Scheme & Syllabus

(Choice Based Credit System)

For

M.Tech. Programme in Civil Engineering
Specializations: Environmental Engineering, Highways &Transportation Engineering, Infrastructure Development& Management, Soil & Foundation Engineering, Structural Engineering, Building Construction Management, Water Resource Engineering

(w.e.f.Session2019-20)

Program Code: CIV 401

DEPARTMENT OF CIVIL ENGINEERING

SCHOOLOFENGINEERING

RIMT UNIVERSITY, MANDI GOBINDGARH, PUNJAB

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SECTION1

Vision &Mission of the University

VISION

- To become one of the most preferred learning places and a centre of excellence to promote and nurture future leaders who would facilitate the desired change in the society.

MISSION

- To impart teaching and learning through cutting-edge technologies supported by the world class infrastructure
- To empower and transform young minds into capable leaders and responsible citizens of India instilled with high ethical and moral values.
- To develop human potential to its fullest extent and make them emerge as world class leaders in their professions and enthuse them towards their social responsibilities.

SECTION2

Vision and Mission of the Department

VISION

- Through excellence in technical education, research, and innovation become an internationally renowned technical department for human resource development.

MISSION

- Providing a scholarly atmosphere for Undergraduate, Post Graduate and Doctoral programmes while dissemination knowledge through leading edge research.
- Designing academic programmes and methods with dynamism, innovation, and flexibility.
- Engaging in joint initiatives with industry for the advancement and benefit of society.
- Creating morally competent, compassionate, and innovative world leaders.

SECTION3

About the Program

M.Tech (Civil Engineering) or Master of Technology in Civil Engineering is a Post-Graduate Civil Engineering course. The Civil Engineering program encompasses tasks such as planning, overseeing, and constructing public works such as roads, bridges, tunnels, buildings, airports, dams, water works, sewage systems, ports, and so on, and provides a variety of difficult professional options.. This course basically provides students a platform with which they will be able to discover the extent to shape up the buildings, dams, roads, railways and repair the existing constructions to develop societies and cities. With the help of this course, students will be able to acquire knowledge which is very important to build and manage all the Civil related work.

SECTION 4

Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PROGRAMME EDUCATION OBJECTIVES (PEOs)

PEO1 To mould the students to become effective global science students in the competitive environment of modern society.

PEO2 To provide students with strong foundation in contemporary practices of Science, different functional areas and scientific environment.

PEO3 To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in range of professions.

PEO4 To develop communication, analytical, decision-making, motivational, leadership, problem solving and human relations skills of the students.

PEO5 To inculcate professional and ethical attitude in students.

PEO6 To pursue lifelong learning as a means of enhancing knowledge and skills necessary to contribute to the betterment of profession

Program Outcome (POs)

M.Tech -Structural Engineering

Program Outcomes

PO1 An ability to independently carry out research /investigation and development work to solve practical problems.

PO2 An ability to write and present a substantial technical report/document.

PO3 Students should be able to demonstrate a degree of mastery for designing and solving structural engineering problems.

PO4 An ability to use appropriate modern tools in structural engineering. In doing so he should demonstrate sufficient knowledge of competing tools and their relative merits and demerits.

PO5 An ability to demonstrate the traits of learning and unlearning throughout his professional career, and be willing to learn new techniques, methods and processes.

PO6 To impart practical knowledge to become a responsible engineer adhering to all established practices of his profession.

M.Tech – Soil & Foundation Engineering / Geotechnical Engineering

Program Outcomes

PO1 Independently carry out research/investigation and development work to solve practical problems.

PO2 Write and present a substantial technical report/document.

PO3 Demonstrate a degree of mastery over geotechnical engineering.

PO4 Identify Engineering solutions to problematic soils and provide suitable foundation.

PO5 Apply modern tools for designing geo technical structures.

PO6 Work in inter-disciplinary engineering teams with social responsibility and ethical values and pursue lifelong learning.

M.Tech – Highway and Transportation Engineering

Program Outcomes

PO1 To impart the knowledge of planning, design, construction, maintenance, up gradation, and operation of the highways/Transportation Infrastructure

PO2 To develop innovative capability among students using modern equipment's and latest software so as to inculcate in them the ability to participate in creative and integrative activities in their relevant branch.

PO3 To create research aptitude among the students in the field of transportation engineering and its interdisciplinary areas.

PO4 Students should be able to understand how to implement construction process using effective and efficient project planning tools

M.Tech – Environmental Engineering

Program Outcomes

PO1 To equip the students with capabilities required for identifying, formulating and management of environmental issues/problems.

PO2 To impart training to the students to prepare them for conducting high value research on environmental engineering and other related issues and also to pursue lifelong learning.

PO3 To introduce the students to the environmental problems at international, national and regional level so that they get exposure to the burning issues.

PO4 To impart training to the students to gain capabilities for conducting joint collaborating works.

M.Tech – Infrastructure Development& Management

Program Outcomes

PO1 To impart knowledge to students in the latest technological aspects of Infrastructure projects and to provide them with opportunities in taking up advanced topics of the field of study.

PO2 To mould the graduate civil engineers to undertake safe, economical and sustainable infrastructure projects.

PO3 Critically assess the relevant technological issues**.**

PO4 Conduct experimental and/or analytical work and analyzing results using modern mathematical and scientific methods.

PO5 Formulate relevant research problems and critically assess research of their own and of others**.**

M.Tech – Building Construction Management

PO1 - Model professionalism in the construction industry through ethics and advocacy; team building; leadership; mentorship especially around supporting historically marginalized employees in the industry.

PO2 Evaluate the importance of jobsite safety and research strategies that can be used to build a culture of safety.

PO3 Research, implement, and evaluate construction processes using project planning methods and tools.

PO4 Assess concepts related to running sustainable projects in order to build sustainable business processes.

PO5 Recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

M.Tech – Water Resource Engineering

PO1 To utilize domain knowledge required for analyzing and resolving field problems of hydraulics and water resources.

PO2 Ability to write and present a substantial technical report of the comprehended problem and its

recommended solution.

PO3 Assess surface and groundwater resources

PO4 Plan water resources projects for meeting socio-economic and environmental needs

PO5 Analyze hydrologic extremes and adopt suitable management practices to minimize impacts

Program Specific Outcome (PSOs)

PSO 01: Development of professional skills in the area of Structural Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Geotechnical Engineering, Geo-informatics & Remote sensing, and Construction techniques & management

PSO 02: Application of relevant aspects of mathematics in engineering analysis and design.

PSO 03: Refurbishing of technical communication skills

PSO 04: Application of these principles and practices to problems related to Civil Engineering and other allied technical & industrial fields.

PSO 05: Work as design consultants in construction industry for the design of civil engineering structures.

SECTION-5

Curriculum / Scheme with Examination Grading Scheme

SEMESTER WISE SUMMARY OF THE PROGRAMME M.TECH (CIVIL ENGINEERING)

S.No	Semester	No. of Contact Hours	Marks	Credits
1	I	16	500	16
2	II	20	500	18
3	III	12	500	26
4	IV	00	100	20
	Total	**48**	**1600**	**80**

COURSECATEGORY-WISECREDIT DISTRIBUTION

S. No.	Category	Number of Credits	PercentageWeightage
1	UniversityCore		
2	UniversityOpen		
3	ProgramCore		
4	ProgramElective		
5	ProgramSpecialization		
6	MOOCs		
7	Project/ResearchProjects		
8	Thesis/Dissertation		
9	Training/Internships/FieldTrips		
10	ProfessionalSkills		
11	AnyOther(Fundamental)		
TOTAL CREDITS			

EXAMINATION GRADING SYSTEM

Marks Percentage Range	Grade	Grade Point	Qualitative Meaning
80-100	O	10	Outstanding
70-79	A^+	9	Excellent
60-69	A	8	Very Good
55-59	B^+	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Fail
0-39	F	0	Fail
ABSENT	AB	0	Fail

Percentage Calculation: CGPA*10

M.Tech -Structural Engineering
Program Outcomes

PO NO	Description
PO1	An ability to independently carry out research /investigation and development work to solve practical problems.
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery for designing and solving structural engineering problems.
PO4	An ability to use appropriate modern tools in structural engineering. In doing so he should demonstrate sufficient knowledge of competing tools and their relative merits and demerits.
PO5	An ability to demonstrate the traits of learning and unlearning throughout his professional career, and be willing to learn new techniques, methods and processes.
PO6	To impart practical knowledge to become a responsible engineer adhering to all established practices of his profession.

M.Tech – Soil & Foundation Engineering
Program Outcomes

PO NO	Description
PO1	Independently carry out research/investigation and development work to solve practical problems.
PO2	Write and present a substantial technical report/document.
PO3	Demonstrate a degree of mastery over geotechnical engineering.
PO4	Identify Engineering solutions to problematic soils and provide suitable foundation.
PO5	Apply modern tools for designing geo technical structures.
PO6	Work in inter-disciplinary engineering teams with social responsibility and ethical values and pursue lifelong learning.

M.Tech – Highway and Transportation Engineering
Program Outcomes

PO NO	Description
PO1	To impart the knowledge of planning, design, construction, maintenance, up gradation, and operation of the highways/Transportation Infrastructure
PO2	To develop innovative capability among students using modern equipment's and latest software so as to inculcate in them the ability to participate in creative and integrative activities in their relevant branch.
PO3	To create research aptitude among the students in the field of transportation engineering and its interdisciplinary areas.
PO4	Students should be able to understand how to implement construction process using effective and efficient project planning tools

M.Tech – Environmental Engineering
Program Outcomes

PO NO	Description
PO1	To equip the students with capabilities required for identifying, formulating and management of environmental issues/problems.
PO2	To impart training to the students to prepare them for conducting high value research on environmental engineering and other related issues and also to pursue lifelong learning.
PO3	To introduce the students to the environmental problems at international, national and regional level so that they get exposure to the burning issues.
PO4	To impart training to the students to gain capabilities for conducting joint collaborating works.

M.Tech – Infrastructure Development and Management
Program Outcomes

PO NO	Description
PO1	To impart knowledge to students in the latest technological aspects of Infrastructure projects and to provide them with opportunities in taking up advanced topics of the field of study.
PO2	To mould the graduate civil engineers to undertake safe, economical and sustainable infrastructure projects.
PO3	Critically assess the relevant technological issues.
PO4	Conduct experimental and/or analytical work and analyzing results using modern mathematical and scientific methods.
PO5	Formulate relevant research problems and critically assess research of their own and of others.

M.Tech – Building Construction Management
Program Outcomes

PO NO	Description
PO1	An ability to independently carry out research /investigation and development work to solve practical problems.
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
PO4	Students should be able to understand how to implement construction process using effective and efficient project planning tools, they will able to identify the activities and coordinate resources and create goals and objectives to complete individual task
PO5	Students should be able to understand how to use mathematics logic and technology to help effectively and efficiently analysis the project and solve problems required for technical tasks
PO6	Students should be able to understand concepts related to running sustainable projects and business

M.Tech – Water Resource Engineering
Program Outcomes

PO NO	Description
PO1	Graduates of the program will be able to demonstrate in depth knowledge of the discipline and build capability to apply that knowledge to water resources issues.
PO2	Program graduates will gain knowledge and skill in integrating water resources concepts across multiple disciplines.
PO3	Graduates will have the ability to employ technical knowledge and leadership skills to water resources research and consultancy problems.
PO4	Graduates of the WRE program will demonstrate the ability to carry out original and useful research in key areas of water resources engineering.
PO5	Program graduates will be able to identify and analyse the impact of water resources development project and find a suitable solution from number of alternatives.

Engineering Post graduate Programs
Master of Technology (M.Tech)
The Program Educational Objectives of M.Tech Program:

PEO NO	Description
PEO1	To mould the students to become effective global science students in the competitive environment of modern society.
PEO2	To provide students with strong foundation in contemporary practices of Science, different functional areas and scientific environment
PEO3	To develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in range of professions.
PEO4	To develop communication, analytical, decision-making, motivational, leadership, problem solving and human relations skills of the students.
PEO 5	To inculcate professional and ethical attitude in students.
PEO6	To pursue lifelong learning as a means of enhancing knowledge and skills necessary to contribute to the betterment of profession

M.TECH STUDY SCHEME – ENVIRONMENTAL ENGINEERING

Program : M. Tech. – Environmental Engineering **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-111	Environmental Chemistry		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM LAB		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE-149 Hydrology & Water Harvesting
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

Program : M. Tech. - Environmental Engineering **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-112	Physics of Environment		4	3	1		3		16		24	60		100
2	MTCE-113	Air pollution and control		4	3	1		3		16		24	60		100
3	MTCE-114	Industrial & Hazardous Waste Management		4	3	1		3		16		24	60		100
4	MTCE-115	Unit Processes & Operations -I		4	3	1		3		16		24	60		100
5	MTCE-132	Lab-2 (Advance Environment Lab)		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

Program : M. Tech. - Environmental Engineering **Total Credits: 26**
Department : Department of Civil Engineering **Contact Hours:12**
Year : 2nd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-116	Unit Processes & Operations-II		4	3	1		3		16		24	60		100
2	MTCE-1xx	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-183	Project		10							100				100
5	MTCE-182	Pre-thesis Seminar		4							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE-142 Construction and maintenance Mgt.
MTE : Mid Term Examination	MTCE-150 Energy through Water Utilization
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE-151 Environmental Standards & Laws
	MTCE-145 Composite Materials

Program : M. Tech. - Environmental Engineering **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2nd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

M.TECH STUDY SCHEME – HIGHWAYS & TRANSPORTATION ENGINEERING

Program : M. Tech. – Highways & Transportation Engineering **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-101	Bridge Engineering		4	3	1		3		16		24	60		100
3	MTCE-1XX	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM LAB		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE-146 Land use and Regional Transportation Planning
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

Program : M. Tech. - Highways & Transportation Engineering **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-107	Advanced Traffic Engineering		4	3	1		3		16		24	60		100
2	MTCE-108	Geometric Design of Transportation Infrastructure		4	3	1		3		16		24	60		100
3	MTCE-109	Pavement Material Characterization		4	3	1		3		16		24	60		100
4	MTCE-110	Pavement Analysis and Design		4	3	1		3		16		24	60		100
5	MTCE-131	Advance Material Testing lab		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

Program : M. Tech. - Highways & Transportation Engineering **Total Credits: 26**
Department : Department of Civil Engineering **Contact Hours:12**
Year : 2nd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-106	Advanced Foundation Engineering		4	3	1		3		16		24	60		100
2	MTCE-1XX	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-1XX	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-183	Project		10							100				100
5	MTCE-182	Pre-thesis Seminar		4							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE- 142 Construction and maintenance Mgt.
MTE : Mid Term Examination	MTCE-147 Pavement Management System
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE-148 Transportation system planning and management
	MTCE-145 Composite Materials

Program : M. Tech. - Highways & Transportation Engineering **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2nd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

M.TECH STUDY SCHEME – INFRASTRUCTURE DEVELOPMENT & MANAGEMENT

Program : M. Tech. – Infrastructure Development & Management **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-117	Principles and Practices of Management		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM LAB		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE-152 Management in Organization
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

Program : M. Tech. - Infrastructure Development & Management **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-118	Materials and Equipment Management		4	3	1		3		16		24	60		100
2	MTCE-119	Infrastructure Development and Management		4	3	1		3		16		24	60		100
3	MTCE-120	Project Management Systems and Techniques		4	3	1		3		16		24	60		100
4	MTCE-121	Quality, Safety and Environment Management		4	3	1		3		16		24	60		100
5	MTCE-131	Advance Material Testing lab		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

Program : M. Tech. - Infrastructure Development & Management **Total Credits: 26**
Department : Department of Civil Engineering **Contact Hours:12**
Year : 2nd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-122	Contracts Management		4	3	1		3		16		24	60		100
2	MTCE-1xx	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-183	Project		10							100				100
5	MTCE-182	Pre-thesis Seminar		4							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE-142 Construction and maintenance Mgt.
MTE : Mid Term Examination	MTCE-153 Construction Finance Management
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE-154 Joint Ventures And Privatization In Infrastructures Projects
	MTCE-145 Composite Materials

Program : M. Tech. - Infrastructure Development & Management **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2nd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

M.TECH STUDY SCHEME – SOIL & FOUNDATION ENGINEERING

Program : M. Tech. – Soil & Foundation Engineering **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-123	Advance Soil Mechanics		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM Lab		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE-158 Rock Mechanics
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

Program : M. Tech. - Soil & Foundation Engineering **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-124	Ground Improvement Techniques		4	3	1		3		16		24	60		100
2	MTCE-125	Sub-Surface geophysical methods		4	3	1		3		16		24	60		100
3	MTCE-126	Soil Dynamics and Machine Foundation		4	3	1		3		16		24	60		100
4	MTCE-127	Design of Road Pavements		4	3	1		3		16		24	60		100
5	MTCE-133	Advance Soil Testing Lab		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

Program : M. Tech. - Soil & Foundation Engineering **Total Credits: 26**
Department : Department of Civil Engineering **Contact Hours:12**
Year : 2nd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-106	Advanced Foundation Engineering		4	3	1		3		16		24	60		100
2	MTCE-1xx	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-183	Project		10							100				100
5	MTCE-182	Pre-thesis Seminar		4							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE-155 Earthen Embankment
MTE : Mid Term Examination	MTCE-143 Computer Aided design methods
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE-156 Applied Soil Mechanics
	MTCE-157 Environment Impact Asseesment

Program : M. Tech. - Soil & Foundation Engineering **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2nd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

M.TECH STUDY SCHEME – STRUCTURAL ENGINEERING

Program : M. Tech. – Structural Engineering **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-101	Bridge Engineering		4	3	1		3		16		24	60		100
3	MTCE-1XX	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM LAB		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE-140 Solid Mechanics
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

Program : M. Tech. - Structural Engineering **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-102	Dynamics of Structures		4	3	1		3		16		24	60		100
2	MTCE-103	Pre stressed Concrete structures		4	3	1		3		16		24	60		100
3	MTCE-104	Advanced Structural Analysis		4	3	1		3		16		24	60		100
4	MTCE-105	Plastic Analysis and design of steel Structures		4	3	1		3		16		24	60		100
5	MTCE-131	Advance Material Testing Lab		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

Program : M. Tech. - Structural Engineering **Total Credits: 26**
Department : Department of Civil Engineering **Contact Hours:12**
Year : 2nd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-106	Advanced Foundation Engineering		4	3	1		3		16		24	60		100
2	MTCE-1XX	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-1XX	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-183	Project		10							100				100
5	MTCE-182	Pre-thesis Seminar		4							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE-142 Construction and maintenance Mgt.
MTE : Mid Term Examination	MTCE-143 Computer Aided design methods
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE-144 High Rise Buildings
	MTCE-145 Composite Materials

