K.E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Curriculum Structure and Evaluation
To be implemented for 2020-22 batch
***Rev CCM** Course Structure/RIT/04/2020-22*

Department : Civil Engineering
Class : F. Y. M. Tech Civil-Construction Management **Semester:** I

Course Code	Course	Teaching Scheme				Evaluation Scheme					
							Theory (Marks)			Practical (Marks)	
		L	T	P	Credits	Scheme	Max	Min. % for passing		Max.	Min. % for passing
CCM1144	Construction Project Management	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	---
						ESE	50	40		----	----
CCM1154	Construction Equipment and Techniques	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40		----	----
	Program Elective I	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15				
						ESE	50	40		----	----
	Program Elective II	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			---	----
						ESE	50	40		----	----
CCM1244	Research Methodology & IPR	1	1	-	2	ISE	50	40	40	----	----
						ESE	50	40		----	----
SHP551	Technical Communication	2	-	-	Audit	P/NP				----	----
CCM1254	Fundamentals of BIM Lab	-	-	4	2	ISE		----		50	50
						ESE	---	----		50	50
CCM1264	Project Planning Lab 1	-	-	4	2	ISE	----	----		50	50
						ESE	---	----		50	50
	TOTAL	**15**	**1**	**08**	**18**						

Total Contact Hours/week : 24
Total Credits : 18

ISE: In Semester Exam, UT1 & UT2: Unit Test-I, Unit Test-II; ESE: End Semester Exam, P: Pass, NP: Not Pass

Program Elective-I

Sr. No.	Course Code	Course
01	CCM1164	Ground Improvement Techniques
02	CCM1174	Operations Research
03	CCM1184	Pavement Construction and Management
04	CCM1194	Total Quality Management

Program Elective-II

Sr. No.	Course Code	Course
01	CCM1204	Bridge Construction
02	CCM1214	Prefabricated Structures
03	CCM1224	Project Formulation and Appraisal
04	CCM1234	Construction Waste Management

Department: Civil Engineering
Class : F. Y. M. Tech Civil-Construction Management **Semester:** II

Course Code	Course	Teaching Scheme				Evaluation Scheme					
							Theory (Marks)			Practical (Marks)	
		L	T	P	Credits	Scheme	Max	Min. for % passing		Max.	Min. % for passing
SHP526	Statistical Analysis	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	---
						ESE	50	40		----	----
CCM1274	Project Economics and Financial Management	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40		----	----
CCM1284	Construction Contracts	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			----	----
						ESE	50	40		----	----
	Program Elective III	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15				
						ESE	50	40		----	----
	Program Elective IV	3	-	-	3	ISE	20	40	40	----	----
						UT1	15			----	----
						UT2	15			---	----
						ESE	50	40		----	----
CCM1374	Project Planning Lab II	-	-	4	2	ISE		----		50	50
						ESE	---	----		50	50
CCM1384	Geographic Information System Lab	-	-	4	2	ISE	----	----		50	50
						ESE	---	----		50	50
CCM1394	Mini project	-	-	4	2	ISE	----	----		50	50
						ESE	---	----		50	50
	Industry Internship										
	TOTAL	**15**	-	**12**	**21**						

Total Contact Hours/week : 27
Total Credits : 21
ISE: In Semester Exam, UT1 & UT2: Unit Test-I, Unit Test-II; ESE: End Semester Exam, P: Pass, NP: Not Pass

***Note**- Student has to complete internship of 2 weeks after 2nd semester however its evaluation will be carried out in 3rd semester.

