynthetics - New Horizons, Asian Books Private Ltd., New Delhi.
3. G. Venkatappa Rao, 2011, Geosynthetics-An Introduction, Sai Master Geo environmental Services Pvt Ltd., Hyderabad.
4. G. Venkatappa Rao & Goutam K. Pothal, 2008, Geosynthetics Testing-A Laboratory Manual, Sai Master Geoenvironmental Services Pvt Ltd., Hyderabad.
5. G.V. Rao &Rao G.V.S, Text Book On Engineering With Geotextiles||, Tata McGrawhill
6.Rao G.V &Balan. K, Coir Geotextiles-emerging trends, 2002, Kerala state coir corporation Alappuzha.
7. P.T.M. Gerard Van Santvrot, A.A. Balkema, Geotextiles and Geomembranes in Civil Engg. Oxford and IBH publishing company, New Delhi.
8. J.N. Mandal, —Geosynthetics World||, Willey Eastern Ltd., New Delhi.
9. G.L Siva Kumar Babu, 2006, —An Introduction to Soil Reinforcement and Geosynthetics, university press(India) private limited Hyderabad.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%

Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-303)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-TE-303.1	3	3	3	2	2	2	3	2	3
MCE-TE-303.2	2	3	2	3	2	2	3	3	2
MCE-TE-303.3	3	3	2	2	2	1	2	2	3
MCE-TE-303.4	3	3	2	2	1	2	3	2	3
MCE-TE-303.5	3	3	2	2	1	2	3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCE-TE-304: SUSTAINABLE TRANSPORTATION

Credits	3	Max. Marks	200
Lectures/Week	3 hrs	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Program Elective-V

Course outcomes: At the end of the course, the students will be able to

MCE-TE-304.1. Relate to the basic principles of sustainable transportation planning.
MCE-TE-304.2. Identify the various types of sustainable transportation network and their functions.
MCE-TE-304.3. Design bus and pedestrian facilities for development of sustainable transportation.
MCE-TE-304.4. Justify the principle of sustainability in projects.
MCE-TE-304.5. Design integrated public transport systems.

PART-A

Unit-1

Introduction: Sustainable transportation, definition, necessity, fundamental principles, quantifying sustainability. Sustainable transportation planning: Paradigm shift in planning, land use and travel behaviour.

Unit-2

Sustainable Transportation Networks: Built environment and public health; transportation demand management; automobile dependence and oil consumption; bicycle and pedestrian planning.

Unit-3

Design for Sustainable Transportation: Design of bicycle and pedestrian facilities; safety issues for pedestrians and bicyclists; the transportation needs of special populations (elderly, children, disabled and immigrants).

PART-B

Unit-4

Professional praxis: principles of applying professional praxis under a state of paradigm shift. retrofitting existing urban areas; Innovative transportation solutions, case studies.

Unit-5

Emerging concepts in sustainable transportation: Green vehicles and green roads, green and alternate fuels; managing congestion: carsharing, pricing control: congestion and emission pricing.

Unit-6

Sustainable public transport: Promoting public transport: principles involved and techniques, miscellaneous transportation systems, integrated public transport systems.

References

1. H. McClintock, Planning for Cycling – principles, practice and solutions for urban planners. Cambridge: CRC Press.
2. H. Frumkin; Frank, L. and Jackson, R. Urban Sprawl and Public Health, designing, planning, and building for healthy communities. Washington DC: Island Press.
3. Newman, P. and Kenworthy, J. Sustainability and Cities – Overcoming Automobile Dependence. Washington DC: Island Press.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (MCE-TE-304)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**
MCE-TE-304.1.	2	3	3	2	-	1	3	2	3
MCE-TE-304.2.	2	3	-	2	2	-	2	3	3
MCE-TE-304.3.	2	3	1	2	2	-	2	2	2
MCE-TE-304.4.	3	3	2	3	2	1	2	2	2
MCE-TE-304.5.	3	2	3	3	2	2	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-ID-001: BUSINESS ANALYTICS

Periods/week	Credit	Max marks: 200
L: 3 T: 0	3	Internal: 100
Duration of Examination: 3 Hrs		External: 100

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

M-ID-001.1 Demonstrate the knowledge of data analytics.
M-ID-001.2. Depict the ability of thinking critically in making decisions based on data and deep analytics.
M-ID-001.3. Demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
M-ID-001.4 Demonstrate the ability to translate data into clear, actionable insights.

Unit1: Business analytics:

1.1 Overview of Business analytics, Scope of Business analytics
1.2 Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.
1.3 Statistical Tools: Statistical Notation, Descriptive Statistical methods,
1.4 Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2: Trendiness and Regression Analysis:

2.4 Modelling Relationships and Trends in Data, simple Linear Regression.
2.5 Important Resources, Business Analytics Personnel,
2.6 Data and models for Business analytics, problem solving, Visualizing and Exploring Data
2.7 Business Analytics Technology.

Unit 3: Organization Structures of Business analytics

3.1 Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.
3.2 Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis,
3.3 Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process,
3.4 Prescriptive Modelling, nonlinear Optimization.

Unit 4: Forecasting Techniques:

4.1 Qualitative and Judgmental Forecasting, Statistical Forecasting Models,
4.2 Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend,
4.3 Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.
4.4 Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform,
4.5 New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5: Decision Analysis:

5.1 Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities,
5.2 Decision Trees,
5.3 The Value of Information,
5.4 Utility and Decision Making.

Unit 6: Recent Trends in:

6.1 Embedded and collaborative business intelligence
6.2 Visual data recovery, Data Storytelling and
6.3 Data journalism.

Text/Reference Books:

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Business Analytics Principles, Concepts, and Applications, Pearson FT Press.
2. Pochiraju, Bhimasankaram, Seshadri, Sridhar, Essentials of Business Analytics, Springer.
3. Tanushri Banerjee, Arindam Banerjee, Business Analytics, SAGE Publications
4. James Evans, Business Analytics, 2nd Edition, Pearson Education.
5. D. Camm Jeffrey, Essentials of Business Analytics, Thomson Press India Limited.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks. Use of calculators will be allowed in the examination. However, only ordinary scientific calculators will be permissible.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-ID-001)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-ID-001.1	2	2	2	-	2	1	3	1	2
M-ID-001.2	3	2	2	1	2	-	2	2	2
M-ID-001.3	3	3	1	-	2	-	2	2	2
M-ID-001.4	2	3	1	-	2	1	2	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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M-ID-002: INDUSTRIAL SAFETY

Credits	3	Max. Marks	200
L-T-P	3-0-0	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Examination	100

Course Outcomes: At the end of the course, students will be able to

M-ID-002.1 Apply standard safety procedures in an industrial environment.
M-ID-002.2 Be familiar with standard workplace hazard/warning signs and labels.
M-ID-002.3 Be familiar with standard categories of hazardous materials.
M-ID-002.4 Identify hazard and potential hazard areas.
M-ID-002.5 Develop safety programs to prevent or mitigate damage or losses.
M-ID-002.6 Assess safety practices and programs.
M-ID-002.7 Conduct safety audits and improve safety practices.

Unit 1: Industrial safety

1.1 Accident, causes, types, results and control
1.2 Mechanical and electrical hazards, types, causes and preventive steps/procedure
1.3 Describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc,
1.4 Safety color codes.
1.5 Fire prevention and fire-fighting, equipment and methods.