Program : M. Tech. - Structural Engineering **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2nd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

IMT UNIVERSITY MANDI GOBINDGARH

M.TECH STUDY SCHEME – BUILDING CONSTRUCTION AND MANAGEMENT (REGULAR)

Program : M. Tech. – Building Construction and Management (Regular) **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-165	Advanced Construction Technology		4	3	1		3		16		24	60		100
3	MTCE-XXX	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM lab		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE157- Environment Impact Assessment
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

RIMT UNIVERSITY MANDI GOBINDGARH

Program : M. Tech. - Building Construction and Management (Regular) **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-122	Contracts Management		4	3	1		3		16		24	60		100
2	MTCE-166	Smart Materials & Buildings		4	3	1		3		16		24	60		100
3	MTCE-167	Buildings Planning & Design		4	3	1		3		16		24	60		100
4	MTCE-168	Construction Engineering And Management		4	3	1		3		16		24	60		100
5	MTCE-131	Advance Material Testing Lab		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

RIMT UNIVERSITY MANDI GOBINDGARH

Program : M. Tech. - Building Construction and Management (Regular) **Total Credits: 12**
Department : Department of Civil Engineering **Contact Hours:08**
Year : 2rd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-169	Project Safety Management		4	3	1		3		16		24	60		100
2	MTCE-XXX	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-XXX	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-182	Pre Thesis Seminar/		4							100				100
5	MTCE-183	Project		10							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE-142 Construction and Maintenance Mgt.
MTE : Mid Term Examination	MTCE-143 Computer Aided design methods
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE-159 Energy and Buildings
	MTCE- 160 Plumbing & Air Conditioning

RIMT UNIVERSITY MANDI GOBINDGARH

Program : M. Tech. - Building Construction and Management (Regular) **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2rd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

RIMT UNIVERSITY MANDI GOBINDGARH

M.TECH STUDY SCHEME – WATER RESOURCE ENGINEERING (Regular)

Program : M. Tech – Water resource Engineering **Total Credits: 16**
Department : Department of Civil Engineering **Contact Hours:16**
Year : 1st Year / 1st Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTRM-101	Operation Research and Methodology		4	3	1		3		16		24	60		100
2	MTCE-170	Advanced Hydrology		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective-I		4	3	1		3		16		24	60		100
4	MTRM-102	ORM LAB		2			4				100				100
5	MTCE-181	Seminar		2						100					100

CWA : Class Work Assessment	**Elective-I**
LWA : Lab Work Assessment	MTCE-157 Environmental Impact Assessment
MTE : Mid Term Examination	MTCE-141 Disaster Management
ETE : End Term Examination	
ETE : End Practical Examination	

RIMT UNIVERSITY MANDI GOBINDGARH

Program : M. Tech – Water resource Engineering **Total Credits: 18**
Department : Department of Civil Engineering **Contact Hours:20**
Year : 1st Year / 2nd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-171	Hydro-power Engineering		4	3	1		3		16		24	60		100
2	MTCE-172	Mechanics of Sediment Transportation		4	3	1		3		16		24	60		100
3	MTCE-173	Ground Water Hydrology		4	3	1		3		16		24	60		100
4	MTCE-174	Water Resources Planning & Management		4	3	1		3		16		24	60		100
5	MTCE-134	Advanced Fluid Mechanics Lab		2			4				100				100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

RIMT UNIVERSITY MANDI GOBINDGARH

Program : M. Tech – Water resource Engineering **Total Credits: 26**
Department : Department of Civil Engineering **Contact Hours:12**
Year : 2nd Year / 3rd Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-175	Design of Hydraulic Structures		4	3	1		3		16		24	60		100
2	MTCE-1xx	Elective-II		4	3	1		3		16		24	60		100
3	MTCE-1xx	Elective –III		4	3	1		3		16		24	60		100
4	MTCE-183	Project		10							100				100
5	MTCE-182	Pre-thesis Seminar		4							100				100

CWA : Class Work Assessment	**Elective-II**
LWA : Lab Work Assessment	MTCE- 161 Remote Sensing & GIS
MTE : Mid Term Examination	MTCE-150 Energy through Water Utilization
ETE : End Term Examination	**Elective –III**
ETE : End Practical Examination	MTCE- 155 Earthen Embankments
	MTCE- 162 Environmental Evaluation of Water Resources Projects

RIMT UNIVERSITY MANDI GOBINDGARH

Program : M. Tech – Water resource Engineering **Total Credits: 20**
Department : Department of Civil Engineering **Contact Hours:00**
Year : 2nd Year / 4th Semester

Teaching Scheme					Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
S.No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	MTCE-190	Thesis		20										100	100

CWA : Class Work Assessment
LWA : Lab Work Assessment
MTE : Mid Term Examination
ETE : End Term Examination
ETE : End Practical Examination

SUBJECT TITLE: OPERATION RESEARCH AND METHODOLOGY
SUBJECT CODE: MTRM-101
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective and Course Outcome:
Operation research is a scientific method of providing executive departments with a quantities basis for decisions regarding the operations under their control"

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction to Research: Meaning, Definition, Objective and Process Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature Design of Experiment: Basic Principal of Experimental Design, Randomized Block, Completely Randomized Block, Latin Square, And Factorial Design. Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal	**10**
SECTION-II	Sources of Data: Primary and Secondary, Validation of Data Data Collection Methods: Questionnaire Designing, Construction Sampling Design & Techniques – Probability Sampling and Non Probability Sampling Scaling Techniques: Meaning & Types Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability Validity: Content Validity, Criterion Related Validity and Construct Validity	**8**
SECTION-III	Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA	**12**
SECTION-IV	Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling Report Writing: Essentials of Report Writing, Report Format	**10**

Course Outcome:

CO1	Operation research provide tools to problems involving the operations of systems so as provide those in control of the operation with optimum solution to the problems.
CO2	Operation research is concerned with scientifically deciding how best to design and operate man machine systems usually under conditions requiring the allocation of & care resources.
CO3	Operation research is an aid for the executive in making his decisions by providing him with the needed quantitative information based on the scientific method of analysis.
CO4	Operation research in the most general sense can be characterized as the application of scientific methods techniques

Recommended Books:
1.R.I Levin and D.S. Rubin, 'Statistics for Management', 7thEdition, 2013.
2.N.K.Malhotra, 'Marketing Research–An Applied Orientation', 6th Edition, 2010.
3.C.R.Kothari, 'Research Methodology Methods & Techniques', 2nd Edition, 2014.

SUBJECT TITLE: ORM LAB
SUBJECT CODE: MTRM-102
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 100

Objective

To understand the limitations of particular research methods. Develop skills in qualitative and quantitative data analysis and presentation

Contents of Syllabus:

Contents	Contact Hours
Statistical Software: Application of Statistical Softwares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis *Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consist of Applications of Tests and Techniques Mentioned in The Research Methodology UNITs	40

Course Outcome:

CO1	Demonstrate the ability to choose methods appropriate to research aims and objectives
CO2	Understand the limitations of particular research methods. Develop skills in qualitative and quantitative data analysis and presentation
CO3	Develop advanced critical thinking skills.
CO4	Assess the basic function and working of analytical instruments used in research

Suggested Books

1.R.I Levin and D.S. Rubin, 'Statistics for Management', 7thEdition, 2013.
2.N.K.Malhotra, 'Marketing Research–An Applied Orientation', 6th Edition, 2010.
3.C.R.Kothari, 'Research Methodology Methods & Techniques', 2nd Edition, 2014.

SUBJECT TITLE: BRIDGE ENGINEERING
SUBJECT CODE: MTCE-101
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

The main aim of this course is to enable students to choose the appropriate bridge type for a givenproject, and to analyses and design the main components of the chosen bridge.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	General:-Bridge System, Considerations in alignment, Planning, Economic consideration, Aesthetics and selection of type of bridge (Review). Loading Standards:- Standards followed in India, U.K., U.S.A. and Europe	8
SECTION-II	Super Structure Analysis: Bridge deck analysis using different methods, Load distribution theories Courbon specifications for loading, Geometrical proportioning etc. of road, rail-cum-road bridges. Indian Road Congress (IRC) and Indian Railway Loading standards	10
SECTION-III	Connections: Design of different connections, Bearings and joints. Substructure Analysis and Design: Piers, Abutments, Wing walls and other appurtenant structures. Foundations: Well foundations and pile foundation, Design and construction and field problems	8
SECTION-IV	Construction & Maintenance: Erection of bridge super structure, Maintenance, Rating and Strengthening of existing bridges. Dynamics Behavior of bridges Discussion of code provisions for design of bridges for wind and earthquake forces. Long Span Bridges: General discussion of suspension and cable stayed bridges	10

Course Outcome:

CO1	Understand the concept of planning and investigation for bridges
CO2	Analyze and design superstructures for various types of rcc bridges
CO3	Analyze and design various types of substructures and foundations
CO4	Design and check the stability of piers and abutments

Recommended Books:

1. Essentials of Bridge Engineering 6th edition Publication 2016
2. Rangwala, S. C., “Bridge Engineering”, Charotar Publishing House Pvt. Ltd. 2009
3. Ponnuswamy, S. “Bridge Engineering”, McGraw Hill Education.2010

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SUBJECT TITLE: DYNAMICS OF STRUCTURES

SUBJECT CODE: MTCE-102
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

The objective is to provide the fundamental understanding of the structural dynamics and the problem solving ability for dynamic response in civil engineering design, analysis and research.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Single Degree of Freedom Systems: Fundamental, Mass spring damper system, Analysis of free vibrations, Response to harmonic loading, periodic loading, Impulsive loading and general dynamic loading. Generalized SDOF, Vibration analysis by Rayleigh method	8
SECTION-II	Multi Degree of Freedom Systems: Two degree of freedom system undamped, free & forced. And Multi-degree of freedom system, Hozler's method, Stodola's method, Orthogonality condition, Damped system. Dynamic analysis and Response- Modal Analysis, Response spectrum analysis, Rayleigh's- Ritz method	10
SECTION-III	Structures with Distributed Mass And Load: Axial, shear and transverse vibration due to bending of beams, Uniform shear beam, Beam in bending, Numerical techniques for shear beam, Bending of beams, Forced vibration, Plates or slabs subjected to normal loads	12
SECTION-IV	Earthquake Motion And Response: Introduction, Strong motion earthquake, Machine Foundations: Design of machine foundations, industrial floors subjected to dynamic loading.	8

Course Outcome:

CO1	Students will be able to Establishing dynamic equilibrium, the equation of motion
CO2	Students will be able to understand Continuous systems and partial differential equations for rods and beams.
CO3	Students will be able to understand modeling of structural damping.
CO4	Students will be able to understand solve problem on earthquake steeping loading by Cauchy Euler and Trapezoidal method

Recommended Books:

1. Elementary Earthquake Engineering by Jai Krishna & Chander Shekhran,2010
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering 'A.K. Chopra' 2016
3. Dynamics of structures, Damodrasamy, s. kavitha, revised edition 2016

SUBJECT TITLE: PRESTRESSED CONCRETE STRUCTURES
SUBJECT CODE: MTCE-103
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:- To understand the basic aspects of prestressed concrete

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Limit state design of statically determinate pre-stressed beams- limit state of collapse by flexure, shear, and torsion limit state of serviceability Anchorage zone stresses for posttensioned members. Statically indeterminate structures-analysis and design-continuous beams and frames	13
SECTION-II	Choice of profile, linear transformation, concordance, omically viable profile. Composite beam with precast prestressed beams and cast in situ RC slab-analysis and design.	8
SECTION-III	Time dependent effects such as creep, shrinkage etc. on composite construction inclusive of creep relaxation and relaxation creep-partial prestressing principles, analysis and design of simple beams, crack and crack width calculations	9
SECTION-IV	Analysis and design of prestressed pipes, tanks and spatial structures slabs, grids, folded plates and shells	8

Course Outcome:

CO1	Students will be able to understand the basic aspects of prestressed concrete
CO2	Students will be able to design prestressed concrete beam
CO3	Students will be able to design prestressed composite beams
CO4	Students will be able to design flexural members with partial prestressing

Recommended Books:

1. Design of Prestressed Concrete Raymond Ian Gilbert, Neil Colin Mickleborough, Gianluca Ranzi,2017
2. Prestressed concrete – T.Y. Lin. 2010
3. Prestressed concrete – N. Krishna Raju. 2015
4. Prestressed concrete – Ramamurtham, 2016

SUBJECT TITLE: ADVANCED STRUCTURAL ANALYSIS
SUBJECT CODE: MTCE-104
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective. To understand analysis of indeterminate structures and adopt an appropriate structural analysis technique

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Stiffness Matrix Method: Basis of stiffness method, Influence coefficients, Kinematic indeterminacy, Degree of freedom, Matrix approach to stiffness method, Transformation of axes system, Formation of load vectors, Elastic supports, Support displacements, Application of stiffness matrix method to various type of structures e.g. Continuous beams, Trusses, Frames and grids, partially discontinuous structures, Temperature effects	10
SECTION-II	Flexibility Matrix Method: Compatibility equations, Flexibility coefficients, Application of complimentary energy principles, Basis of the method, Application of flexibility matrix method to various types of structures, Analysis of pin jointed trusses, Rigid frames.	8
SECTION-III	Finite Element Method: Introduction to finite element method, Theory of elasticity, Coordinate systems, Rotation of axes, Shape functions, Elements stiffness matrix and load vector, Triangular element in plane stress and strain.	7
SECTION-IV	Numerical integration, Rectangular elements in flexure, Triangular element, Rectangular element in plane stress and bending combined, Computer programming concepts	8

Course Outcome:

CO1	Students will be able to understand analysis of indeterminate structures and adopt an appropriate structural analysis technique
CO2	Determine response of structures by classical, iterative and matrix methods
CO3	Obtain the static and kinematic indeterminacy of structure.
CO4	Analyze the beam and plane frame using Matrix method.

Recommended Books:

1. Matrix Analysis of Framed Structures by Gere and Weaver, edition 2004
2. Analysis of Indeterminate Structures by C.K. Wang, edition 2010
3. Advance Structural Analysis by A.K.Jain. edition 2015

SUBJECT TITLE: PLASTIC ANALYSIS AND DESIGN OF STEEL STRUCTURES
SUBJECT CODE: MTCE-105
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

To understand modes of structural collapse and to Perform the plastic analysis and design of various determinant and in-determinant structures**.**

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Ductility of metals: Concept of plastic design, over loaded factors, ultimate load as design criteria. Hinge formation in indeterminate structures, Redistribution of moments, Assumption made for structures subjected to bending only.	9
SECTION-II	Minimum weight design: concept, assumptions, Design of frame with prismatic measures, Elements of linear programming and its application to minimum weight design problems. Deflections: Assumption, calculation of deflection at ultimate loads, permissible rotations.	11
SECTION-III	Secondary design considerations: Influence of direct load, shear, local buckling, lateral buckling, repeated loading and brittle fracture on moment capacity design of eccentrically loaded columns.	6
SECTION-IV	Problem of incremental: collapse, shake down analysis. Special consideration for design of structures using light gauge metals.	8

Course Outcome:

CO1	Students will be able to compute plastic moment capacity of steel members,
CO2	Students will be able to analyze beams and frames using theory of plasticity,
CO3	Students will be able to interpret the design of a frame considering secondary design parameters
CO4	Students will be able to design a frame using minimum weight design concept

Recommended Books:

1. Baker J. and Heyman J., Plastic Design of Frames, Cambridge the University Press, 2010
2. Plastic Analysis and Design of Steel Structures, 2008
3. SP: 6(6) – 1972, Handbook for Structural Engineers

SUBJECT TITLE: ADVANCED FOUNDATION ENGINEERING
SUBJECT CODE: MTCE-106
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

To enable students select the best foundation solutions for different types of Civil Engineering problems

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Shallow Foundations: Design considerations, factors of safety (including limit state), allowable settlements, location and depth of foundations, Codal provisions. Presumptive bearing, capacity. Bearing capacity theories. Layered soils. shear strength parameters. Bearing capacity from N-values, static cone and plate load tests. Total and differential settlement. Stress distribution. Consolidation settlement in clays (with correction factors). Immediate settlement. Settlement in sands from N-values Static cone and Plate load tests.	10
SECTION-II	Soil structure interaction: Introduction to soil-foundation interaction problems, soil behavior , Foundation behavior, interface behavior, soil foundation interaction analysis, Soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behavior, Time dependent behavior.	8
SECTION-III	Deep foundations: Type of Piles. Construction methods. Axial capacity of single piles-static formulae, Skin friction and end bearing in sands and clays. Axial capacity of groups. Settlement of single piles and groups. Uplift capacity. Negative skin friction. Pile load tests. Pile integrity tests. Laterally Loaded Piles: Short and long piles; Free head and fixed head piles; Lateral load capacity of single piles; Lateral deflection; Elastic analysis; Group effect; Lateral load test; Codal provisions. Caissons and Wells.	12
SECTION-IV	Foundations in difficult soils: Expansive soils, chemically aggressive Soil Liquefaction and remedial measures, stone column, deep compaction	8

Course Outcome:

CO1	Student would able to perform design of rectangular & trapezoidal combined footing, strap footing and raft foundation
CO2	Student will be capable to analyzing the mechanics of load transfer in piles; calculations of pile load carrying capacity
CO3	Student shall be able to calculate load carrying capacity of well foundation and analyses of well foundation
CO4	Student can perform analysis of retaining wall failure under earthquake load

Recommended Books:

1. Kaniraj S.K., Design aids in soil mechanics and foundation engineering edition 2016
2. V.N.S. Murthy Advanced foundation Engineering edition 2015
3. John Wiley Joseph E. Bowles Foundation Analysis and Design 2010

SUBJECT TITLE: ADVANCEED TRAFFIC ENGINEERING
SUBJECT CODE: MTCE-107
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

This course aims to provide an insight on traffic and its components, factors affecting road traffic and the design of intersection.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction: Elements of Traffic Engineering, Components of traffic system road users, vehicles, highways and control devices. Consideration, Aesthetics and selection of type of bridge (Review). Vehicle Characteristics: IRC standards, Design speed, volume, Highway capacity and levels of service, capacity of urban and rural roads, PCU concept and its limitations.	12
SECTION-II	Traffic Stream Characteristics: Traffic stream parameters, characteristics of interrupted and uninterrupted flows Traffic Studies: Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, parking studies, accident studies	10
SECTION-III	Traffic Regulation and Control: Signs and markings, Traffic System Management, At-grade intersections, Channelization, Roundabouts Traffic Signals: Pre-timed and traffic actuated. Design of signal setting, phase diagrams, timing diagram, Signal co-ordination Grade Separated Intersections: Geometric elements for divided and access controlled highways and expressways.	11
SECTION-IV	Traffic Safety: Principles and practices, Road safety audit. Intelligent Transportation System: Applications in Traffic Engineering	9