Program Elective-III

Sr. No.	Course Code	Course
01	CCM1294	Special Construction Methods
02	CCM1304	Health and Safety Management
03	CCM1314	Human Resource Management
04	CCM1324	Management Information System

Program Elective-IV

Sr. No.	Course Code	Course
01	CCM1334	Disaster Management
02	CCM1344	Material Management
03	CCM1354	Building Materials
04	CCM1364	Shoring, Scaffolding and Form-work

Department : Civil Engineering
Class : S. Y. M. Tech Civil-Construction Management **Semester:** III

Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Credits	Scheme	Theory (Marks)		Practical (Marks)	
							Max	Min. (%) for passing	Max.	Min.(%) for passing
CCM2014	Industry Internship	--	-	2	Audit Course	ISE			P/NP	
	Open Elective	3	-	-	3	ISE	50	40	--	--
CCM2034	Dissertation Phase-I	--	--	8	4	ISE		----	100	50
CCM2054	Dissertation Phase-II	--	--	12	6	ISE	----	----	100	50
						ESE	---	----	100	50
	TOTAL	**3**	-	**22**	**13**					

Total Contact Hours/week: 25
Total Credits : 13

Open Elective

Sr. No.	Course Code	Course
01	MOE2010	Artificial Intelligence - Machine Learning
02	MOE2020	Creative Thinking: Techniques and Tools
03	MOE2030	MOOC Course
04	MOE2040	Condition Monitoring and Signal Processing
05	MOE2050	Aircraft Conceptual Design

Department : Civil Engineering
Class : S. Y. M. Tech Civil-Construction Management **Semester:** IV

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max	Min. (%) for passing	Max.	Min. (%) for passing
CCM2024	Dissertation Phase-III	- -	- -	12	6	ISE		----	100	50
CCM2044	Dissertation Phase-IV	- -	- -	20	10	ISE	----	----	100	50
						ESE	---	----	100	50
	TOTAL	- -	- -	**32**	**16**					

Total Contact Hours/week: 32
Total Credits : 16

ISE: In Semester Exam, UT1 & UT2: Unit Test-I, Unit Test-II; ESE: End Semester Exam, P: Pass, NP: Not Pass

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Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1144**	Course Name: **Construction Project Management**

L	T	P	Credits
3	---	--	3

Course Description:
This course focuses on guidelines for managing individual projects and project management related key concepts, it also covers the project management life cycle and related processes.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Implement project management framework.
2. Develop time schedules for projects.
3. Identify and control project cost, quality, human resources and communications.
4. Apply project management information system for construction projects.

Prerequisite: Student needs basic knowledge of project flow and stages.

Course Content

Unit No.	Description	Hrs
1.	**Project Management Framework:** Concept of Project and Project Management. Role of the project manager. Organization Structure, Organizational influences on project management and project life cycle. Project management processes, ISO 21500, Project stakeholders and Governance,	06
2.	**Project Scope and Time management:** Project Charter, Project scope planning- Project requirements, WBS etc. Project time management-defining activities, sequencing activities, estimating activity resources and duration.	06
3.	**Advanced Project Scheduling:** CPM scheduling, Precedence network and its applications. Control of schedule-Earn value management.	06
4.	**Project Cost and Quality Management:** Planning project costs-	06

	estimating cost, determining budget and control costs. (Activity Base Costing)	
5.	**Project Human Resource and Communication Management:** Planning human resources-Acquire, develop and manage project team. Planning project communications- Manage and control communications.	06
6.	**Project Management Information System (PMIS):** Importance of PMIS, PMIS framework, project data structuring, Information retrieval and communication using project management software. Project document management. Role of project management office. (PMO) Factors influencing PMIS success.	06

Reference Books:

1. A Guide To A Project Management Body of Knowledge - Published By Project Management Institute
2. Srinathan L. S. "PERT AND CPM (Principles and Applications)", Affiliated east-west press Pvt Ltd.