Unit 2: Fundamentals of maintenance engineering

2.1 Definition and aim of maintenance engineering
2.2 Primary and secondary functions and responsibility of maintenance department, Types of maintenance,
2.3 Types and applications of tools used for maintenance
2.4 Maintenance cost & its relation with replacement economy
2.5 Service life of equipment.

Unit 3: Wear and Corrosion and their prevention

3.1 Wear- types, causes, effects, wear reduction methods,
3.2 Lubricants-types and applications, Lubrication methods, general sketch, working and applications, Screw down grease cup, Pressure grease gun,
3.3 Splash lubrication, Gravity lubrication, Wick feed lubrication, Side feed lubrication, Ring lubrication,
3.4 Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit 4: Fault tracing

4.1 Fault tracing-concept and importance, decision tree concept, need and applications,
4.2 Sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's

4.3 Any one machine tool, Pump, Air compressor, Internal combustion engine, Boiler,
4.4 Electrical motors, Types of faults in machine tools and their general causes.

Unit 5: Periodic maintenance

5.1 Periodic inspection-concept and need Degreasing, cleaning and repairing schemes
5.2 Overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use
5.3 Steps/procedure for periodic maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Repair cycle concept and importance.

Unit 6: Preventive Maintenance

6.1 Definition, need, steps and advantages of preventive maintenance
6.2 Steps/procedure for preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets
6.3 Program and schedule of preventive maintenance of mechanical and electrical equipment
6.4 Advantages of preventive maintenance.

Text/Reference Books:

1. R.Lindley Higgins, Maintenance Engineering Handbook, 5th Edition, McGraw-Hill Professional
2. R.Keith. Mobley, Maintenance Engineering Handbook, 8th Edition, Mc.Graw Hill Education
3. M.P. Poonia and S.C.Sharma, Industrial Safety and Maintenance Management, Khanna Publishing
4. Er.H.P. Garg, Industrial Maintenance, S. Chand and Company.
5. R.Venkataraman, Maintenance Engineering and Management, PHI Publications

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.Use of calculators will be allowed in the examination. However, only ordinary scientific calculators will be permissible.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-ID-002)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-ID-002.1	1	1	-	2	2	3	1	1	1

M-ID-002.2	2	2	2	-	2	-	2	1	2
M-ID-002.3	1	2	3	-	2	-	3	2	2
M-ID-002.4	2	1	2	-	1	2	2	2	2
M-ID-002.5	2	2	3	1	2	2	2	1	1
M-ID-002.6	2	2	1	-	3	1	2	2	2
M-ID-002.7	1	3	3	-	2	1	2	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-ID-003: OPERATIONS RESEARCH

Credits	3	Max. Marks	200
L-T-P	3-0-0	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Examination	100

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

M-ID-003.1. Apply the dynamic programming to solve problems of discreet and continuous variables.
M-ID-003.2. Apply the concept of non-linear programming.
M-ID-003.3. Carry out sensitivity analysis
M-ID-003.4. Model the real world problem and simulate it.

Unit 1: Optimization Techniques

1.1 Model Formulation, models
1.2 General L.R Formulation, Simplex Techniques
1.3 Sensitivity Analysis
1.4 Inventory Control Models.

Unit 2: Formulation of a LPP

2.1 Graphical solution revised simplex method
2.2 Duality theory - dual simplex method
2.3 Sensitivity analysis
2.4 Parametric programming.

Unit 3: Nonlinear programming problem

3.1 Kuhn-Tucker conditions
3.2 Min cost flow problem
3.3 Max. flow problem
3.4 CPM/PERT.

Unit 4: Scheduling and Sequencing

4.1 Single server and multiple server models
4.2 Deterministic inventory models
4.3 Probabilistic inventory control models
4.4 Geometric Programming

Unit 5: Competitive Models

5.1 Single and Multi-channel Problems
5.2 Sequencing Models,

Unit 6: Dynamic Programming

6.1 Flow in Networks
6.2 Elementary Graph Theory
6.3 Game Theory Simulation.

Text/Reference Books:

1. H.A. Taha, 2008, Operations Research: An Introduction, PHI
2. H.M. Wagner, 1982, Principles of Operations Research, PHI, Delhi
3. J.C. Pant, 2008, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi,
4. Hitler Libermann, 2009,Operations Research, McGraw Hill Publications
5. Pannerselvam, 2010, Operations Research, Prentice Hall of India
6. Harvey M Wagner, 2010,Principles of Operations Research, Prentice Hall of India

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks. Use of calculators will be allowed in the examination. However, only ordinary scientific calculators will be permissible.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-ID-003)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-ID-003.1	3	1	2	-	1	-	3	1	2
M-ID-003.2	3	1	2	-	1	-	2	2	1
M-ID-003.3	3	1	1	-	1	-	1	1	1
M-ID-003.4	2	1	3	1	1	-	2	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-ID-004: COST MANAGEMENT OF ENGINEERING PROJECTS

Credits	3	Max. Marks	200
L-T-P	3-0-0	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Examination	100

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

M-ID-004.1. Demonstrate an understanding of, and apply, the fundamentals of project planning and project management.
M-ID-004.2. Prepare and evaluate cost estimates, tender documentation and contract documentation.
M-ID-004.3. Administer and supervise contracts in accordance with the relevant Standards and/or Codes of Practice.
M-ID-004.4. Critically evaluate professional practice principles and their application to an engineering environment.

UNIT 1: Introduction

a. Overview of the Strategic Cost Management Process
b. Cost concepts in decision-making
c. Relevant cost, Differential cost
d. Incremental cost and Opportunity cost.

Unit 2: Objectives of a Costing System; Inventory valuation

1.1 Creation of a Database for operational control
1.2 Provision of data for Decision-Making
1.3 Project: meaning, Different types, why to manage, cost overruns centres
1.4 Various stages of project execution: conception to commissioning
1.5 Project execution as conglomeration of technical and nontechnical activities
1.6 Detailed Engineering activities.

Unit 3: Project Execution

1.1 Pre-project execution, main clearances and documents
1.2 Project team: Role of each member.
1.3 Importance Project site: Data required with significance.
1.4 Project contracts. Types and contents.
1.5 Project execution Project cost control.
1.6 Bar charts and Network diagram.
1.7 Project commissioning: mechanical and process

Unit 4: **Cost Behavior and Profit Planning Marginal Costing**

a. Distinction between Marginal Costing and Absorption Costing
b. Break-even Analysis, Cost-Volume-Profit Analysis.
c. Various decision-making problems.

d. Standard Costing and Variance Analysis
e. Pricing strategies: Pareto Analysis Target costing, Life Cycle Costing.
f. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning.

Unit 5: Total Quality Management and Theory of Constraints

5.1 Activity-Based Cost Management, Bench Marking
5.2Balanced Score Card and Value-Chain Analysis
5.3 Budgetary Control; Flexible Budgets
5.4 Performance budgets; Zero-based budgets.

Unit 6: Cost Management Techniques

6.5 Measurement of Divisional profitability pricing decisions including transfer pricing.
6.6 Quantitative techniques for cost management
6.7 Linear Programming, PERT/CPM
6.8 Transportation problems, Assignment problems
6.9 Simulation, Learning Curve Theory.