Course Outcome:

CO1	Student will be able to identify traffic stream characteristics
CO2	Student will be able to design a pre-timed signalized intersection, and determine the signal splits
CO3	Student will be able to assess level of services of roadway facilities
CO4	Student will be able to bale to remember traffic regulations, impact of noise pollution, air pollution and the method of controlling them

Recommended Books:

1. Kadiyali, L.R., “Traffic Engineering & Transport Planning”, Khanna Publishers, 2011
2. William, R.M. and Roger, P.R., “Traffic Engineering”, Prentice Hall, 2013
3. Traffic & Highway Engineering by Nicholas J. Garber, 2016

SUBJECT TITLE: GEOMETRIC DESIGN OF TRANSPORTATION INFRASTRUCTURE
SUBJECT CODE: MTCE-108
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
To equip the student for examine geometric characteristics and design elements of highways and streets

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Levelof Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design specifications; Pavement Surface characteristics– Skid Resistance, Camber, Objectives. Specifications for hill roads.	**10**
SECTION-II	Horizontal Alignment of Roads: Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance ; Objectives of horizontal curves; Super elevation; Extra- widening on Curves; VerticalCurves –Summit Curves, Valley Curves and Design criteria for Vertical Curves; Sight Distances, Grade Compensation.	**10**
SECTION-III	Geometric Design of Intersections : Types of Intersections; At-grade Intersections –Channelization; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays –Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design, Traffic Signs and Markings.	**14**
SECTION-IV	Airport and Railway Infrastructure Design – Runway orientation, Site selection, Wind rose analysis. Geometric design standards for runways, taxiways, aprons , Airport capacity analysis, Terminal design; GEOMETRIC DESIGN OF RAILWAY TRACK: Gradients- Grade Compensation- Cant and NegativeSuper elevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs .	**10**

Course Outcome:

CO1	Students will be able to design cross-sectional, horizontal and vertical elements of roads
CO2	Students will be able to design intersection, roundabout, exit & entry ramps
CO3	Students will be able to design pedestrian, bicycle and parking facilities
CO4	Students will be able to design street lighting system for roads

Recommended Books:
1. Principles and Practice of Highway Engineering, 2011
2. Highway Engineering, C.E.G .Justo and S.K. Khanna, Nem Chand and Brothers. 2003
3. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas. 2001
4. Railway Engineering, Arora and Saxsena 2014

TITLE: PAVEMENT MATERIAL CHARACTERIZATION
SUBJECT CODE: MTCE-109
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
To characterize various material inputs for different pavement design procedures
Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Subgrade Soil Characterization: Properties of subgrade, soils, A critical look at the Different laboratory and in-situ procedures for evaluating the mechanical properties of soils viz. GI, CBR & Plate Load test, Field compaction and control, Modulus of subgrade reaction. Aggregate: Introduction, Desirable properties of road aggregates, Tests for Road aggregates.	**20**
SECTION-II	Bituminous materials: Introduction, Types of Bituminous materials, Requirements of bitumen, Tests on Bitumen, Cutback Bitumen, Bituminous Emulsion, Bituminous paving mixes, Design by Marshall Method and Modified Hubbard-Field method	**08**
SECTION-III	Cement and Cement Concrete Mix Characterization: Types of cements and basic cement properties, Special cements; Quality tests on cement; Tests on cement concrete including compressive strength, flexural strength, modulus of elasticity and fatigue properties; Introduction to advanced concretes like self-compacted concrete, Light weight concrete, Roller Compacted Concrete for pavement application; Role of different admixtures in cement concrete performance; Joint filers for Jointed Plain Cement Concrete Pavements and their characterization; Nano technology applications in cement concrete.	**12**
SECTION-IV	Soil Stabilization: Introduction, Mechanics of soil stabilization, stabilization with admixtures like cement, lime, fly ash, bitumen, stabilization using soft aggregates, stabilization of Black Cotton soils, stabilization of desert sand, Introduction to Geotextiles application.	**10**

Course Outcome:

CO1	Students will be able to impart practical and latest knowledge on different paving materials along with their characterization
CO2	Students will be able to learning of Conventional and Advanced Characterization of Pavement Materials
CO3	Students will be able to finding practical solution to Mix design of Pavement Materials
CO4	Students will be able to develop suitable performance tests and material specifications.

Recommended Books:
1. Atkins, N. Harold, Highway Materials, Soils and Concretes,FourthEdition.1983
2. Kerbs Robert D. and Richard D. Walker, Highway Materials, McGraw-Hill 1971
3. Relevant IRC and IS Codes of Practices for pavement materials 2014
4. Highway Engineering, S.K. Khanna – C.E.G. JUSTO Railway Engineering, Arora and Saxsena.2014

SUBJECT TITLE: PAVEMENT ANALYSIS AND DESIGN
SUBJECT CODE: MTCE-110
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

This course covers the structural and functional design of pavement structures for highway and airport situations with an emphasis on highways. Structural design examines the direct influence of the vehicles on material and thickness requirements to provide a pavement with suitable design life and good performance

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Pavement Types: Definition, highway and airport pavement comparison, wheel loads, tyre pressure, Contact pressure, design factors. Type of distresses structural and functional, serviceability.	**07**
SECTION-II	Stresses in Flexible: Layered system concept, multilayered solutions. Burmister's method, Fundamental design concepts. Stresses in Rigid Pavements: Relative stiffness of slabs. Modulus of subgrade reaction. Stresses due to warping, stresses due to friction, effect of warping, contraction and expansion. Plain versus reinforced pavements, stresses in dowel bar, tie bar, combined stresses.	**10**
SECTION-III	Design of Flexible Pavements: Design factors. Design wheel load. Equivalent single wheel load. Difference between airport and highway design concept. Different design methods. CBR, GI, Triaxial method, McLeod method. Design of Rigid Pavement: General design considerations. Design of joints in cement concrete pavements, spacing of expansion joint, spacing of contraction joints. Design of dowel bar. Design of tie bar. IRC Recommendations for design of concrete pavements.	**10**
SECTION-IV	Pavement Evaluation and Rehabilitation: Pavement distresses in flexible and rigid pavements, condition and evaluation survey. Present serviceability index. Methods of measuring condition, skid resistance. Principles of maintenance. Methods of structural evaluation.	**04**

Course Outcome:

CO1	Students will be able to carry out the design of flexible pavement
CO2	Students will be able to carry out the design of rigid pavements
CO3	Students will be able to understand the factors that affect pavement designing
CO4	Students will be able to understand the important features of pavement designing

Recommended Books:

1.Principles of Transportation Engineering by Chakroborty & Das, PrenticeHall, India. 2014
2. Highway Engg by S. K. Khanna & C.E.G. Justo, New Chand Bros., Roorkee. 2001
3. Principles of Pavement Design, by Yoder E.J. and Witczak M.W. 2nd, John Wiley & Sons, INC.1975
4. Principles and Practice of Highway Engg. By L.R.Kadiyali, Khanna Publishers, Delhi. Third Edition2017

SUBJECT TITLE: ENVIRONMENTAL CHEMISTRY
SUBJECT CODE: MTCE-111
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

To do research and solve issues, which will be valuable in both environmental and non-environmental occupations

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Concept of Green Chemistry rates of chemical and biochemical reactions with applications in disinfection and biological treatment.	**07**
SECTION-II	Acid-base reactions and the carbonate system with applications in Neutralization and pH control, Complexation reactions and chelation withapplications in chemical coagulation and metals bioavailability.	**14**
SECTION-III	Precipitation and dissolution phenomena with applications in iron and phosphate removal and carbonate scaling, Oxidation-reduction reactions with applications in metals removal processes (e.g., hex chrome reduction),biochemical reactions and acid mine drainage	**08**
SECTION-IV	A survey of organic chemistry and how organic compounds react and behave in the environment, including principles associated with air-water partitioning, solvent-water partitioning, and sorption phenomena with application in air stripping and adsorption.	**10**

Course Outcome:

CO1	Students will be able to describe water purification and waste treatment processes and the practical chemistry involved.
CO2	Students will be able to describe causes and effects of environmental pollution by energy industry and discuss some mitigation strategies.
CO3	Students will be able to demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soi
CO4	Students will be able to recognize different types of toxic substances & responses and analyze toxicological information

Recommended Books:

1. Environmental Chemistry Book by Colin Baird and Michael Cann 2012
2. Environmental Chemistry: Microscale Laboratory Experiments Book by Jorge G. Ibanez, MargaritaHernandez-Esparza, and Mono Mohan Singh 2011
3. Elements of environmental chemistry Textbook by R. A. Hites 2013

SUBJECT TITLE: PHYSICS OF ENVIRONMENT
SUBJECT CODE: MTCE-112
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

This course is designed to illustrate the many aspects of physics that pervade environmental processes in our everyday lives and in naturally occurring phenomena.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Radiation Science: Radiation spectrum (ionizing & non ionizing radiation), Laws of radioactive disintegration, Interaction of nuclear radiation with matter (qualitative discussion only), Dosimetry and effects of radiations.	**06**
SECTION-II	Radiation detectors (GM counter, Ionization counter, Proportional counter and Scintillation counter), Radioactive waste management. Atmospheric Physics : Basic structure of atmosphere, Stefan Law, Wien's displacement law, Planck's Temperature, Earth's radiation budget, Atmospheric Photosensitivity.	**14**
SECTION-III	Fundamental forces and apparent forces, mass, momentum and energy Conservation, Hydrostatic equilibrium. Adiabatic lapse rates and stability, Geostrophic balance, Planetary atmospheres.	**08**
SECTION-IV	Climate Physics: G r e e n-house effect, Feedback mechanisms, Ozone layerdepletion and Global warming.	**05**

Course Outcome:

CO1	Students will be able to study the effects of radiation.
CO2	Students will be able to understand concept of radioactive waste management.
CO3	Students will be able to learn about the fundamental forces and hydrostatic equilibrium.
CO4	Students will be able to discuss the problems of energy demand and explain the possible contributions of renewables to energy supply

Recommended Books:

1. Nuclear Physics, D.C. Tayal, Himalaya Pub. House 2009
2. Physical Geography, Strahler & Strahler, J. Wiley Pub. 2013
3. Introduction to Health Physics, H. Cember, McGraw-Hill 2008
4. Mid-Latitude Atmospheric Dynamics, J. E. martin, J. Wiley Pub. 2006

SUBJECT TITLE: AIR POLLUTION AND CONTROL
SUBJECT CODE: MTCE-113
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

To enable the students to learn about Air Pollution, effects of air pollution, Global effects, Sampling of pollutants, Meteorology and air pollution, Atmospheric stability, Plume rise and dispersion and Prediction of air quality.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Air pollutants – Sources and classification of pollutants and their effect on human health, vegetation and property- Effects - Reactions of pollutants and their effects-Smoke, smog and ozone layer disturbance - Greenhouse effect –Ambient and stack sampling.	**07**
SECTION-II	Atmospheric Phenomena - Dynamism of atmosphere, Energy balance of atmosphere, Meteorological aspects, Wind and wind roses, Environmental and adiabatic lapse rates, Derivations of DALR, WALR and ELR, Atmospheric stability, Factors influencing stability, Temperature inversions, Mixing height.	**08**
SECTION-III	Atmospheric diffusion of pollutants: Transport, transformation and deposition of air. Contaminants - Air sampling & pollution measurement methods - Ambient air quality, and emission standards, Modelling-Gaussian model and equation, Air quality index. Particulate emission control: Settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators.	**14**
SECTION-IV	Particulate emission control: Settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators. Control of gaseous pollutants: Removal of gaseous pollutants by adsorption, absorption, reaction and other methods. Biological air pollution control technologies: Bio-scrubbers, bio filters, and Indoor air quality.	**14**

Course Outcome:

CO1	Students will be able to apply the basic concepts of fluid and particle mechanics
CO2	Students will be able to design industrial ventilation systems
CO3	Students will be able to design and evaluate removal efficiency of particulates of various air pollution control devices
CO4	Students will be able to demonstrate the designing and operation of various air pollution control devices for the removal of gaseous pollutants from both stationary as well as mobile sources

Recommended Books: 1. Wark Kenneth and Warner C.F, Air pollution its origin and control. Harperand Row Publishers, 1998
2. Rao C.S., Environmental Pollution Control Engineering, New age international Ltd, New Delhi. 2007
3. Perkins, H.C., Air Pollution, McGraw-Hill . 1977
4. Rao M.N. and Rao H.V.N., Air Pollution, Tata McGraw-Hill. 1988
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SUBJECT TITLE: INDUSTRIAL AND HAZARDIOUS WASTE MANAGEMENT
SUBJECT CODE: MTCE-114
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

This subject deals with the pollution from major industries and methods of controlling the same. The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Hazardous Waste Treatment and Disposal: Biological and chemical treatment of hazardous wastes; Solidification and stabilization of wastes; Incineration for the treatment and disposal of hazardous wastes; Land farming; Landfill disposal of hazardous waste; Bioremediation of hazardous waste disposal sites.	**14**
SECTION-II	Legal Requirements: Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; E-waste rules; Rules related to recycled plastics, used batteries, flyash, etc. Sources and types of industrial wastewater: Environmental impacts, Regulatory requirements, generation rates	**10**
SECTION-III	Individual and Common Effluent Treatment Plants – Zero effluent discharge systems Wastewater reuse –Disposal of effluent on land – Quantification, characteristics and disposal of Sludge.	**08**
SECTION-IV	Waste minimization – Equalization, Neutralization, Oil separation, Flotation, Precipitation, Heavy metal Removal, adsorption, Aerobic and anaerobic biological treatment.	**08**

Course Outcome:

CO1	Students will be able to regulatory requirement applicable to the handling and management of MSW and special category waste.
CO2	Students will be able to acquiring the knowledge of collection and transportation and solid waste route selection and types of waste collection
CO3	Students will be able to understanding and appreciating the environmental pollution and nuisance potential of municipal solid waste and of special category wastes.
CO4	Students will be able to ability to design facilities for the processing and reclamation of industrial waste water

Recommended Books:

1.“Environmental Engg.” By Howard S. Peavy, Donald R. Rowe & GeorgeTehobanoglous, McGraw Hill, International Edition. 1985
2. Arceivala, S. J. and Asolekar, S. R., Wastewater Treatment for Pollution Control, 3rd ed., McGraw-HillEducation (India) Pvt. Ltd. 2016
3. Eckenfelder, W.W., Industrial Water Pollution Control, McGraw Hill 2000

SUBJECT TITLE: UNIT PROCESS AND OPERATION-I
SUBJECT CODE: MTCE-115
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
This course is designed to impart the knowledge about water quality indices
Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Water Quality: Physical, chemical and biological parameters of water- Water Quality requirement -Potable water standards -Wastewater Effluent standards - Water quality indices. Water purification systems in natural systems: Physical processes-chemical processes and biological processes- Primary, Secondary and Tertiary treatment-Unit operations-unit processes.	14
SECTION-II	Sedimentation: Types, Aeration and gas transfer, Coagulation and flocculation, coagulation processes -stability of colloids - destabilization of colloids transport of colloidal particles, Clariflocculation.	07
SECTION-III	Filtration : theory of granular media filtration; Classification of filters; slow sand filter and rapid sand filter; mechanism of filtration; modes of operationand operational problems; negative head and air binding; dual and multimedia filtration, pressure filters, principle of working and design.	08
SECTION-IV	Theory of disinfection: Factors affecting disinfection, Disinfection - chlorine dioxide; chloramines; ozonation; UV radiation. Miscellaneous methods: Ion Exchange-processes, Application of Membrane . Processes, Reverse Osmosis, Micro-filtration, Nano-filtration, Ultra filtration and Electro dialysis..	10

Course Outcome:

CO1	Students will be able to decide types of processes to treat water for various uses.
CO2	Students will be able to configure processes for water treatment systems.
CO3	Students will be able to design water treatment units for conventional and specific water treatment
CO4	Students will be able to operate and maintain various processes in water treatment plants.