Text Books:

1. Chitakara K. "Construction Project Management (Planning, scheduling and controlling)" McGraw Hill Education (India).
2. Sengupta B. and H. Guha "Construction Management and Planning", McGraw Hill Education (India).
3. Punmia B. C. & K. K. Khandelwal Project Planning and Control with PERT & CPM
4. Khandelwal K.K. and B. C. Punmia "PERT AND CPM", Laxmi Publication, New Delhi.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1154**	Course Name: **Construction Equipment & Techniques**

L	T	P	Credits
3	---	--	3

Course Description:
This subject deals with construction methods and equipment used on construction projects. This course is designed to fulfill the requirements of construction managers to select appropriate equipment based on the construction technique and site condition. Major emphasis in the course is on various earthwork operations and equipment and equipment performance.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Compute productivity of various earth moving equipment,
2. Analyze economics of project execution
3. Select optimum equipment for construction of particular task,
4. Develop method statement for construction task,
5. Select equipment and method based on method statement

Prerequisite: Possess basic knowledge of construction activities

Course Content

Unit No.	Description	Hrs
1.	**Earthwork Equipment:** Fundamentals of Earth Work Operations- Earth Moving Operations-Types of Earth Work Equipment -dozer, Rippers, Excavators, drag-line and clamshell, Trucks and hauling equipment, Scrappers, Earthwork finishing equipment, Compaction equipment. **Rock Excavation:** Introduction, Planning, Drilling: process and equipment, Blast design, Special blasting techniques, blasting procedure.	08
2.	**Construction Plants and Tunneling:** Ready mix concrete plants, Hot mix asphalt plants, Aggregate production plants. Operations and production planning. Mechanical excavation for tunneling in hard and soft strata.	06

3.	**Fundamental Concepts of Equipment Economics**: Equipment records, cost of capital, Investment alternatives, Elements of ownership and operating cost, replacement decisions, rent or lease.	**04**
4.	**Trench-less Technology:** Introduction to trench-less Technology, Concept, Methods used in Trench-less technology, equipment and applications of trench-less technology.	**06**
5.	**Construction Dewatering:** Introduction, Various methods of dewatering, Pumps for dewatering, Design of dewatering system, cost of dewatering. Vacuum dewatering in concrete slab construction, it's process and Equipment.	**06**
6.	**Offshore Construction:** Dredging operation: Methods and Equipment, Piles and Pile driving: Method and equipment, construction of Docks and Harbor, Floating docks	**06**

Reference Books:

1. James J.O' Brien, John A. Havers and Frank W. Stubbs "Standard hand book of Heavy construction", Third edition, Mc-Graw-Hill Publication,
2. Patrick Powers. J. "Construction Dewatering: New Methods and Applications", John Wiley&Sons,
3. Jerry Irvine "Advanced Construction Techniques", C A Rocketr,

Text Books:

1. Peurifoy C. , R. L. Ledbetter, W. B. and Schexnayder "Construction Planning, Equipment and Methods", Tata Mc-Graw Hill, Singapore,
2. Sharma S. C. "Construction Equipment and Management", Khanna Publishers, New Delhi,
3. Deodhar S. V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi,
4. Sankar S. K. and Saraswati S. "Construction Technology", Oxford University Press, New Delhi,

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1164**	Course Name: **Ground Improvement Techniques**

L	T	P	Credits
3	---	--	3

Course Description:
The course content includes the basics of laboratory and in situ tests for geotechnical projects. Then, surface compaction, admixture stabilization and deep densification are covered. Ground modification by consolidation and vertical drains are then covered. Various types of in-situ reinforcement techniques such as stabilization of soil using different material & methods, soil nailing, stone columns are also covered in this course.

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

1. Apply principles of ground improvement techniques.
2. Assess the most appropriate ground improvement techniques in specific circumstances.
3. Carry out laboratory and in situ tests for soil improvement.
4. Justify the applications of soil improvement methods on projects.