Text/Reference Books:

1. H.A. Taha, 2008, Operations Research: An Introduction, PHI
2. Robert S Kaplan Anthony A. Alkinson, Advanced Management Accounting, 3rd Edition, Pearson
3. KalpeshAshar, Cost Accounting and Management, 4th Edition, Vibrant Publications
4. John M.Nicholas and Herman Steyn, Project Management for Engineering, Business and Technology, 5th Edition, Routledge Taylor & Francis
5. Asish K. Bhattacharyya, Principles & Practices of Cost Accounting, 3rd Edition, PHI Publishers
6. N.D. Vohra, Quantitative Techniques in Management, 5th Edition, Tata McGraw Hill Book Co. Ltd.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.Use of calculators will be allowed in the examination. However, only ordinary scientific calculators will be permissible.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement	PO1	PO2	PO3	PO4	PO	PO	PO	PSO	PSO 2

(M-ID-004)					**5**	**6**	**7**	**1**	
M-ID-004.1	2	2	2	-	1	-	2	1	2
M-ID-004.2	1	3	2	1	-	1	1	2	2
M-ID-004.3	1	3	2	-	2	-	2	1	2
M-ID-004.4	3	2	1	-	2	-	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-ID-005: COMPOSITE MATERIALS

Credits	3	Max. Marks	200
L-T-P	3-0-0	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Examination	100

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

M-ID-005.1. Identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
M-ID-005.2. Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products.
M-ID-005.3. Analyse the elastic properties and simulate the mechanical performance of composite laminates; and understand and predict the failure behaviour of fibre-reinforced composites
M-ID-005.4. Apply knowledge of composite mechanical performance and manufacturing methods to a composite design project
M-ID-005.5. Critique and synthesize literature and apply the knowledge gained from the course in the design and application of fibre-reinforced composites.

Unit 1: Introduction

a. Definition – Classification and characteristics of Composite materials
b. Advantages and application of composites
c. Functional requirements of reinforcement and matrix
d. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Unit 2: Reinforcements

2.1 Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers.
2.2 Properties and applications of whiskers, particle reinforcements.
2.3 Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures.
2.4 Isostrain and Isostress conditions.

Unit 3: Manufacturing of Metal Matrix Composites:

a. Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing
b. Properties and applications. Manufacturing of Ceramic Matrix Composites
c. Liquid Metal Infiltration – Liquid phase sintering
d. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Unit 4: Manufacturing of Polymer Matrix Composites:

a. Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method –
b. Filament winding method
c. Compression moulding
d. Reaction injection moulding

e. Properties and applications.

Unit 5: Strength

5.1Laminar Failure Criteria-strength ratio
5.2 Maximum stress criteria
5.3 Maximum strain criteria
5.4 Interacting failure criteria
5.5 Hygrothermal failure

Unit 6: Laminate

6.1Laminate first play failure-insight strength
6.2Laminate strength-ply discount truncated maximum strain criterion
6.3 Strength design using caplet plots
6.4 Stress concentrations.

Text/Reference Books:

1. M. Robert Jones, Mechanics of Composite Materials, 2nd Edition, Taylor & Francis
2. K.K.Chawla, Composite Materials, 4th Edition, Springer
3. Daniel Gay, SuongV.Hoa, Stephen W.Tsai, Composite Materials-Design and Applications, Taylor and Francis
4. D.L.Deborah Chung, 2010, Composite Materials-Science and Applications, 2nd Edition, Springer,
5. George Lubin, Handbook of Composites, Springer
6. R.Balasubramaniam, Material Science and Engineering, 2nd Edition, Wiley

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks. Use of calculators will be allowed in the examination. However, only ordinary scientific calculators will be permissible.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-ID-005)	**PO1**	**PO2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**

M-ID-005.1	2	2	2	-	1	-	2	2	2
M-ID-005.2	1	2	3	1	1	1	3	2	2
M-ID-005.3	3	3	2	-	2	-	2	1	1
M-ID-005.4	2	2	1	-	-	-	2	-	-
M-ID-005.5	2	2	-	-	-	-	1	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-ID-006: WASTE TO ENERGY

Credits	3	Max. Marks	200
L-T-P	3-0-0	Continuous Evaluation	100
Examination Duration	3hrs	End Semester Examination	100

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

M-ID-006.1. To enable students to understand of the concept of Waste to Energy.

M-ID-006.2. To link legal, technical and management principles for production of energy from waste.

M-ID-006.3. To learn about the best available technologies for waste to energy.

M-ID-006.4. To analyze case studies for understanding success and failures.

M-ID-006.5. To facilitate the students in developing skills in the decision making process.

Unit 1: Introduction to Energy from Waste

3.1 Classification of waste as fuel
3.2 Agro based, Forest residue
3.3 Industrial waste
3.4 MSW – Conversion devices
3.5 Incinerators, gasifiers, digestors.

Unit 2: Biomass Pyrolysis

2.1 Pyrolysis – Types, slow fast
2.2 Manufacture of charcoal, Methods, Yields and application
2.3 Manufacture of pyrolytic oils and gases, yields and applications.

Unit 3: Biomass Gasification:

a. Gasifiers – Fixed bed system – Downdraft and updraft gasifiers
b. Fluidized bed gasifiers
c. Design, construction and operation
d. Gasifier burner arrangement for thermal heating
e. Gasifier engine arrangement and electrical power
f. Equilibrium and kinetic consideration in gasifier operation.

Unit 4: Biomass Combustion:

a. Biomass stoves – Improved chullahs, types, some exotic designs
b. Fixed bed combustors, Types, inclined grate combustors
c. Fluidized bed combustors, Design, construction and operation
d. Operation of all the above biomass combustors.

Unit 5: Biogas

5.1 Properties of biogas (Calorific value and composition)
5.2 Biogas plant technology and status
5.3 Bio energy system - Design and constructional features
5.4 Biomass resources and their classification
5.5 Biomass conversion processes
5.6 Types of biogas Plants – Applications - Alcohol production from biomass

Unit 6: Thermo-chemical Conversion

6.1 Direct combustion - biomass gasification
6.2 Pyrolysis and liquefaction
6.3 Biochemical conversion - anaerobic digestion
6.4 Bio diesel production
6.5 Urban waste to energy conversion
6.6 Biomass energy programme in India.

Text/Reference Books:

1. Lisa Branchini, 2015, Waste to Energy, Springer
2. Shilpkar P &Shilpkar D, 2012, Handbook of Bio-gas Technology, Agrotech Publishing
3. D.S. Challal, 1992, FoodFeed and Fuel from Biomass, IBH Publishing Co. Pvt. Ltd.
4. Ashok V.Desai, Nonconventional Energy, 1990, New Age International Publishers
5. Marc J. Rogoff, Francois Screve, Waste to Energy Technologies and Project Implementation, 2nd Edition, Elsevier.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.Use of calculators will be allowed in the examination. However, only ordinary scientific calculators will be permissible.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-ID-006)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-ID-006.1	1	2	2	-	-	-	2	1	1

M-ID-006.2	1	2	-	-	1	-	2	1	1
M-ID-006.3	1	2	2	-	-	-	2	2	2
M-ID-006.4	2	2	1	-	-	-	1	2	2
M-ID-006.5	2	3	2	-	-	-	2	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCE-300 : DISSERTATION PHASE- I

Credits	10	Max. Marks	300
Lectures/Week	20 hrs	Continuous Evaluation	200
Examination Duration	3 hrs	End Semester Exams	100

Course Type: Dissertation

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

MCE-300.1	Develop acumen for higher education and research
MCE-300.2	Conduct Comprehensive literature survey in chosen area of research
MCE-300.3	Identify structural engineering/construction management/transportation engineering problems reviewing available literature.
MCE-300.4	Critically think in research study area
MCE-300.5	Formulate appropriate methodology to analyze complex structural systems.
MCE-300.6	Apply engineering and management principles through efficient handling of project

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following: Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Synopsis

Guidelines for Dissertation Phase – I

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include Springer/Science Direct. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

• Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.
• Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, a record of continuous progress.
• Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the phase-I work.