Recommended Books 1. Weber, W.J., Physicochemical processes for water quality control, JohnWiley and sons. 1972
2. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G. Environmental Engineering, McGraw Hills, 1985.
3. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata McGrawHill Publication. 2009

SUBJECT TITLE: UNIT PROCESS & OPERATION-II
SUBJECT CODE: MTCE-116
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

This course provides the various waste water characteristics and the treatment techniques

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Principles: Objectives of biological treatment - significance - aerobic and anaerobic treatment kinetics of biological growth - factors affecting growth - attached and suspended growth. Determination of kinetic coefficients for organics removal - Biodegradability assessment – selection of process – reactors – batch - continuous type – kinetics	**7**
SECTION-II	Waste Water Characteristics: Physical, Chemical, Biological characteristics of waste water, sampling, flow measurement. Physical and Chemical Treatment of Waste Water: Screening, Grit removal, Flow equalization, Chemical precipitation, other solids removal operations. Disinfection with Chlorine compound, Aeration, Control of odour, Control of volatile organic compounds.	**14**
SECTION-III	Aerobic Treatment of Waste Water: Design and construction aspects and the relevant parameters of significance of the following units. Activated Sludge Process, Trickling Filters, Aerated Lagoons, Rotating Biological Contactors, Sequential Batch Reactors (SBR) and Stabilization pond	**8**
SECTION-IV	Anaerobic Treatment of Waste Water: Sludge digestion theory and principles, Septic tank design and Effluent disposal. Disposal of digested sludge, Anaerobic ponds, UASB reactors and various modifications in UASB process and anaerobic filters...	**6**

Course Outcome:

CO1	Students will be able to calculate design flow, characterize wastewater and prepare wastewater treatment flow schemes
CO2	Students will be able to plan and design the components of wastewater treatment systems
CO3	Students will be able to plan and design sludge treatment and disposal system
CO4	Students will be able to understand the chemical engineering processes in waste water treatment

Recommended Books:

1. Arceivala S. J.Waste water Treatment for Pollution Control, TMH, New Delhi, Second Edition, 2000.
2. Qasim S. R. Wastewater Treatment Plant, Planning Design & Operation, Technomic Publications,New York, 1994.
3. Metcalf and Eddy, Wastewater Engineering, Treatment and Reuse, Tata Mc GrawHill Publicat2003

SUBJECT TITLE: PRINCIPALAND PRACTICE MANAGEMENT
SUBJECT CODE: MTCE-117
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

To understand the various aspects of management and will inculcate the ability to apply the multifunctional approach.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Management: Concept, Nature, Importance; Management: Art and Science, Management as a Profession, Management vs. Administration, Management Skills, Levels of Management, Characteristics of Quality Managers.Evolution of Management: Early contributions, Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, HawthorneExperiments and Human Relations, Social System Approach, Decision Theory Approach. Social Responsibility of Managers and Ethics in Managing.	**13**
SECTION-II	Introduction to Functions of Management Planning: Nature, Scope, Objectives and Significance of Planning, Types of Planning, Process of Planning, Barriers to Effective Planning, Planning Premises and Forecasting,Objective Setting: Concept, Types and Process of Setting Objectives; Operational Planning Tools, M.B.O. Concept, Process and Managerial Implications, Decision Making: Concept, Process, Types and Styles of Decision Making, Decision Making in Risk and Uncertainty.	**12**
SECTION-III	Organizing: Concept, Organization Theories, Forms of Organizational Structure, Combining Jobs, Departmentation, Span of Control, Delegation ofAuthority, Authority & Responsibility, Principles of Organizational Designing, Contingency Approach to Organization Design, Learning Organizations. Staffing: Concept, System Approach, Manpower Planning, Job Design, Recruitment & Selection, Training & Development, Performance Appraisal Directing: Concept, Direction and Supervision.	**10**
SECTION-IV	Organizing: Concept, Organization Theories, Forms of Organizational Structure, Combining Jobs, Departmentation, Span of Control, Delegation ofAuthority, Authority & Responsibility, Principles of Organizational Designing, Contingency Approach to Organization Design, Learning Organizations. Staffing: Concept, System Approach, Manpower Planning, Job Design, Recruitment & Selection, Training & Development, Performance Appraisal Directing: Concept, Direction and Supervision.	**10**

Course Outcome:

CO1	Students will enable to study the evolution of Management,
CO2	Students will come apply the functions and principles of management.
CO3	Students will well versed about the application of the principles in an organization.
CO4	Students will able to know about dynamics of controlling an emerging issues in management

Recommended Books:

1. Stoner, Freeman & Gilbert Jr -Management (Prentice Hall of India, 6th Edition 2009)
2. Koontz Harold &Weihrich Heinz — Essentials of management (Tata McGraw Hill, 5thEdition 2008)
3. Robbins & Coulter -Management (Prentice Hall of India, 9th Edition 2009) Robbins S.P. andDecenzo David A. -Fundamentals of Management: Essential Concepts

SUBJECT TITLE: MATERIAL & EQUIPMENT MANAGEMENT
SUBJECT CODE: MTCE-118
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

To demonstrate basic knowledge about construction equipment and machineries.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	GENERAL MANAGEMENT: Introduction and characteristics of management, Principle and function of management, Scientific management. Materials Management: Scope, Objective and functions of material management, Procurement and store management, Materials handling management, Inventory control and management. Disposal of Surplus Materials	**12**
SECTION-II	Earth Moving Equipment Crawler and wheel tractors their functions, types an specifications; Gradability Bull dozers and their use; tractor pulled scrapers, their sizes and output; effect of grade an rolling resistance on the output of tractor pulled scrapers Earth loaders; Placing and compacting earth fills. Power shovels-functions, selection, sizes, shovel dimension and clearances, output, Draglinesfunctions, types sizes, outputclamshells;Safe lifting capacities and working ranges cranes; Hoes, Trenching machine types and production rate calculation of producing rates of equipment.	**12**
SECTION-III	Hauling Equipment : Trucks; Bottom dump wagons;capacities of trucks and wagons Balancing the capacities of hauling units with the size excavator; effect of grade, rolling resistance and altitude on the cost/performance of hauling equipment; balancing excavating hauling equipment examples	**10**
SECTION-IV	Drilling, Blasting and Tunneling Equipment : Definition of terms, bits, Jackhammers, Drifters, wagon drills, che drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern; Rates for drilling rock, compressors. Pile Driving Equipment : Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact.	**10**

Course Outcome:

CO1	Students will be able to analyze the techniques of erection of construction units.
CO2	Students will be able to demonstrate basic knowledge about construction equipment and machineries.
CO3	Students will be able to clearly explain about the hauling and conveying equipment.
CO4	Students will be able to identify and manage with respect to time and their motion and movements.

Recommended Books:

1 . Construction equipment and its planning and application Dr. Mahesh Verma.
2. Heavy construction planning equipment and methods -Jagman Singh Oxford and IBH.Edition 2004
3. Construction Planning equipement and Methods by RL Peuripo Tata McGraw Hill. (2007)
4. Mangement Machines and Methods in Civil Engineering-John,Christan, John Wiley and Sons (2008)

SUBJECT TITLE: INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT
SUBJECT CODE: MTCE-119
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

The Course is designed to familiarize the students with the issues and challenges of developing infrastructure in India

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction: Impact of Infrastructure development on economic development, standard of living and environment. Reasons for rise of public sector and government in infrastructural activities. Changed socio-economic scenario and current problems and related issues.. Policies on Infrastructure Development: A historical review of the Government policies on infrastructure. Current public policies on transportations, power and telecom sectors. Plans for infrastructure development. Legal framework for regulating private participation in roads and highways, Ports & Airports, Power and Telecom.	**12**
SECTION-II	Construction and Infrastructure: Construction component of various infrastructure sectors. Highway, ports and aviation, oil and gas, power, telecom, railways, irrigation. Current scenario, future needs, investment needed, regulatory framework, government policies and future plans. Technological and methodological demands on construction management in infrastructure development projects	**10**
SECTION-III	Infrastructure Management: Importance, scope and role in different sectors of construction. • Highway Sector: Repayment of Funds, Toll Collection Strategy, Shadow tolling, and direct tolls, Maintenance strategy, Review of toll rates & structuring to suit the traffic demand, • Irrigation Projects: Large / Small Dams - Instrumentation, monitoring of water levels, catchments area, rainfall data management, prediction, land irrigation planning & policies, processes Barrages, Canals. • Power Projects: Power scenario in India, Estimated requirement, Generation of Power distribution strategies, national grid, load calculation & factors, Hydropower - day to day operations, management structures, maintenance, Thermal Power, Nuclear Power. • Airports: Requisites of domestic & International airports & cargo & military airports, facilities available, Terminal management, ATC. • Railways: Mass Rapid Transport System MRTS, LRT, Multi-modal Transport System.	**12**
SECTION-IV	Drilling, Blasting and Tunneling Equipment : Definition of terms, bits, Jackhammers, Drifters, wagon drills, che drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern; Rates for drilling rock, compressors	**10**

Course Outcome:

CO1	Students will be able to achieve Knowledge of Planning and development of problem solving skills in management.
CO2	Students will be able to understand the principles of financial fundamentals.
CO3	Students will be able to develop analytical skills.
CO4	Students will be able to summarize the solution of economic evaluation techniques.

Recommended Books:

1.Chandra, Prassanna, “Projects, Planning, Analysis, Selection, Financing, Implementation and Review”,Tata McGraw-Hill, New Delhi, 2006.
2.Raghuram, G. & Jain, R., “Infrastructure Development & Financing Towards a Public-PrivatePartnership”, Macmillan India Ltd., New Delhi, 2002
3. NICMAR, “Construction Business Opportunities in Infrastructure Development in India”, NICMAR,Mumbai, 2001.
4. India Infrastructure Report 2001 & 2002, Oxford University Press, New Delhi, 2001/02
5. Parikh Kirit S., “India Development Report, 1999-2000”, Oxford University Press, New Delhi, 2002

SUBJECT TITLE: PROJECT MANAGEMENT & SYSTEM TECHNIQUE
SUBJECT CODE: MTCE-120
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
This syllabus introduces students to the concepts, tools and issues of the management of information technology and systems, the process and tools of project management, and the control of organisational systems.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Project Management Concepts and Needs Identification Attributes of a Project, Project Life Cycle, The Project management Process, Global Project Management, Benefits of Project Management, Needs Identification, Project Selection, Preparing a Request for Proposal, Soliciting Proposals, Project organization, the project as part of the functional organization, pure project organization ,the matrix organization, mixed organizational systems.	**12**
SECTION-II	Project Planning and Scheduling: Design of project management system; project work system; work breakdown structure, project execution plan, work packaging plan, project procedure manual; project scheduling; bar charts, line of balance (LOB) and Network Techniques (PERT / CPM)/ GERT, Resource allocation,Crashing and Resource Sharing Project Monitoring and Control Planning, Monitoring and Control; Design of monitoring system; Computerized PMIS (Project Management Information System). Coordination; Procedures, Meetings, Control; Scope/Progress control, Performance control, Schedule control, Cost control,	**10**
SECTION-III	Project Performance Indicators; Project Audit; Project Audit Life Cycle, Responsibilities of Evaluator/ Auditor, Responsibilities of the Project Manager.	**12**
SECTION-IV	Drilling, Blasting and Tunneling Equipment : Definition of terms, bits, Jackhammers, Drifters, wagon drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment; selecting drilling pattern; Rates for drilling rock, compressors.	**10**

Course Outcome:

CO1	Students will acquire skill in designing project proposal for various domains
CO2	Students will understand and analyze different techniques of project management- financial, technical, environmental and market demand
CO3	Students will be able to compare various scheduling techniques
CO4	Students will be able to develop the abilities in project evaluation techniques like PERT, CPM etc.

Recommended Books:
1.Project Management – Gido / Clements – Cengage 5th (2010)
2.Project Management, Meredith Mantel, Wiley 8th
edition(2011)3.Project Management, S.Choudhury, TMH (2009)

SUBJECT TITLE: QUALITY, SAFETY AND ENVIRONMENT MANAGEMENT
SUBJECT CODE: MTCE-121
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

Advance Diploma in Quality Health Safety & Environment provides students with a solid foundation in the managerial aspects of developing and implementing quality, health and safety management systems that can move organizations toward a more sustainable and socially responsible future.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction To Safety Philosophy: Sequence of Accident Occurrence, Occupational Injuries-Effects of Industrial Accidents, Analysis of Accidents, Injury Data, Accident Investigations & Reporting, Accident Constringent. Safety & Health Management: Employer & Employee Responsibilities, Record-keeping & Reporting Requirements, Safety Organization, Responsibilities of Safety Officer, Supervisors, Safety committees	**12**
SECTION-II	Risk Management: Definitions of Hazards, Risks, Evolution of Methodical Analysis, System safety Analysis techniques, Performance measurement, Operational Reviews - Internal & External Work Practices In Industries: Hazards in Chemical Operations, Material Handling Hazards, Lifting Machinery & Pressure Vessels, Material Safety Data Sheets, Classification of Chemicals, Hazardous Chemicals, Storage Practices, Radiation Safety, Petroleum Storage Requirements, Pesticide Safety..	**12**
SECTION-III	Indian Statutes: Central Acts, Factory's Act, AP Factory Rules, Construction Safety Regulations, Petroleum Rules 2002, Electrical Act & Rules. Fire Safety: Basic Elements, Causes, Industrial Fires, Explosions, Effect On Environment, Property & Human Loss, Prevention Techniques, Building Design, Fire Protection Systems, Contingency Plan, Emergency Preparedness, Evacuation	**10**
SECTION-IV	Industrial Best Practices: In Electrical, Mechanical, Fire, Machine Guarding, Personal Protective Equipment, Occupational Health, Ergonomics Ambulance, Noise Abatement Methods, Management Of Contractors. Occupational Safety & Management Standards: Indian Standards, OHSAS 18001 Standard and its Elements, CE Certificate, Social Accountability Standards, System Implementation, Benefits.	**10**

Course Outcome:

CO1	Students will be able to understand the construction accidents and Legal Implications
CO2	Students will be able to clearly explain the Elements of an Effective Safety Programme.
CO3	Students will be able to Elaborate the concept on Safety in Construction Contracts.
CO4	Students will be able to understand the Safe Workers and its types

Recommended Books:

1.Industrial safety and health, David L. Goetsch, Macmillan Publishing Company, 1993.
2.Handbook of environmental health and safety, Vol I & II, Herman Kooren, Michael Bisesi, Jaico Publishing House, 1999.

SUBJECT TITLE: CONTRACTS MANAGEMENT
SUBJECT CODE: MTCE-122
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
To make student capable of understanding and reviewing various provisions included in the contract for effective management of the projects

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Construction Contracts: a) Standard forms of contracts, methods of inviting tenders, pre-bid meetings, pre-qualification system, scrutiny of tenders and comparative statement Contract formation, conditions of contracts, contracts with various stakeholders on a major construction projects, contract pricing by the client, project management consultants and the contractor, contract performance, contract correspondence and contract closure.	**10**
SECTION-II	Construction Claims: Extra items and causes of claims. Types of construction claims, documentation. settlement of claims, extension of time. Dispute Resolution :Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards.	**10**
SECTION-III	Contract Conditions: a)General condition and Particular conditions, conditions of Ministry of Statistics and Program Implementation-Government Of India. Model forms of contract. Role of Planning Commission. b) ICE conditions-Introduction, FIDIC conditions- evolution of FIDIC document, types based on whether design is of employer or contractor, Design & Build contract, EPC contract, short forms of contract-Colour Code. Various conditions of Red Book...	**12**
SECTION-IV	Indian Contract Act (1872):a)Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. b)Clauses 1 to 75-Contract formation, contract performance, valid excuses for nonperformance, Breach of contract, effects of breach- understanding the clauses and applying them to situations/scenarios on construction projects. Importance of the Workmen's Compensation Act on construction projects.	**12**

Course Outcome:

CO1	Students will be able to involve the principles of planning and analyzing of contracts.
CO2	Students will be able to study the process of claim settlement and dispute resolution in construction.
CO3	Students will be able to provide a coherent development to the students to evaluate and design construction contract documents.
CO4	Students will be able to involve the student about the Indian Contract Act (1872).

Recommended Books:
1. Civil Engineering Contracts and Estimates - B. S. Patil – Universities Press- 2006 Edition, reprinted in2009.
2.The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers.

SUBJECT TITLE: ADVANCE SOIL MECHANICS
SUBJECT CODE: MTCE-123
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
This course is designed to Understand the soil reinforcement mechanisms

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Foundations - Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing (Rectangular, Trapezoidal, Strap), Raft Footing.	**10**
SECTION-II	Soil Structure: - Type of bonds, Important clay minerals, Atomic and symbolic representation, Base exchange capacity, Force fields between soils particles and exchangeable ions, Guoy – Champ man diffused double layer theory, Clay structural measurement.	**10**
SECTION-III	Behavior of compacted soils- General , Effect of compaction on structure ,Swelling pressure, Shrinkage, Shear Strength, Pore Water pressure , Permeability, Comparison of dry of O.M.C & wet of O.M.C....	**10**
SECTION-IV	Elastic theories of stress distributions in soils - Boussinesq's equation, Wester-gaard, Burmister Theories, Different conditions of loads, Constitutive relationship for soils. Shear strength parameters of cohesion less and saturated cohesive soils, Principles of Effective stress condition, Effect of rate of stress on shear parameters , Stress- Strain relationship , Skempton's Pore pressure coefficients, Hvorslev's true shear parameters, Effect of over consolidation on shear parameters. Immediate settlement, Methods of determination, Estimation of Reconsolidation pressure. Three-dimensional consolidation pre-compression of clay deposits with and without sand drains.Secondary consolidation factors.	**15**

Course Outcome:

CO1	Students will be able to predict the suitability of clayey soil for various geotechnical applications
CO2	Students will be able to familiar with advanced equipment’s
CO3	Students will be able to analyze and interpret the state of stress in soil and evaluate various failure criteria for soils
CO4	Students will be able to gain knowledge on critical state model for the deformation and strength of soils

Recommended Books:
1. Grim, R.E. " Clay Mineralogy"(2006)
2. Harr, M.E. “Foundation of Theoretical soil Mechanics”(2010)
3. Lambe& Whitman " Soil Mechanics"(2008)
4. Scott, R.F. “Principles of Soil Mechanics”(2016)

SUBJECT TITLE: GROUND IMPROVEMENT TECHNIQUES
SUBJECT CODE: MTCE-124
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

The students will learn the importance and fundamentals of ground improvement techniques for measuring field parameters by using traditional and modern methods involved in civil construction.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction: Need of ground improvement, different methods of ground improvement.	**10**
SECTION-II	Ground improvement in granular soils: In place densification by (i) Vibro – flotation (ii) Compaction pile (iii) Vibro-compaction piles (iv) Dynamic compaction (v) Blasting	**8**
SECTION-III	Ground improvement in cohesive soils: Compressibility, vertical and radial consolidation, preloading methods. Types of drains, construction techniques. Stone column: Function, design principals, load carrying capacity, construction techniques.	**12**
SECTION-IV	Ground improvement by Grouting and Soil Reinforcement: Grouting in soil, types of grout, characteristics, grouting methods. Soil Reinforcement: Mechanism, types of reinforcing elements, reinforcement of soil beneath the road, foundation. Geosynthetics and applications. Soil stabilization: Mechanical, Lime, Cement, Fly ash, Resins & Other Chemicals.	**12**

Course Outcome:

CO1	Students will be able to gain competence in properly devising alternative solutions to difficult and earth construction problems
CO2	Students will be able to evaluate their effectiveness before, during and after construction.
CO3	Students will be able to study many different approaches to the ground modification broadens of the mind of any engineer and inspires creativity
CO4	Students will be able to improve geotechnical construction and related fields

Recommended Books:

1. M.P. Moasley" Ground Improvement" 2nd Edition, 2010.
2. P. Purushothama Raj " Ground Improvement", 2nd edition 2005.

SUBJECT TITLE: SUBSURFACE GEOPHYSICAL METHODS
SUBJECT CODE: MTCE-125
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
This course is designed to do the soil exploration and its stabilization with different tests.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction: Necessity and Importance of soil exploration , Method of sub surface exploration Test pits , Trenches, Caissons, Tunnels and drifts, Wash boring , Percussion drilling , Rotary drilling, Factors affecting the selection of a suitable method of boring. Extent of boring, Factors controlling spacing and depth of bore holes, Spacing and depth of various Civil engineering structures.	**12**
SECTION-II	Stabilization of bore holes, Different method of stabilization of the bore holes, their relative merits and demerits.	**10**
SECTION-III	Sampling: Source of disturbance and their influence, Type of sampler, Principle of design of sampler, Representative and undisturbed sampling in various types of soils, Surface sampling, Amount of sampling, Boring and sampling record, Preservation and shipment of sample preparation of bore log	**10**
SECTION-IV	Penetration tests, Standard penetration tests, Dynamic cone penetration tests with and without bentonite slurry, Static cone penetration tests, factor affecting the penetration tests, Fields Tests: Wash boring, Percussion boring, Standard penetration test, Dynamic cone penetration tests with and without bentonite mud slurry. Static cone penetration test, Surface sampling	**10**

Course Outcome:

CO1	Students would able to identify the objects of site investigation and describe the use of different types of samples and samplers
CO2	Students would understand the process of soil exploration by different boring methods
CO3	Students shall be able to perform standards penetration test, static and dynamic cone penetration test
CO4	Students will capable of carrying out plate load test, pressurement test, using piezometer , slope inclinometer

Recommended Books:
1. Hvorsler M. "Subsurface exploration and sampling of soil for Civil Engg. Purposes, 2nd Edition, 2010.
2. Simon and Cayton" Site investigation", 2nd Edition, 1995.