Prerequisite: Student should have basic knowledge of Soil mechanics/Geo-technical engineering

Course Content

Unit No.	Description	Hrs
1.	**Principles and Objectives of Ground Improvement:** Principles and objectives of ground improvement; Introduction to ground improvement developments. Classification of ground improvement techniques. Factors affecting ground improvement	06
2.	**Mechanical Modification:** Mechanical modification methods; Principles of densification, Properties of compacted soils; Compaction control tests; Specifications for compaction	06
3.	**Hydraulic Modification:** Hydraulic modification; dewatering systems; Filtration, drainage and seepage control with Geo-synthetics, preloading	06

	and vertical drains. Electrical dewatering	
4.	**Chemical Modification:** Chemical Modification: Factors affecting chemical modification, Lime stabilization, Cement stabilization, Bitumen stabilization, Stabilization with calcium chloride, sodium chloride, lignin and other synthetic polymers, Methods of construction- mix in place method, traveling plant and stationary plant methods	**06**
5.	**Grouting:** Factors affecting grouting, Grout ability, Grouting materials and their properties, Pressure grouting, Compaction grouting, grouting procedures, Applications of grouting. Grouting Modification, inclusion and Confinement; Soil reinforcements	**06**
6.	**Geo-synthetics Applications:** Introduction to Geo-synthetics, Applications of Geo-synthetics for ground improvement. Miscellaneous: Rock cutting, anchoring, heating, soil nailing	**06**

Reference Books:

1. Koener R M. "Construction and Geotechnical Methods in Foundation Engineering " McGraw Hill Pub Co New York.
2. Ingles O G and Metcalf J B. "Soil Stabilization: Principles and practice", Butterworths, London.
3. Ell F G. "Methods of Treatment of Unstable ground", Newness Butterworths, London.

Text Books:

1. Purushothama Raj P. "Ground Improvement Techniques", Firewall Media.
2. Manfired R.H. "Engineering Principles of Ground Modification", McGraw-Hill Pub.
3. Belt "Methods of Treatment of Unstable Ground", Butterworths.
4. Hausmann, M R "Engineering Principles of Ground Modifications", McGraw Hill Pub Co New York.
5. Rao, G. V. and Raju, V. V. S. "Engineering with geosynthetics", Tata McGraw Hill Book Co., New Delhi.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1174**	Course Name: **Operation Research**

L	T	P	Credits
3	---	--	3

Course Description:
Operations Research as one of the quantitative aid to decision-making, it offers the decision maker, method of evaluating every possible alternative by using various techniques to know the potential outcomes. Operation research as such is applicable to all fields, here course emphasize on construction applications of OR, this course will help students to take optimal decisions in favor of the project.

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

1. Formulate and analyze the managerial problem through or models and arrive at an optimal solution or decision
2. Select appropriate method for decision making.
3. Apply nonlinear programming for managerial problems.

Prerequisite: Should have basic knowledge of Engineering Mathematics

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Introduction to OR history, nature, scope and phases of OR, classification of OR models. Use of Operations Research in Civil Engineering and Managerial Decision making process. Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction	06
2.	**Linear Programming:** Linear programming: Formulation of Linear optimization models, Civil engineering Applications. Simplex method, special cases in simplex method, Method of Big M, duality, sensitivity analysis	06
3.	**Models:** Transportation Model and its variants, Assignment Model and its variants. Application of MS excel in LPP.	06
4.	**Decision Strategies:** Decision strategies - decision under certainty - decision under risk - decision under uncertainty - formulation - decision	06

	criterion and decision under competitive situation	
5.	**Games Theory:** Games Theory-Classification of games. Two - person, zero - sum games - formulation of pay off matrix - saddle points - games with pure strategies and mixed strategies - value of the game. Solution to 2x2 matrix, 2xn matrix, mx2 matrix and mxn pay-off matrix. Graphical method, Decision theory.	**06**
6.	**Simulation & Waiting Line Theory:** Queuing theory and waiting time - application to industries. Introduction to dynamic programming and network analysis, Monte Carlo Simulation	**06**

Reference Books:

1. Koener R M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill Pub Co New York,
2. Ingles O G and Metcalf J B. "Soil Stabilization: Principles and practice", Butterworths, London,
3. Ell F G. "Methods of Treatment of Unstable ground", Newness Butterworths, London,

Text Books:

1. Prem Kumar Gupta, Dr. D. S. Hira, "Operations Research" S. Chand publications,
2. Taha, H.A., "Operations Research - An Introduction", Prentice Hall, (7th Edition),
3. Sharma J. K. , "Quantitative Techniques-for managerial decisions", Macmillan Business books,
4. Singiresu S. Rao, "Engineering Optimization", New Age International Publishers,

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1184**	Course Name: **Pavement Construction Management**

L	T	P	Credits
3	---	--	3

Course Description:
This elective, deals with the construction and management of pavements. The course is designed to provide in depth knowledge and skills required to plan, execute and monitor infrastructure projects.