Distribution of Marks for Internal Assessment of Dissertation Phase-I

	Criteria	**Weightage**	**Marks**	
1	Attendance	20%	40	**Project Coordinator + Project Guide**
2	Projects Selection and Specification	20%	40	**Project Coordinator + Project Guide +DPC**
3	Literature review	20%	40	
4	Synopsis	20%	40	
5	Final Presentation and Viva	20%	40	
	Total	100%	200	

Note: Marks for all criteria mentioned above from Sr. No. 2 to 5 is separately given by both Project Guide and DPC out of max. marks mentioned against each criteria. The final calculation of total internal assessment for project is done as follows:

Marks obtained by student= A + (0.6*P)+(0.4*D)

Where A are the Marks Given on the Basis of Attendance against serial no. 1
P are the marks given by Project Guide out of Total marks against serial no. 2 to 5 and
D are the marks given by Departmental Project Committee out of Total marks against serial no. 2 to 5.

Distribution of Marks for External Assessment of Dissertation Phase - I			
	Criteria	**Weightage**	**Marks**
1	Synopsis	20%	20
2	Presentation	20%	20
3	Viva	60%	60
	Total	100%	100

Course Articulation Matrix

CO Statement(MCE-300)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-300.1	3	1	1	1	1	1	3	3	3
MCE-300.2	2	-	2	-	-	1	3	2	2
MCE-300.3	3	2	1	1	1	2	1	3	3
MCE-300.4	3	-	-	3	1	1	1	2	2
MCE-300.5	3	3	3	3	2	-	1	1	1
MCE-300.6	2	1	3	3	3	2	1	3	3

SEMESTER-IV

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCE-400 : DISSERTATION PHASE- II

Credits	16	Max. Marks	600
Lectures/Week	32 hrs	Continuous Evaluation	400
Examination Duration	3 hrs	End Semester Exams	200

Course Type: Dissertation

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

MCE-400.1 Develop Study and research Methodology
MCE-400.2 Conduct Laboratory / Field Studies
MCE-400.3 Solve complex structural/construction management/transportation engineering problems by applying appropriate techniques and tools.
MCE-400.4 Exhibit good communication skill to the engineering community and society.
MCE-400.5 Develop understanding of technical dissertation presentation and writing.
MCE-400.6 Demonstrate professional ethics and work culture.

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following: Literature survey Problem Definition

- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – II

- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.

• Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work.

Distribution of Marks for Internal Assessment of Dissertation Phase - II

	Criteria		Weightage	Marks	
1	Attendance		10%	40	**Project Coordinator + Project Guide**
2	Design of Project		20%	80	**Project Coordinator + Project Guide +DPC**
3	Implementation of Project		20%	80	
4	Testing & Evaluation		10%	40	
5	Project Report	Organization and Clarity	10%	40	
		Contents	10%	40	
6	Final Presentation and Viva		20%	80	
	Total		100%	400	

Note: Marks for all criteria mentioned above from Sr. No. 2 to 6 is separately given by both Project Guide and DPC out of max. marks mentioned against each criteria. The final calculation of total internal assessment for project is done as follows:

Marks obtained by student= A + (0.6*P)+(0.4*D)

Where A are the Marks Given on the Basis of Attendance against serial no. 1
P are the marks given by Project Guide out of Total marks against serial no. 2 to 6 and
D are the marks given by Departmental Project Committee out of Total marks against serial no. 2 to 6.

Distribution of Marks for External Assessment of Dissertation Phase - II			
	Criteria	**Weightage**	**Marks**
1	Project Report	20%	40
2	Presentation	20%	40
3	Viva	60%	120
	Total	100%	200

Course Articulation Matrix

CO Statement (MCE-400)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
MCE-400.1	3	1	1	1	1	1	3	3	3
MCE-400.2	2	-	-	-	-	1	3	2	2

MCE-400.3	3	2	1	1	1	2	1	3	3
MCE-400.4	-	3	3	3	1	-	-	2	2
MCE-400.5	-	3	3	3	2	-	1	1	1
MCE-400.6	-	1	3	3	3	-	1	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-001: STRESS MANAGEMENT BY YOGA

Credits		Audit Pass	Max. Marks 100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-002.1 Develop health mind in a healthy body thus improving social health.

M-MC-002.2 Improve efficiency

PART-A

Unit 1: Introduction

a. Definitions of Eight parts of yog. (Ashtanga)

Unit 2: Do's &Don't's

2.1 Yam and Niyam

2.2 Do's and Don't's in life

Unit 3: Preachings

3.1 Ahinsa, satya, astheya, bramhacharya and aparigraha

3.2 Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

PART-B

Unit 4: Asans

4.1 Ahinsa, satya, astheya, bramhacharya and aparigraha

Unit 5: Benefits

5.1 Various yoga poses and their benefits for mind and body

Unit 6: Breathing Techniques

6.1 Regularization of breathing techniques and its effects-Types of pranayam

Text Books/ Reference Books:

1. K.N.Udupa, 2007, Stress and Its Management by Yoga, Motilal Banarsi dass Publishers
2. Swami Vivekananda, 1998, Raja Yoga Conquering the Nature, Vedanta Pr.
3. B.K.S. Iyenger, 2018, Yoga for Everyone, Dorling Kindersley
4. Swami SaytanandaSaraswati, 2013, Asana Pranayama, Mudra Bandha, Bihar School of Yoga
5. Stuart Ray Sarbacker, Kevin Kimple, 2015, The Eight Limbs of Yoga, North Point Press

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%

Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-001)	**PO1**	**PO2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**
M-MC-001.1	3	3	1	1	1	1	1	3	2
M-MC-001.2	3	3	-	1	1	-	2	1	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-002: ENGLISH FOR RESEARCH PAPER WRITING

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-002.1 Demonstrate how to apply technical information and knowledge in practical documents for professional audiences and public audiences.
M-MC-002.2 Develop writing skills and level of readability
M-MC-002.3 Distinguish the section details of a research paper
M-MC-002.4 Develop professional format features in print, html, and multimedia modes with appropriate nonverbal cues and visual aids.
M-MC-002.5 Frame a good quality of research paper

PART-A

Unit 1: Introduction

1.1 Planning and Preparation
1.2 Word Order
1.3 Breaking up long sentences, Structuring Paragraphs and Sentences
1.4 Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 2: Paper Framing

2.1 Clarifying Who Did What, Highlighting Your Findings
2.2 Hedging and Criticising
2.3 Paraphrasing and Plagiarism
2.4 Sections of a Paper
2.5 Abstracts
2.6 Introduction.