SUBJECT TITLE: SOIL DYNAMICS AND MACHINE FOUNDATION
SUBJECT CODE: MTCE-126
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective
The present course is aimed to bring out the advanced theories and practical knowledge of soil dynamics. Each topic will be attempted to develop in logical expression.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction: Nature of dynamic loads, Stress conditions on soil, Elements under E.Q. loading, Theory of vibrations.	**12**
SECTION-II	Dynamic Earth Pressure Problem and Retaining wall: Behavior of Retaining Walls during Earth Quakes Modification of Coulomb's Theory, Modified Coulomb's construction, Analytic solution for c- soils, Indian standard code of Practice	**12**
SECTION-III	Dynamic Bearing Capacity: General, Failure Zones & Ultimate Bearing capacity criteria for satisfactory action of footing, Earthquake load on footing, Dynamic analysis for vertical loads.	**6**
SECTION-IV	Liquefaction of Soils: Theory, Criterion of Liquefaction , Factor Affecting , Laboratory study on liquefaction in Triaxial shear and oscillatory simple shear, evaluation of liquefaction Potential , Vibration Table studies, Liquefaction behavior of dense sands. M/C Foundations: Introduction, Criteria for satisfactory M/C foundation, Methods of analysis, Degree of freedom of a Block, I.S. for design of reciprocation M/C design Procedure for Block Foundation, Vibration Isolation & Screening of Waves.	**12**

Course Outcome:

CO1	Students will be able to calculate the dynamic properties of soil & perform relevant tests in laboratory
CO2	Students will be able to perform an equivalent-linear site response analysis
CO3	Students will be able to evaluate the liquefaction potential using simplified methodology
CO4	Students will be able to recognize & differentiate between the conventional behaviour

Recommended Books:

1. Parkash S. "Soil Dynamics" Leonards " Foundation Engineering" 2nd Edition,2011.

SUBJECT TITLE: DESIGN OF ROAD PAVEMENT
SUBJECT CODE: MTCE-127
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective

The present course is designed to choose appropriate pavement quality control test, and quantify construction variability

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Pavement Types: Definition, highway and airport pavement comparison, wheel loads, tyre pressure, Contact pressure, design factors. Type of distresses structural and functional, serviceability	**12**
SECTION-II	Stresses in Flexible: Layered system concept, multilayered solutions. Burmister's method, Fundamental design concepts. Stresses in Rigid Pavements: Relative stiffness of slabs. Modulus of subgrade reaction. Stresses due to warping, stresses due to friction, effect of warping, contraction and expansion. Plain versus reinforced pavements, stresses in dowel bar, tie bar, combined stresses.	**12**
SECTION-III	Design of Flexible Pavements: Design factors. Design wheel load. Equivalent single wheel load. Difference between airport and highway design concept. Different design methods. CBR, GI, Triaxial method, McLeod method. Design of Rigid Pavement: General design considerations. Design of joints in cement concrete pavements, spacing of expansion joint, spacing of contraction joints. Design of dowel bar. Design of tie bar. IRC recommendations for design of concrete pavements.	**12**
SECTION-IV	Pavement Evaluation and Rehabilitation: Pavement distresses in flexible and rigid pavements, condition and evaluation survey. Present serviceability index. Methods of measuring condition, skid resistance. Principles of maintenance. Methods of structural evaluation.	**12**

Course Outcome:

CO1	Students will be able to identify the factors affecting the design and performance of diverse types of highway
CO2	Students will be able to evaluate the stresses and strain at various locations of flexible and rigid pavements
CO3	Students will be able to designing flexible and rigid pavements applying various methods
CO4	Students will be able to designing longitudinal and transverse joints in rigid and flexible pavements

Recommended Books:

1. Principles of Transportation Engineering by Chakroborty& Das, Prentice Hall, India, 2nd Edition, 2011.
2. Highway Engg by S. K. Khanna& C.E.G. Justo, New Chand Bros., Roorkee, 10th Edition, 2015.
3. Principles of Pavement Design, by Yoder E.J. and Witczak M.W., 2nd Edition, 2010.
4. Principles and Practice of Highway Engg., byL.R.Kadiyali, 10th Edition, 2011.

SUBJECT TITLE: LAB-2 (ADVANCED ENVIRONMENT LAB)
SUBJECT CODE: MTCE-132
SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 100

Objective: This course is designed to impart the knowledge about air, noise and waste water testing.

Contents of Syllabus:

Contents	ContactHours
1. Monitoring of ambient air quality for total suspended particulate. 2. Measurements of $SO_2$and NO_x in ambient air. 3. Detection of levels of noise pollution in residential/commercial/industrialand silent/sensitive areas 4. Field visit of Industrial/wastewater treatment plant.	**40**

Course Outcome:

CO1	Students will be able to develop environmental scientists and engineers and sensitize them towards environmental issues.
CO2	Students will be able to acquire analytical skills in assessing environmental impacts through a multidisciplinary approach.
CO3	Students will be able to identify environmental problems and solutions through organized research.
CO4	Students will be able to improve the communication and writing skill so as to face the competitive world

Suggested Books:

1. Metcalf & Eddy, Inc., Waste water Engineering Treatment and Reuse, 2nd Edition, 2003.
2. Air pollution: its origin and control by Kenneth Wark, Cecil Francis Warner, Wayne T. Davis, 3rdEdition, 1997.

SUBJECT TITLE: ADVANCE SOIL TESTING LAB
SUBJECT CODE: MTCE-133
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 100

Objective: This course is designed to impart the hands on experience o to test the quality of soil though various advanced tests**.**

Contents of Syllabus:

Contents	ContactHours
1. Determination of in-situ density by Sand replacement method. 2.Determination of in-situ density by core cutter method 3. Determination of Liquid Limit & Plastic Limit. 4. Determination of specific gravity of soil solids by pyconometer method. 5. Compaction test of soil. 6. Determination of Relative Density of soil. 7. Determination of permeability by Constant Head Method. 8. Determination of permeability by Variable Head method. 9. Unconfined Compression Test for fine grained soil. 10. Direct Shear Test 11. Triaxial Test 12. Grain size analysis of sand and determination of uniformity coefficient(Cu) and coefficient of curvature (Cc).	**40**

outcome of course:

CO1	Students will be able to analyse data from auger boring
CO2	Students will be able to analyse the data from plate load test
CO3	Students will be able to analyse the data from static and dynamic cone penetration test
CO4	Students will be able to analyse the data from sub soil investigation tests

Suggested Books:

Soil Testing Engineering, manual By ShamsherPrakash and P.K. Jain.Nem Chand & Brothers.

SUBJECT TITLE: SOLID MECHANICS
SUBJECT CODE: MTCE-140
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Theory of stress, state of stress in a body. Differential equations of equilibrium	16
SECTION-II	Analysis of state of stress at a given point in a body, geometrical theory of strains, displacement components and strain components and relation between them, generalized hooks law, strains expressed in terms of stresses, stresses expressed in terms of strains.	16
SECTION-III	Torsion of prismatic bars and bending.	8
SECTION-IV	Saint-venant method, three dimensional stress systems, tensors, unsymmetrical bending.	8

Course Outcome:

CO1	Students will be able to develop stress and strain tensors and perform transformations
CO2	Students will be able to analyze stress-strain relationships for materials in elastic state.
CO3	Students will be able to solve problems of linear elasticity using boundary value concept
CO4	Students will be able to analyze problems of plasticity and behavior of visco-elastic materials using various models

Recommended Books:

1. Theory of elasticity- S.Timoshenko (2010)
2. Theory of elasticity-M.Filonenko (1972)
3. Solid mechanics-S.H. Crandall (2006)

.

SUBJECT TITLE: DISASTER MANAGEMENTSUBJECT CODE:MTCE-141
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction to Disaster Management: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle. Disaster Mitigation and Preparedness: Natural Hazards: causes, distribution pattern, consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. Man-made Hazards: causes, consequences mitigation measures for various Industrial hazards/disasters, preparedness for natural disasters in urbanareas.	12
SECTION-II	Hazard and Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems. Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, Reconstruction and rehabilitation.	12
SECTION-III	Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines.	12
SECTION-IV	Application of Geo-informatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems. Integration of public policy: Planning and design of infrastructure fordisaster management, community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management. Case Studies: Lessons and experiences from various important disasters with specific reference to civil engineering.	12

Course Outcome:

CO1	Students will be able to understand basic conceptual understanding of disasters.
CO2	Students will be able to understand approaches of Disaster Management
CO3	Students will be able to build skills to respond to disaster
CO4	Students will be able to methods of community involvement as an essential part of successful DRR.

Recommended Books:

1. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester (2013)
2. Disaster Management, R.B. Singh (Ed), Rawat Publications (2006)

SUBJECT TITLE: CONSTRUCTION AND MAINT. MGMT.
SUBJECT CODE: MTCE-142
SEMESTER: III
CONTACTHOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3Hrs

Objective: This course is designed to impart the knowledge about varius structural and architectural services and their maintenance.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Services in Residential, commercial and medical buildings (A) Sanitation, water supply, electric wiring, rain water disposal, lighting & illumination, calculation methods for these services (B) Air Conditioning& ventilation: Natural ventilation, control cooling systems, modern systems of air conditioning, ducting Systems, different mechanical means of air conditioning. (C) Fire Safety Dye.(D) Thermal Insulation	16
SECTION-II	Architectural controls and building byelaws: Role of building byelaws in a city, local byelaws and architectural controls, facade control and zoning plans.	10
SECTION-III	Regional planning: Understanding of physical, social and economic parameters for regional planning.	8
SECTION-IV	Landscaping: Forces of man and nature, their relationship and effect on shaping landscape, site analysis.	6

Course Outcome:

CO1	To make students understand the concepts of Project Management for planning to execution of projects
CO2	To make students understand the feasibility analysis in Project Management and network analysis tools for cost and time estimation
CO3	To enable students to comprehend the fundamentals of Contract Administration, Costing and Budgeting.
CO4	Make students capable to analyze, apply and appreciate contemporary project management tools and methodologies in Indian context.

Recommended Books:
NA

SUBJECT TITLE: COMPUTER AIDED DESIGN METHODS
SUBJECT CODE: MTCE-143
SEMESTER: II
CONTACTHOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3Hrs

Objective: This course is designed to The main goals are to provide students with a conceptual understanding of the principles of CAD systems, the implementation of these principles

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Computer Aided Design: Introduction, computer graphics, geometric modeling, Three dimensional graphics, raster graphic fundamentals, computer aided linkage displays and synthesis, interactive acceleration analysis.	8
SECTION-II	Programming using matrix methods of structural analysis: Assembly of matrices, solution of equilibrium equations, flow charts	10
SECTION-III	Interactive computer programming: Computer programs for design of simple civil engineering structural elements. Expert System in Engineering: Introduction, history, advantages and limitations of expert systems. Components of expert systems: Knowledge base, inference Engine, user's interface.	16
SECTION-IV	Development of expert systems: Problem formulation, application to engineering analysis &design consideration and operations, representative applications in civil engineering.	6

Course Outcome:

CO1	Students will be able to formulate relevant research problems , conduct experimental or analytical study with modern & scientific methods and use of software tools
CO2	Students will be able to design and validate technological solutions to defined problems and communicate clearly
CO3	Students will be able to review and document the knowledge developed by scholar predecessor and critically assess the relevant technologies issues
CO4	Students will be able to develop solutions or to do research in the areas of design and simulation in mechanical engineering

Recommended Books:

1. "Matrix Analysis of Framed Structures" by William Weaver. (2004)
2. "Introduction to Expert Systems" by Jackson, P. (1998)
3. "A guide to Expert Systems" Waterman, D.A. (2002)

SUBJECT TITLE: HIGH RISE BUILDINGS
SUBJECT CODE: MTCE-144
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart knowledge on the planning and designing aspects of high rise buildings.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Tall building systems and concepts: Environmental systems. Service systems, construction system, foundation design, architectural- structural interaction. Tall building criteria and loading gravity load. Earthquake loadings, wind loading and effects, fire and blast, quality control crib structural safety	12
SECTION-II	Structural design of tall steel buildings: Commentary on structural standards, elastic analysis and design. Plastic analysis and design, stability. Design methods based on stiffness, fatigue and fracture, load factor (Limit State) design.	11
SECTION-III	Structural design of tall concrete and masonry buildings: Commentary structural standards, plastic analysis-strength of members and correction, non-linear analysis and limit design, stability, stiffness and crack control creep shrinkage and temperature effects. Limit state design, masonry structures.	13
SECTION-IV	Frame-shear wall systems: Twist of frame. Analysis of shear wall, frame wall interaction, analysis of coupled shear wall, computation of earthquake load dynamic analysis of tall building.	4

Course Outcome:

CO1	Students will be able to plan tall buildings considering structural systems, fire rating, local considerations etc.
CO2	Students will be able to evaluate loading for tall structures
CO3	Students will be able to analyze and design of tall structural systems including structural connections
CO4	Students will be able to analyze tube-in-tube construction and 3-dimensional analysis of shear core building

Recommended Books:

1. Structural Analysis and design of Tall Buildings by Tara NathBungale (2011)
2. Advances in tall buildings by Beedle L.S. (2007)
3. Experimental design, Theory & application, Federer, Oxford & IBH pub Co. (1955)

SUBJECT TITLE: COMPOSITE MATERIALS
SUBJECT CODE: MTCE-145
SEMESTER: III
CONTACTHOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about the various high strengthening properties of materials.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Supplementary cementing materials: Types of supplementary cementing materials such as fly ash, silica fume, rice husk ash, and meta kaolin; their physical, chemical, mineralogical properties, effects of these materials on the fresh properties, strength properties, durability properties. Fiber Reinforced Concrete: Definition, types of fibers, properties of fibers, factors affecting FRC, mixing and casting procedure, composite materials approach, effect of fibers on the workability, strength and durability of concretes and applications of different types of fibers	13
SECTION-II	High volume fly ash concrete: Definition, effect of types of fly ash in large quantities on the strength properties of concrete, durability and abrasion resistance of HVFA, applications of HVFA. Self-compacting concrete (SCC): Definition, advantages and disadvantages of SCC, various mix design procedures, tests for SCC; applications for SCC	10
SECTION-III	Behavior of concrete at high temperature: Definition of high temperature, mechanism of concrete failure at high temperature, spalling characteristics, difference in the behavior of normal concrete, high strength concrete and self-compacting concrete at high temperature.	7
SECTION-IV	High performance concrete: Definition of HPC, material selection and its properties, parameters for concrete being considered as HPC, applicationsof HPC. Polymer Concrete Composites: Definition, types of monomers and polymers, types of polymer concretes and their applications. Fiber reinforced plastics (FRP): Types of FRP, their properties and effects on concrete elements under various loading conditions. Use of waste materials and by-products: Types of waste materials and by-products such as waste glass, scrap tires, waste foundry sand, clean coal ash, etc. Effect of these materials on the various properties of mortar and concrete, introduction of leachates from waste materials and their analysis	19

Course Outcome:

CO1	Students will be able to identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
CO2	Students will be able to analyse the elastic properties and simulate the mechanical performance of composite laminates; and understand and predict the failure behaviour of fibre-reinforced composites
CO3	Students will be able to apply knowledge of composite mechanical performance and manufacturing methods to a composites design project
CO4	Students will be able to critique and synthesise literature and apply the knowledge gained from the course in the design and application of fibre-reinforced composites.

Recommended Books:

1. Nevelli, A. M., Properties of Concrete, Prentice Hall of India (1995). Siddique, R., SpecialStructuralConcretes
2. Galgotia Publications (2000). Krishna Raju, N., Concrete Mix Design, CBS Publications (2002).
3. Concrete Technology, Tata-McGraw Hill, 3rd Edition (2008).

SUBJECT TITLE: LAND USE & REGIONAL TPT. PLANNING

SUBJECT CODE: MTCE-146
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about urbanization, transit oriented land use planning.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Urbanization; urban forms and structures, Delineation of regions ,Land usetransportation models	13
SECTION-II	Transit oriented land use planning ,Regional and intercity travel demandestimation	11
SECTION-III	Freight travel demand modeling, Regional network planning	10
SECTION-IV	Policy formulation and evaluation	10

Course Outcome:

CO1	Students will acquire basic understanding of what transportation planning is, its theoretical backgrounds and applications.
CO2	Students will acquire skill for collecting data about travel behaviour and analyzing the data for use in transport planning.
CO3	Students will acquire ability to understand the important concepts about public transport system.
CO4	Students will acquire ability to work in team and communicate with others effectively for transport related topics.

Recommended Books:

1. Blundon, W. R. and J Black, The Land Use Transport System, 2nd Edition,AustralianNatlUnivPress
2. Eric Koomen and Judith Borsboom-van Beurden, Land-Use Modelling in Planning Practice(GeoJournal Library), 1st Edition, Springer

SUBJECT TITLE: PAVEMENT MANAGEMENT SYSTEM
SUBJECT CODE: MTCE-147
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3Hrs

Objective: This course is designed to impart the knowledge about pavement management systems, pavement performance.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction Pavement Management Systems; Components of pavementmanagement systems Pavement conditions survey and ratings	10
SECTION-II	Pavement performance prediction Concepts, modeling techniques, Comparison of different deterioration models Highway Development andManagement tools Rehabilitation budget planning; Ranking and optimization methodologies.	12
SECTION-III	Alternate pavement design Strategies and economic evaluation , Reliability concepts in pavement engineering; life cycle costing.	11
SECTION-IV	Road asset management, pavement preservation programs , Expertsystems and pavement management.	10

Course Outcome:

CO1	Students will be able to assess pavement surface conditions and evaluate it.
CO2	Students will be able to estimate the structural stability of pavements using various tests.
CO3	Students will be able to demonstrate the ability to discuss pavement management system models and methodologies.
CO4	Students will be able to assess pavement surface conditions and evaluate it.