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

1. Apply PMS to pavement projects,
2. Perform quality tests and analyze the results,
3. Manage pavement inventory,
4. Decide material specifications as per MORTH,
5. Plan the project execution,

Prerequisite: Basic knowledge of Infrastructure engineering/Highway engineering

Course Content

Unit No.	Description	Hrs
1.	**Pavement management system:** Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design, Construction and Maintenance; Rehabilitation and Feedback systems; Highway financing; Fund generation; Evaluating alternate strategies and Decision criteria;	06
2.	**Pavement Inventories:** Serviceability Concepts; Visual Rating; Pavement Serviceability Index; Roughness Measurements; Distress Modes - Cracking Rutting Etc; Pavement Deflection - Different Methods and BBD, Skid Resistance, Roughness, Safety - Aspects;	06
3.	**Quality Control and Evaluation:** Quality Assurance; Quality Control - ISO 9000, Sampling Techniques - Tolerances and Controls related to Profile and Compaction	06

4.	**Construction of Pavement sub structure:** Excavation, Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilized Sub Bases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction; Drainage Surface, Turfing Sand Drains; Sand Wicks; Rope Drains, Geo- Textile Drainage;	**06**
5.	**Flexible pavement construction:** Preparation and Laying of Tack Coat; Bituminous Macadam, Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC Specifications	**06**
6.	**Rigid Pavement Construction:** Cement Concrete Pavement Analysis – Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.	**06**

Reference Books:

1. Haas and Hudson , W. R. Pavement management systems –McGraw Hill publications
2. Sargious, M. A. – Pavements and surfacing for highways and airports – Applied Science Publishers ltd
3. Bent Thagesan, Highway and Traffic engineering for developing countries

Text Books:

1. Bridge and Pavement maintenance- Transportation Research Record no.800, TRB
2. Shahin M. Y, - Pavement management for airports, roads and parking lots
3. MORTH – Specifications

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1194**	Course Name: **Total Quality Management**

L	T	P	Credits
3	---	--	3

Course Description:
The growing importance of quality management has emphasized the need for the study of principles and techniques of total quality management by engineering students, this course is designed to full fill the need.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Derive strategic plan for TQM.
2. Develop framework for TQM.
3. Apply quality management systems.
4. Examine suitable systems for TQM.

Prerequisite: Student should be aware of Quality parameters

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Introduction to Quality, dimensions of quality, Managing quality, The quality cycle, Evolution of TOC, Scope of TOC, TQM framework, Benefits of TQM	06
2.	**Management Issues in Quality I:** Managing for quality and high performance, Focusing on customers, Leadership and strategic planning for TQM, HRD and management for TQM, What is quality I and quality II….is it part I or II like that?...	06
3.	**Management Issues in Quality II:** Process management, Measurement and strategic information management, organizing for TQM, Building and sustaining Total Quality Organization.	06
4.	**Technical issues in Quality:** Quality assurance and control, Statistical	06

	Process Control, Introduction to reliability and maintenance.	
5.	**Management of Total Quality:** Just-In-Time systems, Bench marking, Business-Process- Re-engineering, Supply Chain Management, Total Quality Management in services, World-Class Manufacturing	**06**
6.	**Quality Management Systems:** Introduction, Benefits of ISO registration, ISO 9000 series of standards, ISO requirements, Implementation, Documentation, Quality manuals	**06**

Reference Books:

1. Dale H. Besterfield, Glen H. Besterfield, Hemant Urdhwareshe, "Total Quality Management", Pearson, Seventh impression

Text Books:

1. Bhat K Shridhara , "Total Quality Management- Text & Cases", Himalaya Publishing House,
2. Shankar K and D. Bagade, "Total Quality Management", Himalaya Publishing House

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1204**	Course Name: **Bridge Construction**

L	T	P	Credits
3	---	--	3

Course Description:
This course "Bridge Construction" covers various aspects of Bridge construction along with bringing out the advanced theories and practical knowledge of Bridge construction. Each topic is developed in logical progression with up-to-date information with reference to codal provisions and journals.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Select location for bridge through geotechnical investigation data.
2. Perform hydrological calculations of design parameters.
3. Apply standard loadings and safety consideration for bridge design.
4. Select appropriate bridge superstructure elements for bridges.

Prerequisite: Student should have knowledge about bridge components and types.

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** History of Bridges; Components of a Bridge and its definitions, Classification of Road Bridges, related structures, span length, Classical Examples. Historical developments, Case studies.	04
2.	**Investigation for Bridges:** Need for investigation, selection of bridge site, Collection of Bridge design data; Hydrological calculation. Waterway calculation; Scour calculation; Depth of foundation; Freeboard, Collection of Bridge design data; Vertical clearance. Economic span, Location of piers & Abutments, Traffic projections, Investigation reports, Importance of proper investigation.	06
3.	**Loading Standards for Bridge Design:** Road Bridges: IRC, BS code, AASHTO code. Dead load, Live load, Impact factor, Centrifugal force, Wind loads, hydraulic forces, Longitudinal forces, Seismic forces; Earth pressure. Buoyancy; Lane concept, equivalent loads, traffic load; Width of Roadway and Footway. Influence lines for statically; determinate structures.	08

	I.L. for statically indeterminate structures. Transverse distribution of Live loads among deck longitudinal, Load combinations for different working state and limit state designs. Railway Bridges: Loadings for Railway Bridges; Railroad data, Pre-design considerations; Railroad vs. Highway bridges	
4.	**Superstructures:** Selection of main bridge parameters, design methodologies, Choices of superstructure types, Slab bridge and voided slab bridge; Beam-Slab bridge; Box Girder Bridge, Typical Details, Slab Bridge. Slab-Girder Bridge (Straight/Skew), Box Girder Bridge (Straight/ Skew).	**06**
5.	**Bridge Components:** Pier; Abutment; Wing walls; Importance of Soil-Structure Interaction; Types of foundations, Open foundation; Pile foundation; Well foundation; Examples - Simply supported bridge, Continuous Bridge.	**06**
6.	**Bearings and Deck Joints:** Different types of bridge bearings and expansion joints; Design of bearings and joints, Parapets and Railings for Highway Bridges: Definitions; Classification of Highway Bridge parapets; Various Details.	**06**

Reference Books:

1. Hambly E.C , "Bridge Deck Behaviour", E & FN SPON Publications.
2. RYALL M. J. , G.A.R PARKE, J.E. HARDING, "The Manual of Bridge Engineering", Thomas Telford Publishers.

Text Books:

1. Raina V. K. "Concrete Bridge Practice, Analysis, Design and Economics", Tata McGraw- Hills Publishing Company Limited.
2. Rajagopalan R. "Bridge Superstructure", Tata McGraw- Hills Publishing Company Limited.
3. PonnuswamyS. , "Bridge Engineering", Tata McGraw - Hills Publishing Company Limited.
4. Aswani M. G., V. N. Vazirani and M.M. Ratwani, "Design of Concrete Bridges", Khanna Publishers.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1214**	Course Name: **Prefabricated Structures**

L	T	P	Credits
3	---	--	3

Course Description:
This course offered as elective, deals with the fast and pre design construction methods and detailing. Pre designed buildings and other infrastructure structural components are being used by the industry a lot today, so, this course will provide students insight about prefabricated buildings.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Choose from various types of fabrications,
2. Design pre-fabricated components,