Unit 3: Literature Review

3.1 Review of the Literature
3.2 Methods
3.3 Results and Discussion
3.4 Conclusions
3.5 The Final Check

PART-B

Unit 4: Skill Application

4.1 Key skills needed when writing a Title

4.2 Key skills needed when writing an Abstract
4.3 Key skills needed when writing an Introduction
4.4 Skills needed when writing a Review of the Literature

Unit 5: Content Development

5.1 Skills needed when writing the Methods
5.2 Skills needed when writing the Results
5.3 Skills needed when writing the Discussion
5.4 Skills needed when writing the Conclusions

Unit 6: Ensuring Paper Quality

6.1 Useful phrases
6.2 How to ensure paper is as good as it could possibly be the first- time submission

Text Books/ Reference Books:

1. R. Goldbort, 2006, Writing for Science, Yale University Press (available on Google Books)
2. Day R, 2006, How to Write and Publish a Scientific Paper, Cambridge University Press
3. N.Highman, 1998, Handbook of Writing for the Mathematical Sciences, SIAM.Highman's book .
4. Adrian Wallwork ,2011, English for Writing Research Papers, Springer New York Dordrecht Heidelberg
5. Dr.Pawan Singh, 2019,Dr.Baseem Khan, Writing Quality Research Papers, BPB Publishers

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-002)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO 2
M-MC-002.1	1	3	3	2	1	2	1	2	2
M-MC-002.2	-	3	1	1	1	-	1	-	-
M-MC-002.3	2	-	-	-	-	-	2	2	2
M-MC-002.4	1	1	1	1	-	1	1	2	2
M-MC-002.5	2	2	2	2	2	-	2	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-003: DISASTER MANAGEMENT

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-003.1 Describe foundations of hazards, disasters and associated natural/social phenomena

M-MC-003.2 Demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

M-MC-003.3 Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

M-MC-003.4 Exhibit standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

M-MC-003.5 Assess strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

M-MC-003.6 Conduct independent DM study including data search, analysis and presentation of disaster case study

PART -A

Unit 1: Introduction

1.1 Disaster: Definition, Factors and Significance
1.2 Difference Between Hazard and Disaster
1.3 Natural And Manmade Disasters: Difference, Nature, Types and Magnitude

Unit 2: Repercussions of Disasters and Hazards

2.1 Economic Damage, Loss of Human and Animal Life
2.2 Destruction of Ecosystem
2.3 Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches
2.4 Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War And Conflicts

Unit 3: Disaster Prone Areas in India

3.1 Study of Seismic Zones
3.2 Areas Prone to Floods and Droughts, Landslides and Avalanches
3.3 Areas Prone to Cyclonic and Coastal Hazards With Special Reference To Tsunami
3.4 Post-Disaster Diseases and Epidemics

PART -B

Unit 4: Disaster Preparedness And Management

4.1 Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard

4.2 Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies
4.3 Media Reports: Governmental and Community Preparedness

Unit 5: Risk Assessment

5.1 Disaster Risk: Concept and Elements
5.2 Disaster Risk Reduction, Global and National Disaster Risk Situation
5.3 Techniques Of Risk Assessment
5.4 Global Co-Operation In Risk Assessment And Warning
5.5 People's Participation In Risk Assessment
5.6 Strategies for Survival

Unit 6: Disaster Mitigation

6.5 Meaning, Concept and Strategies of Disaster Mitigation
6.1 Emerging Trends in Mitigation
6.2 Structural Mitigation and Non-Structural Mitigation
6.3 Programs of Disaster Mitigation in India

Text Books/ Reference Books:

4. R. Nishith, Singh AK, Disaster Management in India: Perspectives, issues and strategies 'New Royal book Company.
5. P. Sahni et.al. (Eds.), Disaster Mitigation Experiences And Reflections, Prentice Hall of India, New Delhi.
6. S.L. Goel, Disaster Administration And Management Text And Case Studies ,Deep & Deep Publication Pvt. Ltd., New Delhi.
7. P. Kumar, Dhrub Mittal, 2019, Disaster Management, Preparedness, Response, Recovery, Oakbridge Publications
8. Dr.Mrinalinin Pandey, 2014, Disaster Management, Wiley India Private Limited

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-003)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO 2
M-MC-003.1	1	-	3	2	-	1	-	1	1
M-MC-003.2	3	3	2	2	1	1	2	1	1
M-MC-003.3	3	-	-	-	-	-	-	3	1
M-MC-003.4	-	1	1	2	3	2	1	-	-
M-MC-003.5	3	-	2	2	2	-	1	1	1
M-MC-003.6	2	2	2	2	1	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-004: SANSKRIT FOR TECHNICAL KNOWLEDGE

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-004.1 To get a working knowledge of Sanskrit, the scientific language in the world
M-MC-004.2 Apply learning of Sanskrit to improve brain functioning
M-MC-004.3 Explore the huge knowledge from ancient literature
M-MC-004.4 Enhance memory power

PART-A

Unit 1: Introduction

1.1 Alphabets

Unit 2: Tenses

2.1 Past
2.2 Present
2.3 Future

Unit 3: Sentence Framing

3.1 Simple sentences

PART-B

Unit 4: Sanskrit Roots

4.1 Order
4.2 Introduction of roots

Unit 5: Literature about Information

5.1 Technical information about Sanskrit Literature

Unit 6: Technical Concepts

6.1 Technical concepts of Engineering-Civil, Electrical, Mechanics, Architecture, Mathematics

Text Books/ Reference Books:

1. Michael Coulson, 2010, Complete Sanskrit, A Comprehensive Guide to Reading and Understanding Sanskrit, Teach Yourself
2. Suresh Soni, India's Glorious Scientific Tradition, Ocean Books Private Limited, New Delhi

3. Deeksha-VempatiKutumbshashashtri, Teach Yourself Sanskrit, Rashtriya Sanskrit Sansthanam, New Delhi Publications
4. M.R.Kale, 2015, A Higher Sankrit Grammer, Motilal Banarsi dass Publishers
5. Acharya Ratnakar, 2015, Sanskrit for English Speaking People, Motilal Banarsi dass Publishers

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-004)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-MC-004.1	1	-	2	2	-	1	-	1	1
M-MC-004.2	2	2	2	2	1	1	2	1	1
M-MC-004.3	2	-	-	-	-	-	-	3	1
M-MC-004.4	-	1	1	2	2	2	1	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-005: VALUE EDUCATION

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-005.1 Relate to value of education and self-development
M-MC-005.2 Learn the importance of human values
M-MC-005.3 Utilize the concepts of behaviour development
M-MC-005.4 Enhance overall personality development

PART-A

Unit 1: Introduction

1.2 Values and self-development
1.3 Social values and individual attitudes
1.4 Work ethics
1.5 Indian Vision of humanism

Unit 2: Morals

2.1 Moral and non-moral valuation
2.2 Standards and principles
2.3 Value judgements

Unit 3: Importance of Values

3.1 Importance of cultivation of values
3.2 Sense of duty, devotion, self-reliance
3.3 Confidence, concentration, truthfulness, cleanliness
3.4 Honesty Humanity, power of faith, National unity
3.5 Patriotism, love for nature, discipline

PART-B

Unit 4: Personality Development

4.1 Soul and scientific attitude, positive thinking, integrity and discipline
4.2 Punctuality, love and kindness
4.3 Avoid fault thinking, free from anger, dignity of labour
4.4 Universal brotherhood and religious tolerance
4.5 True friendship, happiness vs suffering, love for truth

Unit 5: Behaviour Development

5.1 Aware of self-destructive habits
5.2 Association and cooperation, Doing best for saving nature

5.3 Character and competence-True friendship, happiness vs suffering, love for truth
5.4 Aware of self-destructive habits
5.5 Association and cooperation
5.6 Doing best for saving nature

Unit 6: Faith

6.1 Character and competence-Holy books vs Blind faith
6.2 Self-management and good health
6.3 Science of reincarnation
6.4 Equality, non-violence, humility, role of women
6.5 All religions and same message,
6.6 Mind your mind, self-control
6.7 Honesty, studying effectively.