Recommended Books:

1. Haas, R., W.R. Hudson, and J.P. Zaniewski, “Modern Pavement Management”,
2. Krieger Press Yoder E.J. and Witezak, “Principles of Pavement Design,” JohnWiley & Sons
3. Shahin M.Y. “Pavement Management for Air Port, Roads and Parking Lots”,Chapman and Hall/Springer

SUBJECT TITLE: TRANSPORT SYSTEM PLANNING AND MANAGEMENT
SUBJECT CODE: MTCE-148
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about transportation planning and systems.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	General Importance of transportation, transportation planning methodology, hierarchical levels of planning and its relation to rural, urban areas. Long range planning, Passenger and goods transportation, General concept and process of transport planning, Land-use transport interactions, Socio-economic characteristics of Land use	9
SECTION-II	Transportation Systems Multi modal transportation system; Characteristics of Mass Transit systems including technical, demand operational and economic problems, fixed Track Facility, Mass Rapid Transit System- Elevated, Surface and Underground construction , Express Bus System, integrated Operating Characteristics of Terminal and Transfer facilities	8
SECTION-III	Urban Transportation Planning Studies Urban Travel Characteristics, Private and Public Behavior analysis, Transportation demand Surveys, Delineation of the urban area, zoning, Origin-Destination Studies, Home Interviews, trip Classification and Socio- Economic variables in trip making projections	12
SECTION-IV	Planning Methodology and Systems analysis Study of existing network-trip generation techniques, Category analysis, multiple regression techniques, Modal split analysis, Trip distribution techniques, Growth Factor model, Gravity models, Opportunity models and multiple regression models, Traffic assignment methods, Minimum Path tree-All or nothing assignment and capacity restraint techniques, analysis and evaluation techniques	14

CO1	Students will acquire basic understanding of what transportation planning is, its theoretical backgrounds and applications.
CO2	Students will acquire skill for collecting data about travel behaviour and analyzing the data for use in transport planning.
CO3	Students will acquire ability to understand the important concepts about public transport system.
CO4	Students will acquire ability to work in team and communicate with others effectively for transport related topics.

Recommended Books:

1. Kadiyali, L. R., Traffic Engineering and Transport Planning, KhannaPublishers
2. Highway Engg.-Khanna S.K. and Justo C. E. G. New ChandPublication
3. C A O'Flaherty, "Transport Planning and Traffic Engineering",Butterworth Heinemann, Elsevier, Burlington, MA

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: HYDROLOGY AND WATER HARVESTING
SUBJECT CODE: MTCE-149
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3Hrs

Objective: This course is designed to impart the knowledge about Geological Activity, Water Harvesting.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Water, Nature & Properties, Water Sources their Management, GroundWater, Movement Nature	5
SECTION-II	Geological Activity, Streams & Drainage, Depositional Features, Glacier, Ocean, Topography & Circulation Shapin	7
SECTION-III	Water Harvesting, Canals, Barrage & Dams, Environmental Impacts & Economics, Rain Water Management, Rain WaterHarvesting Techniques	8
SECTION-IV	Atmospheric Water, Water Estates & Heat, Cloud, Foe, ThunderStorms, Orographic Precipitation, Global Balances of Energy & Water, Pollution Dome & Plume.	10

Course Outcome:

CO1	Students will be able to understand the concept of occurrence movement and distribution of water that is a prime resource for development of a civilization..
CO2	Students will be able to know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology
CO3	Students will be able to know the basic principles and movement of ground water and properties of groundwater flow.
CO4	Students will be able to understand the water harvesting techniques

Recommended Books:

1. Hydrology and Water Resources Engineering , K.CPatra
2. Elements of Water Resources Engineering , K.N.Duggal
3. Irrigation and Water Resources Engineering , G.LAsawa
4. Modern Hydrology and Sustainable Water Development , S.KGup

SUBJECT TITLE: ENERGY THROUGH WATER UTILIZATION
SUBJECT CODE: MTCE-150
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about biomass, bio-energy utilization in India.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Bioenergy, Future Supply in Developing Countries, Energy Planning, Energy Technologies and Development. Observations on Producer GasDevelopment with Particular Reference to Thailand.	10
SECTION-II	Biomass Utilization in India, Stoves and Kilns, A Study of EthanolProduction in Kenya. The Economics of Bioenergy in Developing Countries, Afforestation andPublic Participation.	7
SECTION-III	Bioenergy Research and Development in Developing countries. Energy by Rice Husk utilization Energy Conversion Considerations, Burning in a Controlled Atmosphere, Destructive Distillation, Pyrolysis, Gasification – Producer Gas, Other Chemicals.	8
SECTION-IV	Thermo chemical and Biochemical Processes, Physical and Chemical Characteristics of Rice Husk, Use of Rice Husk as Fuel,Processes Using Husk as an Energy Source, Equipment and Machinery to Convert Rice-Husk to Energy and for other related Functions.	10

Course Outcome:

CO1	Students will be able to apply concepts of stress, strain, elasticity and plasticity to intact rock and rock masses.
CO2	Students will be able to collect rock mechanics data in the field, combine it with laboratory test data and assess the stability of excavations in rock.
CO3	Students will be able to determine likely rock mass behaviours under different excavation and loading conditions and propose mitigation solutions.
CO4	Students will be able to apply concepts of stress, strain, elasticity and plasticity to intact rock and rock masses.

Recommended Books:

1. Energy Conservation Through Effective Energy Utilization: Jesse C. Denton, Stephen Webber,John E. Moriarty –1976
2. HandbookofWaterandEnergyManagementinFoodProcessing:JiriKlemes,RobinSmith,Jin-Kuk Kim –2008
3. Renewable Energy in the Middle East: Michael Mason, AmitMor –2009

SUBJECT TITLE: ENVIRONMENTAL STANDARD AND LAWS
SUBJECT CODE: MTCE-151
SEMESTER: III
CONTACTHOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about various environmental standard and laws

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction : Indian Constitution and Environmental Protection – National Environmental policies – Precautionary Principle and Polluter Pays Principle – Concept of absolute liability – multilateral environmental agreements and Protocols – Montreal Protocol, Kyoto agreement, Rio declaration –Environmental Protection Act, Water (P&CP) Act, Air (P&CP) Act –Institutional framework (SPCB/CPCB/MOEF)	**12**
SECTION-II	Water (P &Cp) Act, 1974: Power & functions of regulatory agencies - responsibilities of Occupier, Provision relating to prevention and control, Scheme of Consent to establish, Consent to operate – Conditions of the consents – Outlet – Legal sampling procedures, State Water Laboratory –Appellate Authority – Penalties for violation of consent conditions etc. Provisions for closure/directions in apprehended pollution situation.	**12**
SECTION-III	Environment (Protection) Act 1986: Genesis of the Act – delegation of powers – Role of Central Government - EIA Notification – Sitting of Industries – Coastal Zone Regulation - Responsibilities of local bodies mitigation scheme etc., for Municipal Solid Waste Management - Responsibilities of Pollution Control Boards under Hazardous Waste rules and that of occupier, authorization – Biomedical waste rules –	**12**
SECTION-IV	Fundamentals of Environmental Management and ISO 14000series: Background and development of ISO 14000 series. Environmental management Plans, principles and elements. TheISO 14001- Environmental management systems standard. Environmental law in India: Environmental policy and laws.	**12**

Course Outcome:

CO1	Students will be able to identify core environmental issues and legal and institutional responses to them.
CO2	Students will be able to analyze the role of judiciary in environmental protection.
CO3	Students will be able to understand development of environmental law in an international perspective, specifically developed and developing countries perspective.
CO4	Students will be able to introduce the basic concepts and principles of environmental law and to analyze these principles as tools of environmental protection, where the laws and policies fall short.

Recommended Books:

1. CPCB, “Pollution Control acts, Rules and Notifications issued there under “Pollution ControlSeries – PCL/
2. Pares Distn. Environmental Laws in India (Deep, Latededn.)
3. Central Pollution Control Board, Delhi, 1997. 2. Shyam Divan and Armin Roseneranz“Environmental law and policy in India “Oxford University Press, NewDelhi,2001.
4. Handbook of environmental management and technology: Gwendolyn Holmes, BenRamnarine Singh, Louis Theodore

SUBJECT TITLE: MANAGEMENT IN ORGANIZATION
SUBJECT CODE: MTCE-152
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about management structure and its duties.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction to organizational management: Nature , scope and complexity, Longitudinal thinking and legacy factor, Theory and majors schools of thought and framework of organizational analysis, Systems contingency approach to organization theory and practice; techniques of organizational diagnosis, Theory of organizational structures - nature and consequence of structure	12
SECTION-II	Impact of structure, organization change and intervention strategy: Socio-culture dimension of work and behavior. Impact of Environment and cultural variables on organization structure & Style, Organization change & Organization development, Intervention strategies for organization development - Individual, Group & Interpersonal Interventions, Total System Intervention & Stabilizing Change, MBO.	12
SECTION-III	Environment Analysis & Impact: Automation, Interdependence & Evaluation Issues: Nature of Organizational Processes, Environmental analysis Techniques & impact for organizational growth, Issues of Mechanization, Automation & Computerization, Organization Interdependence, Organization Evaluation.	12
SECTION-IV	Case Studies: Introduction, Objectives of case study, Phases of case study, Steps of case study, Types of case studies.	12

Course Outcome:

CO1	Students will be able to describe situations where management decision-making should incorporate ethical reasoning, multiculturalism, and internal intergroup behavior.
CO2	Students will be able to use fundamental management concepts and principles as guides to analyze class environment case incidents.
CO3	Students will be able to identify many of the factors and forces managers must confront both internal and external to the organization.
CO4	Students will be able to understand the environmental analysis

Recommended Books:

NICMAR, “Management In Organization”, NICMAR

SUBJECT TITLE: CONSTRUCTION FINANCE MANAGEMENT
SUBJECT CODE: MTCE-153
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about financial management in construction industry.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Financial Planning: Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves. Over and under capitalization, Introduction to Micro financing. Budget: Budgetary control system. Types of budgets, Procedure for master budgets. Budget manual.	10
SECTION-II	Corporate Sector: Corporate tax planning, Public policies on ICRA grading of exchange, World financial market, Role of financing institutes in Construction, CIDC-IRA grading of construction entities, Venture Capital Financing- Indian Venture Capital scenario, SEBI regulation.	10
SECTION-III	Construction Accounts: Accounting process, preparation of profit and loss account and balance sheet as per the companies Act, 1956, preparation of contract accounts for each project, methods of recording and reporting site accounts between project office and head office, Ratio Analysis. Escrow Account for PPP Project.	10
SECTION-IV	Case Studies: Case studies for 1)BOT 2)Dams 3)Mass Transit System 4)Infrastructure Projects 5)Government Funded Projects with respect to a) Project Appraisal b) Raising of funds c) Cost to complete analysis	10

Course Outcome:

CO1	Students will be able to calculate cash flows to determine revenue generation
CO2	Students will be able to analyze technology workflows and describe their efficiencies
CO3	Students will be able to learn how to calculate the quantity takeoff, labor, and equipment costs for construction projects
CO4	Students will be able to understand master financial planning for financing development projects

Recommended Books:

1. Construction Management & PWD Accounts --- D Lal, S. K. Kataria& Sons, 2012
2. Principles of Corporate Finance, Brealey R.A. Tata McGraw Hill, New Delhi, 2003.
3. "Financial Management" – Indian Institute of Banking and Finance – MacmillanPublications.

SUBJECT TITLE: JOINT VENTURE AND PRIVATIZATION IN INF
SUBJECT CODE: MTCE-154
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about the joint ventures.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	The joint ventures concept. Motives and kinds of Joint Ventures	12
SECTION-II	Requirements for Joint Venture project Negotiation and its organization	12
SECTION-III	Arrangement between joint venture partners and kinds of agreements for transfer of technology	12
SECTION-IV	Bilateral investment Treaties and legal framework and settlement of Disputes and Indian Law on Intellectual Property. Joint Ventures abroad	12

Course Outcome:

CO1	Students will be able to evaluate the roles played and sources of support provided by private and government bodies
CO2	Students will be able to apply Techniques for assembling information and making qualitative judgments are properly described.
CO3	Students will be able to understand Tools used to conduct careful quantitative financial analysis are explained thoroughly
CO4	Students will be able to apply Techniques for sourcing and enhancing the terms of funding both in domestic and international projects.

Recommended Books:

NICMAR, " Joint Venture and Privatisation in Infrastructure Projects ", NICMAR

SUBJECT TITLE: EARTHEN EMBANKMENT
SUBJECT CODE: MTCE-155
SEMESTER: III
CONTACTHOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3hrs

Objective: This course is designed to impart the knowledge about the earthen dams and embankments.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Investigation of dams sites: General & extent of investigation, Preliminary and Final investigation, Geological investigation, Sub - surface investigation, Drilling and Sampling. Soil test & other utility: Generalvarious soil test for coarse, Sand and gravels, Clay, Silts & fine sands, Tests of foundation material shear consideration and settlement tests O.M.S. consideration.	16
SECTION-II	Earth Dams: General History, Advantages and disadvantages, General features of earth & rock-fill dams, Design consideration for the variouscomponents. Flow through saturated Porous Media: Darcy' s law - its applications , Laplace equation for isotropic and anisotropic soils , theory offlow nets.	11
SECTION-III	Seepage through embankments and its controls: General determination of phreatic line by different methods, Effect of seepage, Piping, control of seepage and exit gradients by different structures such as cut off, Sheet pilling upstream blankets, filters, internal drains etc. Failure & Maintenance of earth Dams: Cause & remedies of hydraulic seepage and structure failures , Causes of foundation failure and maintenance of Earth dams	13
SECTION-IV	Construction material and Methods: General consideration for the construction of materials, suitability of different materials for various components earth dams. Soil unsuitable for dam construction by roll,Hydraulic- fill & semi hydraulic fill methods.	8

Course Outcome:

CO1	Students will be able to understand lateral earth pressure theories and pressure theories and design of retaining walls.
CO2	Students will be able to design coffer dams and earth dams by different methods
CO3	Students will be able to understand pressure envelops and design of various components in braced cuts, coffer dams
CO4	Students will be able to understand Construction material and Methods

Recommended Books:

1. U.S.B.R. " Design of small Dams"
2. Creger Justin and Hinds "Engineering for Dams Vol. 2 & 3.
3. J.Nemec " Engineering Hydrology"

SUBJECT TITLE: APPLIED SOIL MECHANICS
SUBJECT CODE: MTCE-156
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment:40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about behavior of soil and its stabilization.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction to stability of slopes, Stability number, Friction circle, Bishop's method of slices- simple and rigorous ; Wedge method, Factor of safety w. r . t. height and strength. Earth work construction, Embankments, Earth dams, Field compaction, Seepage and piping in embankments and dams construction problems.	14
SECTION-II	Stabilization of soils: Mechanical, Electrical and Chemical methods of stabilization, Problems of excavation, Dewatering, Stability of base and embankment. Arching in Soil & underground culvert and conduits.	14
SECTION-III	Swell and shrinkage, Soils characteristics, swelling pressure of soils, Mechanics of Swelling, Crack. Design of open cuts.	12
SECTION-IV	Soil Freezing Permafrost: Geo thermal profile, Freezing index. Depth of frost penetration & its determination, Freezing in coarse and fine grained soil, Fields frost heaving.	8

Course Outcome:

CO1	Students will be able to calculate and analyse the stresses on soil and be able to draw the stress paths
CO2	Students will be able to analyse the effect of flow of fluids through soils
CO3	Students will be able to evaluate the compressibility of soils
CO4	Students will be able to obtain the shear strength of soils

Recommended Books:

1. USBR " Design of SmallDams"
2. Das, Braja M " Advanced SoilMechanics"
3. Lamba& Whitman "SoilMechanics"
4. Tylor, D.W. " Fundamental of soilMechanics"

SUBJECT TITLE: ENVIRONMENT IMPACT ASSESSMENT & MANAGEMENT
SUBJECT CODE: MTCE-157
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about environment impact assessment & management

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Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction- Components of Environment- Man and Environment – Health and Environment – Environmental Ethics – Interdisciplinary nature of Environment -Sustainable development – Social, economical and environmental dimensions	6
SECTION-II	Elements of EIA – Purpose – Screening – Scoping - Terms of Reference - Public Consultation - Environmental Clearance process followed in India - Key Elements in 1994 & 2006 EIA (Govt. of India) Notification	7
SECTION-III	Socio-economic impacts - Impact types- Identification- Impact assessment Methodologies Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation- Introduction to latest softwares in water and air quality Modeling	8
SECTION-IV	Water Quality Analysis- Standards for Water, Air and Noise Quality - Impact of development on vegetation and wild life-Environmental Management Plan- EIA- Case study related to Hydro electric Project.	10

Course Outcome:

CO1	Students will be able to Explicate the concept of EIA
CO2	Students will be able to Illustrate the necessity of public participation in EIA studies
CO3	Students will be able to Summarize the importance of environment attributes
CO4	Students will be able to Quantify impacts for various developmental projects

Recommended Books:

1. Larry W Canter, Environmental Impact Assessment, McGraw Hill Inc., NewYork.
2. EIA Notification, Ministry of Environment & Forests, Govt. of India,2006.
3. Rau G J and Wooten C.D, EIA Analysis Hand Book, McGrawHill.
4. Robert A Corbett, Standard Handbook of Environmental Engineering, McGrawHill.
5. John Glasson, RikiTherivel and S. Andrew Chadwick, Introduction to EIA, University CollegeLondon PressLimited

SUBJECT TITLE: ROCK MECHANICS
SUBJECT CODE: MTCE-158
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about behavior of rocks, their classification and testing.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	INTRODUCTION: Introduction on the rock mechanics its relation with engineering Geology and soil Mechanics-Importance and application ofthe rock mechanics to Civil Engineering. CLASSIFICATION: Review of litho-logical classification of rocks, Engineering classification of intact and fissured rock- Deere & Miller and Deere classification - RQD classification on wave velocity relation classification on fissures joints and faults.	16
SECTION-II	ENGINNERING PROPERTIES OF ROCK MASSES LAB. TESTS: Void- index test, Compression & tensile tests, Permeability, Strengthcharacteristics, Strength of intact and fissured rocks, Effect of test conditions. STABILITY IN ROCK SLOPES: Modes of failures in rock masses simplified Bishop's method, Janbu's method, Hock's method, Wedge'smethod.	16
SECTION-III	IN SITU TESTING OF ROCKS: Field direct shear test, Triaxial test, Use of flat jacks, Cable jacking, Chamber test & Plate load test	8
SECTION-IV	STABILISATION OF ROCKS: Rock Bolting, Principle of rock Bolting,Rock grouting, Grouting materials, Grouting operations & method of grouting.	8

Course Outcome:

CO1	To understand of the mechanical behavior of rock materials, rock discontinuities and rock masses
CO2	To gain knowledge of rock mass structure, discontinuities features and rock mass classification
CO3	To understand rock strength & deformability and in situ stress testing method and its effects on design in massive elastic rock and stratified rock, respectively.
CO4	To know about methods of determine Engineering Properties of Rocks and their measurement in the laboratory and at site

Recommended Books:

1. Goodman R.E." Rock Mechanics"
2. Rock Mechanics for Engineering : B.P. Verma
3. Engineering Geology : D.S.Arora
4. Engineering Geology : Parbin Sing

SUBJECT TITLE: SEMINAR
SUBJECT CODE: MTCE-181
SEMESTER: I

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	0	2

Internal Assessment: 100
End Term Exam: NA
Duration of Exam: NA

Objective : This part of course aims to outline annotated bibliography of research demonstrating scholarly skills and prepares a well-organized report employing elements of technical writing and critical thinking etc.