Text Books/ Reference Books:

1. S.K.Chakraborty, 1999, Values and Ethics for Organizations-Theory and Practice, Oxford University Press
2. A.B.Rao, 2007, Business Ethics and Professional Values, Excel Books
3. G.B. Jyotsna, R.C.Joshi, 2019, Business Ethics and Corporate Governance, McGraw Hill
4. Dr.PriyankaKaushik Sharma, 2016, Corporate Governance-Business Ethics and CSR, Galgotia Publishing Company
5. Jayshree Suresh, B.S.Raghvan, 2003, Human Values and Professional Ethics, S.Chand.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-005)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-MC-005.1	1	-	2	2	-	1	-	1	1
M-MC-005.2	2	2	2	2	1	1	2	1	1
M-MC-005.3	2	-	-	-	-	-	-	3	1
M-MC-005.4	-	1	1	2	2	2	1	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-006: CONSTITUTION OF INDIA

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-006.1 Relate to premise informing the twin themes of liberty and freedom from a civil rights perspective
M-MC-006.2 Discuss the growth of the demand for civil rights in India for the bulk of Indian before the arrival of Gandhi in Indian politics
M-MC-006.3 Understand the intellectual origin of the framework of argument that informed the conceptualization of social reforms leading to revolution in India
M-MC-006.4 Comprehend the circumstances surrounding the foundation of the Congress Socialist Party (CS) under the leadership of Jawaharlal Nehru
M-MC-006.5 Relate to the passage of the Hindu Code Bill of 156

PART-A

Unit 1: History and making of the Indian Constitution

1.1 History
1.2 Drafting committee (composition and working)

Unit 2: Philosophy of Indian Constitution

2.1 Preamble
2.2 Salient features

Unit 3: Contours of Constitutional Rights and Duties

3.1 Fundamental rights
3.2 Right to Equality
3.3 Right to Freedom
3.4 Right against Exploitation
3.5 Right to Freedom of Religion
3.6 Cultural and Educational Rights
3.7 Right to Constitutional Remedies
3.8 Directive Principle of State Policy
3.9 Fundamental Duties

PART-B

Unit 4: Organs of Governance

4.1 Parliament
4.2 Composition
4.3 Qualifications and Disqualifications
4.4 Power and functions
4.5 Executive
4.6 President
4.7 Governor
4.8 Council of Ministers
4.9 Judiciary, Appointment and Transfer of Judges, Qualifications
4.10 Powers and functions

Unit 5: Local Administration

5.1 District's Administration head;role and importance
5.2 Municipalities: Introduction, Mayor and role of Elected representative CEO of Municipal Corporation
5.3 Panchayati raj: introduction, PRI, Zila Panchayat
5.4 Elected officials and their roles, CEO, Zila Panchayat: Position and role
5.5 Block level; organizational hierarchy (different departments)
5.6 Village level; Role of elected and appointed officials
5.7 Importance of grass root democracy

Unit 6: Election Commission

6.1 Role and functioning
6.2 Chief Election Commissioner and Election Commissioners
6.3 State Election Commission: Role and Functioning
6.4 Institute and Bodies for the welfare of SC/ST/OBC and women

Text Books/ Reference Books:

1. The Constitution of India, 1950, Bare Act, Government Publication
2. Granville Austin, 1999, The Indian Constitution-Cornerstone of a Nation, Oxford
3. Dr.S.N.Busi, Dr.B.R.Ambedkar, 2016, Framing of Indian Constitution, Ava Publishers
4. Subhash C Kashyap, 2019, Constitution of India- A handbook for students, Vitasta Publishing Pvt. Ltd.
5. Durga Das Basu, 2019,Introduction to the Constitution of India, 2th Edition, Lexis Nexis

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-006)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-MC-006.1	1	-	2	2	-	1	-	1	1
M-MC-006.2	2	2	2	2	1	1	2	1	1
M-MC-006.3	2	-	-	-	-	-	-	3	1
M-MC-006.4	-	1	1	2	2	2	1	-	-
M-MC-006.5	2	-	2	-	1	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-007: PEDAGOGY STUDIES

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

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

M-MC-007.1: Apply pedagogical practices being used by teachers in formal and informal classrooms.
M-MC-007.2: Utilise the effectiveness of pedagogical practices
M-MC-007.3: Contrast the curriculum and guidance materials support pedagogy
M-MC-007.4: Identify critical evidence gaps to guide the development.

PART -A

Unit 1: Introduction and Methodology

1.1 Aims and rationale, Policy background, Conceptual framework and terminology
1.2 Theories of learning, Curriculum, Teacher education
1.3 Conceptual framework, Research questions**.**
1.4 Overview of methodology and Searching.

Unit 2: Thematic overview

2.1 Pedagogical practices are being used by teachers in formal and informal classrooms in Developing countries
2.2 Curriculum, Teacher education

Unit 3: Pedagogical Practices
3.1 Evidence on the effectiveness of pedagogical practices
3.2 Methodology for the in-depth stage: quality assessment of included studies
3.3 Teachereducation(curriculumandpracticum)andtheschoolcurriculumand guidance materials

Unit 4: Theory of Change

4.1.1 Strength and nature of the body of evidence for effective pedagogical practices.
4.1.2 Pedagogic theory and pedagogical approaches.
4.1.3 Teachers' attitudes and beliefs and Pedagogic strategies

Unit 5: Professional Development

5.1 Professional development: Alignment with classroom practices and follow-up support
5.2 Peer support
5.3 Support from the head teacher and the community.
5.4 Curriculum and assessment
5.5 Barriers to learning: limited resources and large class sizes

Unit 6: Research gaps and future directions

6.1 Research design
6.2 Contexts
6.3 Pedagogy
6.4 Teacher education
6.5 Curriculum and assessment
6.6 Dissemination and research impact

Text Books/ Reference Books:

1. Ackers J, Hardman F , 2001, Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M, 2004, Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. K. Akyeampong, 2003, Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. K. Akyeampong, Lussier K, Pryor J, Westbrook J, 2013, Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. R.J. Alexander, 2001, Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. ChavanM , 2003, Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-007)	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-MC-007.1	1	-	2	2	-	1	-	1	1

M-MC-007.2	2	2	2	2	1	1	2	1	1
M-MC-007.3	2	-	-	-	-	-	-	3	1
M-MC-007.4	-	1	1	2	2	2	1	-	-
M-MC-007.5	2	-	2	-	1	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

M-MC-008: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Credits	Audit Pass	Max. Marks	100
L-T-P	2-0-0	Continuous Evaluation	50
Examination Duration	2hrs	End Semester Examination	50

Course Type: Audit Pass Course

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

M-MC-008.1 Achieving the highest goals of life through the readings of Shrimad-Bhagwad-Geeta

M-MC-008.2 Leading the mankind to peace through the study of Geeta

M-MC-008.3 Developing a versatile personality through the study of Neetishatakam

PART-A

Unit 1: Introduction

1.1 Verses- 19,20,21,22 (wisdom)
1.2 Verses- 29,31,32 (pride & heroism)

Unit 2: Neetisatakam-Holistic Development of Personality

2.1 Verses- 26,28,63,65 (virtue)
2.2 Verses- 52,53,59 (dont's)
2.3 Verses- 71,73,75,78 (do's)

Unit 3: ShrimadBhagwadGeeta

3.1 Chapter 2-Verses 41, 47,48,
3.2 Chapter 3-Verses 13, 21, 27, 35

PART-B

Unit 4: Approach

4.1 Chapter 6-Verses 5,13,17, 23, 35
4.2 Chapter 18-Verses 45, 46,48

Unit 5: Basic Knowledge

5.1 Statements of basic knowledge
5.2 Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62,68
5.3 Chapter 12 -Verses 13, 14, 15, 16,17,18

Unit 6: Personality of Role model. Shrimad Bhagwad Geeta

6.1 Chapter2-Verses 17, Chapter 3-Verses 36,37,42
6.2 Chapter 4-Verses 18, 38,39
6.3 Chapter18 – Verses 37,38,63

Text Books/ Reference Books:

1. Swami Swarupananda, 2016, Srimad Bhagavad Gita, Advaita Ashram (Publication Department), Kolkata
2. P.Gopinath, 2010, Three Satakam of Bharatrhari (Niti, Srngara, Vairagya), Rashtriya Sanskrit Sansthanam, New Delhi

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (M-MC-008)	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2
M-MC-008.1	1	-	2	2	-	1	-	1	1
M-MC-008.2	2	2	2	2	1	1	2	1	1
M-MC-008.3	2	-	-	-	-	-	-	3	1
M-MC-008.4	-	1	1	2	2	2	1	-	-
M-MC-008.5	2	-	2	-	1	1	2	1	1

Appendix A: List of courses having relevance to the Local/Regional, National and Global Development needs

Course Code	Course Name	Regional	National	Global
MCE-SE-101	Advanced Structural Analysis	✓		
MCE-CM-101	Project Planning and Control	✓		
MCE-TE-101	Traffic Engineering	✓		
MCE-SE-102	Advanced Solid Mechanics	✓		
MCE-CM-102	Construction Contract Management		✓	
MCE-TE-102	Urban and Regional Transport Planning		✓	
MCE-101	Advanced Concrete Technology	✓	✓	
MCE-SE-151	Structural Design Lab	✓		
MCE-CM-151A	Planning & Scheduling Lab		✓	
MCE-TE-151	Traffic Engineering Lab	✓		
MCE-151	Construction Materials Lab		✓	
M- MC-100	Research Methodology and IPR			✓
M-MC-003	Disaster Management		✓	✓
MCE-SE-103	Theory of Thin Plates and Shells		✓	
MCE-SE-104	Design of Industrial Structures		✓	
MCE-SE-105	Theory of Structural Stability		✓	
MCE-CM-103	Quality Control and Safety in Construction		✓	
MCE-CM-104	Building Serviceability and Maintenance Management	✓	✓	
MCE-CM-105A	Construction of Tall Structures		✓	✓
MCE-TE-103	Advanced Railway Engineering		✓	
MCE-TE-104	Design and Maintenance of Pavements	✓	✓	
MCE-TE-105	Public Transportation Systems	✓	✓	
MCE-SE-106	Analytical and Numerical Methods for Structural Engineering		✓	
MCE-SE-107	Structural Health Monitoring	✓	✓	
MCE-SE-108	Structural Optimization	✓	✓	
MCE-CM-106	Energy Conservation Techniques in Building Construction			✓
MCE-CM-107	Human Resource Management in Construction		✓	
MCE-CM-108	Pavement Materials and Construction Techniques		✓	
MCE-TE-106	Road Construction Planning and Management	✓	✓	
MCE-TE-107	Transportation Economics and Finance	✓	✓	
MCE-SE-201	FEM in Structural Engineering		✓	
MCE-CM-201	Resource Management and Control in Construction			✓

MCE-TE-201	Geometric Design of Streets and Highways		✓	
MCE-SE-202A	Structural Dynamics	✓		
MCE-CM-202	Construction Economics and Finance		✓	
MCE-TE-202	Intelligent Transportation Systems	✓	✓	
MCE-201	Numerical Methods in Civil Engineering	✓	✓	
MCE-SE-251	Model Testing Lab	✓	✓	
MCE-CM-251	Computational lab		✓	
MCE-TE-251	Computational lab		✓	
MCE-251	Numerical Analysis Lab	✓		
MCE-200	Mini Project	✓		
M-MC-002	English for Research Paper Writing			✓
MCE-SE-203	Advanced Steel Design	✓	✓	
MCE-SE-204	Design of Formwork	✓	✓	
MCE-SE-205	Design of High Rise Structures	✓	✓	
MCE-SE-206	Design of Masonry Structures	✓		
MCE-202	Airport Planning and Design		✓	✓
MCE-203	Advanced Construction Technology			✓
MCE-CM-203	Formwork and Shuttering	✓		
MCE-CM-204	Reliability Analysis in Construction Management			✓
MCE-CM-205	Applied Statistics & Queuing Theory			✓
MCE-CM-206	Construction Project Management and BOT system		✓	
MCE-TE-203	Highway Sub-Grade and Foundation Analysis	✓	✓	
MCE-TE-204	Advanced Engineering Geology			✓
MCE-CM-205	Applied Statistics & Queuing Theory			✓
MCE-SE-207	Design of Advanced Concrete Structures	✓	✓	
MCE-SE-208	Advanced Design of Foundations	✓	✓	
MCE-SE-209	Soil Structure Interaction	✓	✓	
MCE-204	Modern Construction Techniques		✓	✓
MCE-CM-207	Legal Aspects in Construction Engineering		✓	
MCE-CM-208	Management Information Systems for Construction Management		✓	
MCE-CM-209	Entrepreneurship in Construction		✓	
MCE-TE-207	Geographic Information Systems			✓
MCE-TE-208	Advanced Design of Bridges		✓	
MCE-TE-209	Transportation Safety and Environment			✓
MCE-300	Dissertation Phase – I	✓	✓	✓
MCE-SE-301A	Design of Prestressed Concrete Structures	✓	✓	