Contents of Syllabus

Seminar will be an independent study on the related topic and will be evaluated internally.

and course outcome:

CO1	Students will be able to establish motivation for any topic of interest and develop a thought process for technical presentation.
CO2	Students will be able to organize a detailed literature survey and build a document with respect to technical publications.
CO3	Students will be able to analysis and comprehension of proof-of-concept and related data.
CO4	Students will be able to make use of new and recent technology for creating technical reports

Recommended Books: NA

SUBJECT TITLE: PRE-THESIS SEMINARSUBJECT CODE: MTCE-182
SEMESTER: III

CONTACTHOURS/WEEK :	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
	0	0	0	4

Internal Assessment: 100
End Term Exam: NA
Duration of Exam: NA

Objective: This course is designed to provide an accurate description of the specific actions that will be taken to complete thesis.

Contents of Syllabus:

Following things to be included in Pre-thesis Seminar:
1. Literature survey.
2. Gap Reflection.
3. Objectives and Methodology
4. ExpectedOutcomes

Synopsis presentation through PPT will be evaluated internally

Recommended Books: NA

SUBJECT TITLE: PROJECT
SUBJECT CODE: MTCE-183
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	0	10

Internal Assessment: 100
End Term Exam: NA
Duration of Exam: NA

Objective: This course is designed to provide an accurate description of the specific actions taken by individuals in order to reach the aim.

Contents of Syllabus:

Students are required to work on project in any of the specified Area (Transportation and Highway Engineering/Structural Engineering/ Infrastructure development and Management and Environmental Engineering).
Project will be evaluated by the external examiner and the internal guide. The candidate is required to make presentation of his Project work and Viva-voce will be held.

Recommended Books:NA

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: THESIS
SUBJECT CODE: MTCE-190
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	0	20

External Assessmen: 100
End Term Exam: NA
Duration of Exam: NA

Objective: This course is designed to provide an accurate description of the specific actions taken by individuals in order to reach the aim.

Contents of Syllabus:

1. Thesis in the specified Area (Transportation and Highway Engineering/Structural Engineering/Infrastructure development and Management and EnvironmentalEngineering)
2. Thesis will be evaluated by the external examiner and the internal guide. The candidate is required to make presentation of his thesis work and Viva-voce will beheld

Recommended Books: NA

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: CONTRACTS MANAGEMENT
SUBJECT CODE: MTCE-122
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about construction claims for contracts and conditions of contracts.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Construction Contracts: a) Standard forms of contracts, methods of inviting tenders, pre-bid meetings, pre-qualification system, scrutiny of tenders and comparativestatement.b)Contract formation, conditions of contracts, contracts with various stakeholders on a major construction projects, contract pricing by the client, project management consultants and the contractor, contract performance, contract correspondence and contract closure.	**10**
SECTION-II	Construction Claims: Extra items and causes of claims. Types of construction claims, documentation. settlement of claims, extension of time. Dispute Resolution :Causes of disputes and importance of role of various stakeholders in prevention of disputes, Alternate Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards.	**10**
SECTION-III	Contract Conditions: a)General condition and Particular conditions, conditions of Ministry of Statistics and Program Implementation-Government Of India. Model forms of contract. Role of Planning Commission. b) ICE conditions-Introduction, FIDIC conditions- evolution of FIDIC document, types based on whether design is of employer or contractor, Design & Build contract, EPC contract, short forms of contract-Colour Code. Various conditions of Red Book...	**12**
SECTION-IV	Indian Contract Act (1872):a)Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. b)Clauses 1 to 75-Contract formation, contract performance, valid excuses for nonperformance, Breach of contract, effects of breach- understanding the clauses and applying them to situations/scenarios on construction projects. Importance of the Workmen's Compensation Act on construction projects.	**12**

course outcome:

CO1	Students will be able to understand the principles of planning and analyzing of contracts.
CO2	Students will be able to study the process of claim settlement and dispute resolution in construction.
CO3	Students will be able to evaluate and design construction contract documents.
CO4	Students will be able to understand about the Indian Contract Act (1872).

Recommended Books:

1. Civil Engineering Contracts and Estimates - B. S. Patil – Universities Press- 2006 Edition, reprinted in2009.
2.The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: ADVANCE MATERIAL TESTING LAB
SUBJECT CODE: MTCE-131
SEMESTER: II
CONTACTHOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 100

Objective: This course is designed to impart the hands-on experience about various advanced material testing practical works.

Contents of Syllabus:

Contents	Contact Hours
Tests on bitumen 1. Penetration test 2. Flash and fire point test 3. Ductility test 4. Softening point test 5.Marshal test Tests on aggregates 1. Shape tests - Elongation, Flakiness Index & Combined Index 2. Aggregate impact value test 3. Los angeles abrasion value test 4. Specific gravity & Water absorption test Field Tests 1. Field density by sand replacement & Core cutter method 2. Bitumen Extraction, bitumen content and aggregate gradation Effect of water/cement ratio on workability and strength of concrete Study of Mix Design Methods using admixtures.	**40**

course outcome:

CO1	Students will be able to apply this knowledge to mix design philosophy to get different grade of concrete
CO2	Students will be able to test of different concrete property to specify quality of concrete
CO3	Students will be able to acquire the expertise to conduct various tests on soil, aggregates, cement and concrete
CO4	Students will be able to identify engineering properties of aggregates and bitumen.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: ADVANCED FLUID MECHANICS LAB
SUBJECT CODE: MTCE-134
SEMESTER: 2nd
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
-	-	4	2

Internal Assessment: 100

Objective: This course is designed to impart the hands-on experience about various advanced fluid mechanics practical works.

Contents of Syllabus:

Contents	Contact Hours
1. Verification of Stoke's Law 2. Boundry layer development on a flat plate 3. Determination of drag on a body in a wind tunnel. 4. Determination of manning's coefficients of rugosity. 5. Determination of elements of hydraulic jump. 6. Discharge and flow profile over a broad crested weir.	**40**

course outcome:

CO1	Students will be able to provide practical knowledge in verification of principles of fluid flow
CO2	Students will be able to impart knowledge in measuring pressure, discharge and velocity of fluid flow
CO3	Students will be able to analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design
CO4	Students will be able to provide exposure to modern computational techniques in fluid dynamics

Recommended Books:

1. Experimental Fluid Mechanics: G.L.Asawa
2. Open Channel Hydraulics: V.T.Chow

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: ENERGY AND BUILDINGS
SUBJECT CODE: MTCE-159
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about Energy efficient materials and Technologies, Non-renewable sources of energy and Environmental aspects

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction, Energy and Buildings – Zero carbon buildings, energy efficiency, energy monitoring, energy modeling, carbon reduction in buildings, renewable energy sources,.	10
SECTION-II	Energy efficient materials and Technologies.	12
SECTION-III	Construction materials and indoor air quality. No/Low cement concrete. Recycled and manufactured aggregate. Role of QC and durability. Life cycle and sustainability	12
SECTION-IV	Non-renewable sources of energy and Environmental aspects – energy norm, coal, oil , natural gas, Nuclear energy, Global temperature, Green house effects, global warming. Acid rain - Causes, effects and control methods. Regional impacts of temperature change.	8

course outcome:

CO1	Students will be able to understand zero carbon building concept.
CO2	Students will be able to learn about energy efficient material and technologies.
CO3	Students will be able to assess the potential conflict between energy conservation and indoor climate for different energy saving measures.
CO4	Students will be able to demonstrate a good ability to work independently on investigating energy and indoor climate issues for buildings.

Recommended Books:

1. "Construction Materials, Methods & Techniques"(3e) by William P Spence, Yesdee Publication 2012, Pvt. Ltd,, Chennai, India
2. "Concrete Structure properties & Materials" by Mehta P.K & Mantreio P.J.M, Prentice hall.
3. "Building Materials" by M L Gambhir, Neha Jamwal, Tata McGraw Hill Publ.
4. New Building Materials and Construction World magazine

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: PLUMBING AND AIR CONDITIONING
SUBJECT CODE: MTCE-160
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective and course outcome: This course is designed **to** bestow supreme knowledge and skills to students that covers allthe objectives of the subject.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Basic principles of Plumbing, need, scope, terminology. Specifications and installation of sanitary fittings like wash basins, water closets, urinals, bidets, sinks, etc in buildings. Uses of gate valve, float valve, flap valve, ball valve, flush valve, etc, different types of taps, faucets, stop cocks, bib cocks, 'P', 'Q', 'S', floor/bottle traps used in buildings.	**10**
SECTION-II	Design considerations on drainage scheme. Planning of bathrooms, lavatory blocks and kitchen in domestic and multistoried buildings. Preparation of plumbing drawings, symbols commonly used in these drawings.	**12**
SECTION-III	Air-conditioning: refrigeration cycle, systems of air conditioning: Unit, split, package, Direct expansion, Chilled water System, Ducting & air conditioning layout, fittings and fixtures.	**12**
SECTION-IV	Fundamentals of architectural acoustics Fundamentals: Sound waves,frequency, amplitude, decibels, logarithms, measurement versus perception, addition and subtraction of decibels. NC curves. Material property:Absorption, reflection, scattering, diffusion, transmission, absorption co- efficient, NRC, sound transmission class (STC), impact insulation class (IIC).	**8**

course outcome:

CO1	Students will be able to demonstrate knowledge of the refrigeration cycle including safety procedures and testing requirements for temperature/pressure relationships.
CO2	Students will be able to demonstrate knowledge of heating, ventilation, and air conditioning and refrigeration controls, including wiring configurations and technical components for optimum performance.
CO3	Students will be able to demonstrate the ability to diagnose and service residential air conditioning systems based on load calculations, equipment selection, and balanced air duct flow.
CO4	Students will be able to demonstrate knowledge of operational procedures and principles used in plumbing

Recommended Books:

1. Barron. M. (2009). Auditorium acoustics and architectural design. 2nd Ed. Taylor & Francis.
2. Conceptnine, R. (2008). The Architecture of Light: Architectural Lighting Design Concepts and Techniques. Sage Publications.
3. Punmia, B. C., Jain, A. K. and Jain, A.K. (1998). Waste Water Engineering. New Delhi : Laxmi Publications.
4. Sawhney, G. S. (2006). Fundamentals of Mechanical Engineering: Thermodynamics, Mechanics and Strength of Materials. New Delhi : Prentice Hall of India.
5. Taylor, E. O. and Rao, V. V. L. (1971). Utilisation of Electric Energy in SI units. Bombay : Orient Longman.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: REMOTE SENSING & GIS
SUBJECT CODE: MTCE-161
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

End Term Exam: 60
Internal Assessment: 40
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about the sensor systems, data products and interpretation.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Energy – electromagnetic radiation, Radiation principles, Electromagnetic spectrum, Ideal remote sensing system, Energy interaction with atmosphere, Atmospheric windows, Energy interaction with earth surface feature, Spectral signature, Multiconcept of remote sensing.	**8**
SECTION-II	Sensor system – various types of platforms, Different types of sensors, Indian remote sensing systems, Data acquisition, Spatial, spectral and radiometric resolution, Thermal sensors, Fundamentals of microwave remote sensing. Digital image processing – operationsinvolved, Source of image acquisition, Data pre processing – atmospheric, radiometric, geometric corrections, Histograms,Density slicing, Grey level mapping, Contrast stretching, Filtering, Principle component analysis, Basic pattern recognition concepts, Discrimination functions	**12**
SECTION-III	Data products and Interpretation - various data products, characteristics, Principles of interpretation, Ground control points, Ground truth. GIS – definition, functions of GIS, Types of data – spatial, non spatial, point, line polygon, vector and raster database, Spatial databases, Coordinate systems and georeferencing, Interpolation methods – Deterministic and Statistical, Strategies for development, implementation and management of GIS	**12**
SECTION-IV	Digitizer, Scanner, Spatial analysis, overlay, query, Sample analysis, modeling in GIS, DEM models and their applications, DTM, Path analysis, Introduction to GIS packages, Projects involving creation of small GIS modules related to water resources and environmental problems	**10**

course outcome:

CO1	Students will be able to analyze raster and vector data and modeling in GIS
CO2	Students will be able to apply the concepts of DBMS in GIS
CO3	Students will be able to apply the concepts of satellite and sensor parameters and characteristics of different platforms
CO4	Students will be able to apply GIS in land use, disaster management, ITS and resource information system

Recommended Books:

1. Meijerink M.J., HAM de Brouwer, Mannaerts C.M. and Velenzuela C.R. "Introduction to the use of Geographical Information Systems for Practical hydrology", ITC Publication No. 23, UNESCO, Paris
2. Lillesand T.M. and Kiefer R.W. "Remote sensing and Image interpretation", John Wiley & Sons, New York
3. Sweain P.H. and Davis S.M. "Remote sensing – The quantitative approach", McGraw Hill Publications, New York
4. Agarwal C.S. and Garg P.K. "Textbook on Remote Sensing in Natural Resources Monitoring and Management", Wheeler Publishing, Allahabad
5. Keith P.B. and Thompson et al. "Remote sensing and water resources management", American Water Resources Association, Urbana Illinois
6.R.N. Cowel "Manual of Remote Sensing, Volume I & II", American Society of Photgrammetry and Remote Sensing, Falls Church, Va.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: ENVIRONMENTAL EVALUATION OF WATER RESOURCE PROJECTS
SUBJECT CODE: MTCE-162
SEMESTER: 3rd
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about Water Resources Projects, Environment: Eco systems.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Water Resources Projects: Need and importance of Water ResourcesProjects, Types of projects. Socio-Economic Analysis :Social and Economic evaluation of population, standards of living, Community needs, Socio-Economicobjectives.	**14**
SECTION-II	Environment: Eco systems, Habitat assessment, Environmental objectives, study of available resources, Environmental monitoring, Environmental evaluation techniques.	**10**
SECTION-III	Project Proposal and Implementation: Project planning, selection of project, Public awareness programme, feasibility reports, Eco-friendlyprojects, Project funding and expenditure, Cost and benefits, Riskassessment.	**8**
SECTION-IV	Project Evaluation: Evaluation and impact of projects like irrigation, Power Supply, Water Supply, Flood Control, Sewage, etc. Facilities generated, negative effects- inundation, migration, etc.	**8**

Course outcome:

CO1	Students will be able to know about different methods of environmental impact assessment and water quality impact assessment
CO2	Students will be able to know about environmental issues in water resources development
CO3	Students will be able to know about the methods of Environmental Impact Assessment and Ecological diversity, its importance and conservation
CO4	Students will be able to know about Environmental issues in water resource development and Water Quality Impact Assessment

References :

1. Economic development and Environmental Issues by P.A. Modi Water
2. Resources and their Environmental Impacts by S.A. Abbasi.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: ADVANCED CONSTRUCTION TECHNOLOGY
SUBJECT CODE: MTCE-165
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about latest and enhanced techniques being used in civil engineering field.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Pile Foundations : Introduction, uses, selection of pile, types of piles, pile spacing, group of piles, efficiency of group of piles, pile cap and pile shoe, load tests on piles, pile driving, pulling of piles, loads on piles, causes of failures of piles, pile driving formulas. Caissons: Definition, uses, construction material, types of caissons, loads on caisson, design features of caissons	**12**
SECTION-II	Coffer Dams: Definition, uses, selection of coffer dams, types of coffer dams, design	**7**
SECTION-III	Control of Ground Water in Excavations: Methods- pumping, well points, bored wells, electro-osmosis, injections with cement, clays and chemical, freezing process, vibro-flotation	**6**
SECTION-IV	Temporary Works: Form work for R.C.C. wall, slab, beam and column, Centering for arches of large spans and dams, design features for temporary works, Slip formwork, False work for bridges, Specialty form work.	12

course outcome:

CO1	Students will be able to implementation of new technology concepts which are applied in field of Advanced construction.
CO2	Students will be able to study different methods of construction to successfully achieve the structural design with recommended specifications.
CO3	Students will be able to involve the application of scientific and technological principles of planning, analysis, design and management to construction technology.
CO4	Students will be able to study of construction equipment, and temporary works required to facilitate the construction process

Recommended Books:

1. S.P. Arora & S.P. Bindra, A Text Book of Building Construction, Dhanpat Rai & Sons, New Delhi.
2. S.K. Sarkar and S. Saraswati, Construction Technology, Oxford University Press, New Delhi.
3. B.C. Punamia, Building Construction, Laxmi Publications, New Delhi
4. S.C. Rangwala, Building Construction, Charotar Publication Pvt Ltd. Anand

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: SMART MATERIALS AND STRUCTURES
SUBJECT CODE: MTCE-166
SEMESTER: 2nd CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about latest and enhanced techniques and materials being used in construction industry.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Supplementary Cementing Materials: Types of supplementary cementing materials such as fly ash, silica fume, rice husk ash, and metakaolin; their physical, chemical, mineralogical properties; Effects of these materials on the fresh properties; Strength properties; Durability properties.	**10**
SECTION-II	Use of Waste Materials and By-products: Types of waste materials and by-products such as waste glass, scrap tires, waste foundry sand, clean coal ash, etc. Effect of these materials on the various properties of mortar and concrete; Introduction of leachates from waste materials and their analysis.	**10**
SECTION-III	Behaviour of Concrete at High Temperature: Definition of high temperature; Mechanism of concrete failure at high temperature; Spalling characteristics; Difference in the behaviour of normal concrete, High strength concrete and self-compacting concrete at high temperature	**11**
SECTION-IV	Fibre Reinforced Concrete: Definition; types of fibres; Properties of fibres; Factors affecting FRC. Mixing and casting procedure; Composite materials approach; Effect of fibres on the workability, strength and durability of concretes; Applications of different types of fibres. Fibre Reinforced Plastics (FRP): Types of FRP, their properties and effects on concrete elements under various loading conditions.	**10**

course outcome:

CO1	Students will be able to provide the knowledge of smart materials and structures.
CO2	Students will be able to smart materials and structures application and analysis
CO3	Students will be able to the use of waste material and by-products in smart structures.
CO4	Students will be able to understand about the fiber reinforced concrete fiber reinforced plastics

Recommended Books:

1. Neville, A. M., Properties of Concrete, Prentice Hall of India (1995) 2. Siddique, R., Special Structural Concretes, Galgotia Publications (2000)
2. Gambhir, M. L., Concrete Technology, Tata-McGraw Hill, 3rd Edition (2008)
3. Siddique, R., Waste Materials and By-products in Concrete, Springer (2008)
4. Krishna Raju, N., Concrete Mix Design, CBS Publications (2002)

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: BUILDING PLANNING AND DESIGN
SUBJECT CODE: MTCE-167
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about Land Acquisition Act earthquake effects and others essential tools need in building planning and design.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Land Acquisition Act 1894 (short titles, extent & definitions ONLY) 2) Municipality act 1911 (short titles, extent & definitions only , Power of committee for making bylaws, for punishment ,to sanction) 3) Architectural Planning and Layout : Principles of planning a building, Factors affecting selection of site for building , Sun & the building	**10**
SECTION-II	Earthquake: Hazardous effects on structures & Ground, General guidelines for earthquake resistance buildings. Liquefaction, factors affecting liquefaction & prevention,	**10**
SECTION-III	Earthquake response of structures, Idealization of structures, Response spectrum analysis, Equivalent lateral force concepts, Torsionally coupled systems, Orthogonal effects, Nonlinear, Pushover and Time history analysis	**11**
SECTION-IV	Philosophy of earthquake resistant design: Ductility, Redundancy & Over strength, Damping, Base Isolation Supplemental Damping, Codal Provisions.	**8**

course outcome:

CO1	Students will be able to understand about land acquisition laws.
CO2	Students will be able to understand about the concept of earthquake resistant structures.
CO3	Students will be able to understand about industry leader who implement the best engineering and management practices and technologies in the construction industry.
CO4	Students will be able to understand about the philosophy of earthquake resistant design of structures.