MCE-SE-302	Analytical and Finite Element Analysis of Laminated Composite Plates		✓	
MCE-SE-303	Fracture Mechanics of Concrete Structures		✓	
MCE-SE-304	Design of Plates and Shells		✓	
MCE-301	Precast Construction Technology	✓	✓	✓
MCE-302	Retrofitting and Rehabilitation of Structures	✓	✓	
MCE-303A	Environmental Impact Assessment			✓
MCE-CM-301	Construction Equipments	✓		
MCE-CM-302	Total Quality Management in Construction		✓	
MCE-CM-303	Sustainable Building Construction			✓
MCE-CM-304	Thrust Areas in Project Management		✓	
MCE-TE-301	Transportation System Planning and Management		✓	
MCE-TE-302	Traffic Simulation Modelling and Application		✓	
MCE-TE-303	Application of Geosynthetics in pavements			✓
MCE-TE-304	Sustainable transportation			✓
MCE-400	Dissertation Phase II	✓	✓	✓

Appendix B: List of courses having focus on Employability, Entrepreneurship and Skill Development

Course Code	Course Name	Employability	Entrepreneurship	Skill Development
MCE-SE-101	Advanced Structural Analysis	✔		
MCE-CM-101	Project Planning and Control	✔		
MCE-TE-101	Traffic Engineering	✔		
MCE-SE-102	Advanced Solid Mechanics	✔		
MCE-CM-102	Construction Contract Management	✔		
MCE-TE-102	Urban and Regional Transport Planning	✔		
MCE-101	Advanced Concrete Technology	✔		
MCE-SE-151	Structural Design Lab			✔
MCE-CM-151A	Planning & Scheduling Lab			✔
MCE-TE-151	Traffic Engineering Lab			✔
MCE-151	Construction Materials Lab			✔
M- MC-100	Research Methodology and IPR	✔		
M-MC-003	Disaster Management	✔	✔	
MCE-SE-103	Theory of Thin Plates and Shells	✔		
MCE-SE-104	Design of Industrial Structures	✔		
MCE-SE-105	Theory of Structural Stability	✔		
MCE-CM-103	Quality Control and Safety in Construction		✔	
MCE-CM-104	Building Serviceability and Maintenance Management	✔	✔	
MCE-CM-105A	Construction of Tall Structures	✔		
MCE-TE-103	Advanced Railway Engineering	✔		
MCE-TE-104	Design and Maintenance of Pavements	✔		
MCE-TE-105	Public Transportation Systems		✔	
MCE-SE-106	Analytical and Numerical Methods for Structural Engineering			✔
MCE-SE-107	Structural Health Monitoring	✔	✔	
MCE-SE-108	Structural Optimization		✔	
MCE-CM-106	Energy Conservation Techniques in Building Construction	✔	✔	
MCE-CM-107	Human Resource Management in Construction		✔	
MCE-CM-108	Pavement Materials and Construction Techniques	✔	✔	
MCE-TE-106	Road Construction Planning and Management	✔	✔	
MCE-TE-107	Transportation Economics and Finance		✔	
MCE-SE-201	FEM in Structural Engineering	✔		

MCE-CM-201	Resource Management and Control in Construction		✔	
MCE-TE-201	Geometric Design of Streets and Highways	✔		
MCE-SE-202A	Structural Dynamics	✔		
MCE-CM-202	Construction Economics and Finance		✔	
MCE-TE-202	Intelligent Transportation Systems	✔		
MCE-201	Numerical Methods in Civil Engineering			✔
MCE-SE-251	Model Testing Lab			✔
MCE-CM-251	Computational lab			✔
MCE-TE-251	Computational lab			✔
MCE-251	Numerical Analysis Lab			✔
MCE-200	Mini Project			✔
M-MC-002	English for Research Paper Writing			✔
MCE-SE-203	Advanced Steel Design	✔		
MCE-SE-204	Design of Formwork	✔		
MCE-SE-205	Design of High Rise Structures	✔		
MCE-SE-206	Design of Masonry Structures	✔		
MCE-202	Airport Planning and Design	✔		
MCE-203	Advanced Construction Technology		✔	
MCE-CM-203	Formwork and Shuttering		✔	
MCE-CM-204	Reliability Analysis in Construction Management		✔	
MCE-CM-205	Applied Statistics & Queuing Theory		✔	
MCE-CM-206	Construction Project Management and BOT system	✔	✔	
MCE-TE-203	Highway Sub-Grade and Foundation Analysis			✔
MCE-TE-204	Advanced Engineering Geology		✔	
MCE-CM-205	Applied Statistics & Queuing Theory		✔	
MCE-SE-207	Design of Advanced Concrete Structures	✔		
MCE-SE-208	Advanced Design of Foundations	✔		
MCE-SE-209	Soil Structure Interaction	✔		
MCE-204	Modern Construction Techniques		✔	
MCE-CM-207	Legal Aspects in Construction Engineering		✔	
MCE-CM-208	Management Information Systems for Construction Management		✔	
MCE-CM-209	Entrepreneurship in Construction		✔	

MCE-TE-207	Geographic Information Systems	✔		
MCE-TE-208	Advanced Design of Bridges	✔		
MCE-TE-209	Transportation Safety and Environment		✔	
MCE-300	Dissertation Phase – I		✔	
MCE-SE-301A	Design of Prestressed Concrete Structures	✔		
MCE-SE-302	Analytical and Finite Element Analysis of Laminated Composite Plates		✔	
MCE-SE-303	Fracture Mechanics of Concrete Structures			
MCE-SE-304	Design of Plates and Shells	✔		
MCE-301	Precast Construction Technology	✔		
MCE-302	Retrofitting and Rehabilitation of Structures	✔		
MCE-303A	Environmental Impact Assessment	✔	✔	
MCE-CM-301	Construction Equipments		✔	
MCE-CM-302	Total Quality Management in Construction		✔	
MCE-CM-303	Sustainable Building Construction	✔		
MCE-CM-304	Thrust Areas in Project Management	✔		
MCE-TE-301	Transportation System Planning and Management	✔		
MCE-TE-302	Traffic Simulation Modelling and Application	✔		
MCE-TE-303	Application of Geosynthetics in pavements		✔	
MCE-TE-304	Sustainable transportation	✔		
MCE-400	Dissertation Phase II		✔	

Appendix C: List of Courses having focus on Environment and Sustainability, Professional Ethics, Human Values and Gender Equality

Course Code	Course Name	Environment and Sustainability	Professional Ethics	Human Values	Gender Equality
MCE-SE-101	Advanced Structural Analysis				
MCE-CM-101	Project Planning and Control	✓			
MCE-TE-101	Traffic Engineering	✓			
MCE-TE-102	Urban and Regional Transport Planning	✓			
M- MC-100	Research Methodology and IPR		✓		
M-MC-003	Disaster Management	✓		✓	
MCE-CM-103	Quality Control and Safety in Construction	✓	✓	✓	
MCE-CM-104	Building Serviceability and Maintenance Management	✓			
MCE-CM-106	Energy Conservation Techniques in Building Construction	✓			
MCE-CM-107	Human Resource Management in Construction			✓	✓
MCE-CM-201	Resource Management and Control in Construction			✓	
MCE-CM-209	Entrepreneurship in Construction		✓		
MCE-301	Precast Construction Technology	✓			
MCE-302	Retrofitting and Rehabilitation of Structures	✓			
MCE-303A	Environmental Impact Assessment	✓	✓		
MCE-CM-302	Total Quality Management in Construction	✓			
MCE-CM-303	Sustainable Building Construction	✓			
MCE-TE-302	Traffic Simulation Modelling and Application	✓			
MCE-TE-303	Application of Geosynthetics in pavements	✓			
MCE-TE-304	Sustainable transportation	✓			