Recommended Books:

1. Soil Mechanics and Foundation Engg – Dr K R Arora – Standard Publishaers.
2. Building planning designing and scheduling – Gurcharan Singh
3. Construction equipment and its planning and application Dr. Mahesh Verma.
4. Construction Planning equipement and Methods by RL Peurify Tata McGraw Hill.
5. IS- 1888 (1978): Plate Load Test 6. IS – 6403 (1981): Bearing capacity of shallow Foundation

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: CONSTRUCTION ENGINEERING AND MANAGEMENT
SUBJECT CODE: MTCE-168
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about management utilization in civil engineering field.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	General Management: Introduction and characteristics of management, Principle and function of management, Scientific management. Introduction: Definition, functions and scope of construction management; scientific methods of management; construction team.	**10**
SECTION-II	Materials Management: Scope, Objective and functions of material management, Procurement and store management, Materials handling management, Inventory control and management, Disposal of Surplus Materials	**12**
SECTION-III	Time-cost Optimization: Direct cost, indirect cost, total cost; purpose, stages and methods of cost control techniques of time cost optimization; examples and case studies.	**12**
SECTION-IV	Site Layout: Principles governing site lay out; factors effecting site lay out; preparation of site lay out. Feasibility study; project reports; progress reports; monitoring and controlling construction activities.	8

course outcome:

CO1	Students will be able to learn the fundamentals of management to utilize the functions of management in construction.
CO2	Students will be able to demonstrate the material management and inventory control in construction projects.
CO3	Students will be able to implement planning strategies and policies.
CO4	Students will be able to carry out organization and execute work in group in an organization.

Recommended Books:

1. Mahesh Verma, 'Construction Equipment and its Planning and Application'.
2. R.L. Peuripo, 'Construction Planning Equipment and Methods', Tata McGraw Hill.
3. Jagman Singh, 'Heavy Construction Planning Equipment and Methods', Oxford.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: PROJECT SAFETY MANAGEMENT
SUBJECT CODE: MTCE-169
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about safety in construction, problems areas in construction safety

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Safety in construction- Safety Concerns, Importance of Safety, Factors affecting safety: Psychological and Technological, Planning for safety provisions, Safety consideration during construction, demolition and during use of equipment.	**9**
SECTION-II	Accidents and their causes, Human factors in construction safety, cost of construction injuries, occupational and safety hazard assessment, legal implications.	**10**
SECTION-III	Problems areas in construction safety, Elements of an effective safety programs, job site safety assessment, safety meetings, safety campaigns and safety incentives	**10**
SECTION-IV	Safety culture, safe workers, Safety and first line supervisors, safety and middle managers, top management practices, company activities and safety, safety personal, workers compensations, project coordination and safety procedures.	12

course outcome:

CO1	Students will be able to carry out the project monitoring and control techniques in construction projects.
CO2	Students will be able to make students aware about the safety practices in construction works.
CO3	Students will be able to choose and assess appropriate methods and tools for a systematic and efficient accident prevention work in construction projects.
CO4	Students will be able to execute project safety and management.

Recommended Books:

1. Tim Howarth and Paul Watson, 'Construction Safety Management', John Wiley & Sons, 2008.
2. Phil Hughes, Ed Ferrett, 'Introduction to Health and Safety in Construction: The Handbook for Construction Professionals and Students on Nebosh and Other Construction Courses', 3rd Edn, Routledge, 2008.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: ADVANCED HYDROLOGY
SUBJECT CODE: MTCE-170
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about hydrological cycle, runoff and river flow

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Hydrological cycle and Water Balance: Basic Definition and Terms, Global and Regional Hydrological Cycle and Water Balance, Surface/Subsurface Hydrological Processes in a Basin ,Global Energy Balance, hydrologic losses.	**10**
SECTION-II	Runoff and River Flow : Runoff Generation mechanisms, River flowrouting ,Unit Hydrograph and Storm hydrograph, Hydrograph separation and Base flow recession Geomorphology, Philosophy of Mathematical Models of Watershed Hydrology	**8**
SECTION-III	Hydrologic Analysis (contd.) - linear and kinematic wave model, overland flow models. Routing - lumped flow, distributed flow, dynamic wave routing, Muskingum methods	**12**
SECTION-IV	Hydrologic Simulation Models - steps in watershed modeling, major hydrologic models. Hydrologic Statistics (contd.) - frequency analysis,Markov process, Markov chain, reliability analysis.	**10**

course outcome:

CO1	Students will be able to enable the students to understand the factors that cause floods and snowmelts.
CO2	Students will be able to introduce the fundamental concepts relevant to implementation of statistical and graphical techniques for proper understanding of the behavior of watershed.
CO3	Students will be able to introduce the phenomena of hydrology, watershed and different parts involved in hydrologic cycle
CO4	Students will be able to introduce students to advanced techniques of hydrological analysis that are of particular relevance to engineering and environmental design, planning and management.

Recommended Books:

1. Bras, R. L., and Rodriguez-Iturbe, 1994, "Random Functions and Hydrology", Dover Publications, New York.
2. Chow, V. T., D. R. Maidment, and L. W. Mays; "Applied Hydrology", McGraw Hill

International Editions.
3. Haan, C. T., 2002, "Statistical Methods in Hydrology", 2nd ed., Blackwell Publishing, Ames, IA.
4. Hoskings, J. R. M. and J. R. Wallis, 1997, "Regional Frequency Analysis, An Approach Based on L-Moments", Cambridge University Press, New York.
5. Viessman Jr., W., and G. L. Lewis, "Introduction to Hydrology", 4th ed., Harper-Collins, New York, 1996.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: HYDRO-POWER ENGINEERING
SUBJECT CODE: MTCE-171
SEMESTER:II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4
		Internal Assessment: 40	
		End Term Exam: 60	
		Duration of Exam; 3 Hrs	

Objective: This course is designed to cover the content about hydro-power energy and projects, stations.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Introduction to Hydro Power Energy: Introduction to non-conventional energy. Types of energy – solar energy, wind energy, biomass energy, ocean & geothermal energy and hydrogen energy etc.What is hydropower energy? Need for hydropower energy and its power estimation. Law of conservation of energy, Route of energy conversion.	**8**
SECTION-II	Types of Hydro Projects, Planning & Management: Government Hydropower policies, environmental issues, SWOT-(Strength weakness opportunity threatening) of hydropower projects, type of clearance required for Hydropower project, master plan, topography, catchments area, types of streams, allotment of site-(Open bid, Mou, Joint venture). Survey & investigation, PFR-(Pre-feasibility report), DPR (Detailed Project Report), Process of development of site (announcement, allotment, clearance, agreement, commissioning).Types of survey- Topographical, metrological, hydrological, ecological, geological.	**12**
SECTION-III	Arial Rainfall Measurement, Type of flow measurement Devices- (Notch, weir, flume), dilution method, and Flow duration curve (important), flood – discharge estimation kripitech formula, dickens formula, English formula, hydrograph, unit hydrograph. Financial institution, SOI Map, Cost / Estimation – wheeling charges, Banking, Moratorium, PPA-(Power purchase agreement), SERC-(State electricity regulatory commission) Hydrological cycle	**10**
SECTION-IV	Description of main parts of Hydropower Station: Block diagram of Small Hydro Power Station. Dam, Details of desilting tank. Storage &Balancing reservoir. Pen Stock, Pipe Line & Tunneling. Surge Tank, Valve House, Turbines. Synchronous Generator. Protection & Control equipment. Governors (Mechanical, electromechanical)	**10**

course outcome:

CO1	Students will be able to develop an understanding of the dynamic response of a hydropower generating facility to governor interventions and the resulting propagation of hydraulic transients
CO2	Students will be able to make implications of hydro projects on water resources, environment, socioeconomics and national economy.
CO3	Students will be able to develop independent problem solving skill in the field of construction and design in hydroelectricity.
CO4	Students will be able to impart basic hydraulic solutions and proposals for hydraulic structures corresponds to hydropower and design of technological devices. Lessons learned

Recommended Books:

1. Bisht Tara Datt, Electrical Machine II, Asian Publishers Muzzaffarnagar.
2. Chakrabarti & Halder, Power System & Analysis - Operation & Research, PHI Pvt. Ltd., New Delhi.
3. Gupta & Singhal, Electric Machines, New Age International (P) Ltd, Publishers New Delhi.
4. Kumar Murugesh K., Basic Electrical Science & Technology, Vikas Publishing House PvtLtd, New Delhi.
5. Nag, P. K., Power Plant Engineering, TMH Publication, New Delhi.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: MECHANICS OF SEDIMENT TRANSPORTATION
SUBJECT CODE: MTCE-172
SEMESTER:II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to and
Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Sediment origin and problems, Properties of sediments, incipient motion of non-uniform and uniform sediments,	**10**
SECTION-II	Bed forms, regimes and channel resistance, Bed load transport, suspended load transport and total load transport equations.	**10**
SECTION-III	Sediment sampling, stable channel design and sediment control, aggradation, degradation and reservoir sedimentation, physical and mathematical models, local scour and bank protection	**12**
SECTION-IV	Long profiles & basins Carbonate, pyroclastic, and aeolian systems	**8**

course outcome:

CO1	To understand concept of analysis of river flow hydraulics and various sediment transport theories
CO2	To be able to analyse hydraulic geometry and to design stable alluvial channels
CO3	To get knowledge of fluvial geomorphology and sediment water interaction
CO4	To analyse and appreciate the phenomenon of scouring around bridge elements and other hydraulic structures

REFERENCES

1. Arthur Mass et el., Design of Water Resources Systems,MacMillan, 1962.
2. L.D. James and R.R.Lee, Economics of Water ResourcesPlanning, McGraw-Hill New York,1971.
3. Loucks, D.P., J.R. Stedinger D.A., Haith: Water Resources ystems, Planning and Analysis, Prentice Hall,1981.
4. Biwaswas A.K. Systems Approach to Water Management, McGrawHill, Kogakusha Ltd., 1976.

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: GROUNDWATER HYDROLOGY
SUBJECT CODE: MTCE-173
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Occurrence and movement of groundwater, origin, age and distribution, Well hydraulics, Aquifers and aquifer parameters,Darcy‟s law, Hydraulic conductivity and its characteristics, General flow equations, unsaturated flow, Dupuit equation	8
SECTION-II	Groundwater flow direction, Steady and unsteady radial flows in aquifers (confined, unconfined and leaky), Multiple well systems, Interference among wells, Partially penetrating wells, Characteristic well losses, Specific capacity, Potential flow, Image well theory and its applications in groundwater flow, Estimation of aquifer parameters from pumping test data. Water well design and well drilling, Well screen, Development and completion of wells, Yield tests, Protection and Rehabilitation of wells	12
SECTION-III	Hydrogeology – porosity and permeability of rocks, Groundwater in igneous, metamorphic and sedimentary rocks, Hydro geological regions of India, Surface and subsurface geophysical explorations, electrical resistivity, seismic refraction, gravity and magnetic methods,Various logging techniques. Groundwater quality – measures, water samples, Pollutant transport in groundwater, chemical and transport processes, Modelling of pollutant transport in the unsaturated zone, Optimization models for management of groundwater quantity and quality	12
SECTION-IV	Groundwater modeling – Mathematical, analog and digital modelling, Analog – direct electric analog, viscous flow analog and other analogs, Application of finite difference and finite element methods for reional groundwater modelling	12

course outcome:

CO1	To get concept of various surface and subsurface geophysical methods for groundwater explorations
CO2	To impart knowledge about well hydraulics, the groundwater processes and their management
CO3	To introduce the fundamental concepts related to numerical flow modeling, and techniques for managing groundwater resources
CO4	To introduce the fundamental concepts related to groundwater dynamics

Recommended Books:

1. Waltin W.C “Groundwater Resources Evaluation”, McGraw Hill Inc. N York
2. Todd D.K. “Groundwater hydrology”, John Wiley&Sons, Singapore
3. Johnson E.E. “Groundwater”, E. Johnson Inc. Washington

4. Raghunath H.M. “Groundwater”, Wiley Eastern Ltd, New Delhi

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

TITLE: WATER RESOURCES PLANNING & MANAGEMENT
SUBJECT CODE: MTCE-174
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the concept of water resources planning & management

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	General Principles of Systems Analysis to Problems in Water Resources Engineering, Objectives of Water Resources Planning andDevelopment,	8
SECTION-II	Economic Analysis of Water Resources Systems, Methods of SystemsAnalysis, Deterministic, Stochastic, Fuzzy Optimisation, Simulation, and Multi Objective	10
SECTION-III	Water Demand Management: Concept, Potential Stresses on Water Demand, The Demand Management Approach, Water Demand and Water Quality Management	12
SECTION-IV	Optimizations techniques for planning, design and operation of water resources and environmental engineering systems.	12

course outcome:

CO1	Students will be able to understand the different components of water resources and their management
CO2	Students will be able to introduce the concepts of watershed management, integrated water resources management, environmental interaction of water resources and policies/framework related to water resources
CO3	Students will be able to understand about the planning and management of water resources
CO4	Students will be able to covers solution of initial and boundary value problem for ordinary and partial differential equation using different methods.

Recommended Books:

1. Loucks, D.P. and Eelco van Beek (2005), “Water Resources Systems Planning and Management – An introduction to methods, models and applications”, Studies and Reports in Hydrology, UNESCO Publishing
2. Loucks, D.P., Stedinger, J.R. and Haith, D.A. (1982) "Water Resources Systems Planning and Analysis", Prentice Hall Inc. N York
3. Vedula, S. and P P Mujumdar (2005) “Water Resources Systems Modeling Techniques and Analysis”, Tata McGraw Hill Pub. Co., New Delhi
4. Charles S. Revelle, E. Earl Whitlatch and Jeff R. Wright (2004), “Civil and Environmental Systems Engineering” Pearson Education Inc., New Jersey

Program Name: M.Tech Civil Engineering
Program Code: CIV-401

SUBJECT TITLE: HYDRAULIC STRUCTURES
SUBJECT CODE: MTCE-175
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	1	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective: This course is designed to impart the knowledge about hydraulic structures and their behavior

Contents of Syllabus:

Sr. No	Contents	Contact Hours
SECTION-I	Design procedure for irrigation channels, Irrigation outlets, Canal masonary works, - principles of design, use of flow net, Khosla's theory , Regulation works - Falls, distributory head regulators, Cross regulators,	14
SECTION-II	Canal head Works, Earth Dams, Gravity Dams, Spillways and Energy dissipators , Escapes , Trench weirs , Supply channel and head regulator.	10
SECTION-III	Highway Drainage: Importance, principles of surface drainage, roadside drains- cross- section; design, drains for hill roads, subsurface drains, capillary cut-off treatment.	8
SECTION-IV	Cross Drainage Works: Importance of cross drainage, causeways, culverts & bridges- types; estimation of design discharge, fixation of waterway, foundation depth and spans	8

Course outcomes:

CO1	To apply the concepts and techniques necessary for an understanding and runoff hydrographs and unit Hydrographs
CO2	To apply advanced computer models for hydrological prediction.
CO3	To Understand advanced hydrological processes and techniques necessary for tackling engineering and environmental problems, such as predicting design floods and assessing the impact of human influences on watersheds.
CO4	Students will be able to understand the drainage works

References:

1. R.S. Varshney, S.C. Gupta and R.L. Gupta; Theory and Design of Irrigation Structures, Nemchand&Brothers ,Roorkee,1992.
2. R.k. Sharma; Irrigation Engineering and Hydraulic Structures, Oxford and IBH Publishing Co., New Delhi,1984.
3. Arora, K.R. " Irrigation water power and Water Resources Engineering", Standard Publishers Distributors,Delhi,2002.
4. L. R. Kadiyali and N. B. Lal; Principles and Practices of Highway Engineering, Khanna Publishers Delhi,2005

Program Name: M.Tech Civil Engineering
Program Code: CIV-401