Prerequisite: Students should know the elements of building

Course Content

Unit No.	Description	Hrs
1.	**Types:** Types of fabrication – Modular co-ordination, components, prefabrication systems and structural schemes; Design considerations; Economy of prefabrication; prefabrication of load carrying members	08
2.	**Design:** Disuniting of structures; Design of cross section of load carrying members; Structural behavior of precast structures. Handling and erection stresses.	06
3.	**Application:** Application of pre-stressing of roof members; floor systems; Two way load bearing slabs, wall panels, hipped plate and shell structures.	06
4.	**Detailing:** Dimensioning and detailing of joints for different structural connections; construction and expansion joints.	08
5.	**Production:** Production, Transportation & erection; Organization of production, storing and erection equipment; Shuttering and mould design – Dimensional tolerances; Erection of R.C. structures, Total prefabricated	08

	buildings.	

Reference Books:

1. Bruggeling A. S. G and G.F Huyghe, "Prefabrication with Concrete", CRC Press,
2. GilbertR. L and N.C Mickeborough, " Design of Prestressed Concrete", Taylor & Francis

Text Books:

1. IS 15917, (2010) " Building Design & Erection Using Prefabricated Concrete"
2. "Architectural Precast Concrete", by Prestressed Concrete Institute,

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1224**	Course Name: **Project Formulation and Appraisal**

L	T	P	Credits
3	---	--	3

Course Description:

This course has been introduced as an elective course to train students in identification, evaluation, structuring and appraisal of various construction, building, infrastructure and engineering projects.

Course Learning Outcomes:

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

1. Perform technical and financial analysis of construction projects,
2. Perform BC ratio analysis,
3. Select project based on appraisal,
4. Develop administration process for project execution.

Prerequisite: Should have basic knowledge of project phases

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Identification of needs, present availability, additional requirements, alternatives and their comparative study, project identification.	06
2.	**Technical Feasibility:** Technical analysis market and demand analysis, project location resource requirement and their fulfillment technology, know how requirements technical study of alternatives and their suitability.	06
3.	**Financial Feasibility:** Financial analysis interest, compounding and discounting, investment and capital outlay cash flow of the project and its significance profit, Probability and break even analysis, internal rate of return, of shadow pricing benefit cost ratio, influence of inflation on profitability influence of inflation and escalation on the projects.	06
4.	**Cost-Benefit Analysis:** Social cost benefit analysis, objectives, direct –	06

	indirect costs and benefits – tangibles, intangibles and their conversion, levy subsidy concepts	
5.	**Appraisal:** criteria and selection from alternatives, discounting non-discounting criteria selection under capital restriction, social restriction and other restriction risk analysis, sensitivity analysis, application of decision tree analysis and game theory.	**06**
6.	**Administration:** Project administration organization and control during execution period maintenance and care taker operational set up, project management after completion. Preparation of project report and norms and its presentation. Definition of entrepreneurship and entrepreneur qualities.	**06**

Reference Books:

1. Tiffin R., Practical techniques of effective project investment appraisal, Viva Books, New Delhi
2. Khatua S. Project Management and Appraisal, Oxford University Press, New Delhi

Text Books:

1. Project Preparation, Appraisal, Budgeting and implementation –Prasanna Chandra
2. Cost Benefit Analysis – E. J. Mishan
3. Chandra P. Projects, planning, analysis, financing, implementation and review, Tata Mc-Graw-hill New Delhi

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1234**	Course Name: **Construction waste management**

L	T	P	Credits
3	---	--	3

Course Description:
Waste management is the need of the hour, construction waste generated is in huge amount and needs to be planned for its reuse, recycle before sending for land filling. This course is designed to cover government policies and other techniques of waste minimization.

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

1. Develop strategies for construction and demolition waste management and resource efficiency.
2. Examine the environmental impact of building materials.
3. Design site waste management plans.
4. Justify the application of waste minimization techniques on construction site.

Prerequisite: Basic knowledge of Environmental Engineering

Course Content

Unit No.	Description	Hrs
1.	**Environmental impact:** Environmental Impact of Building Materials Embodied energy of materials; impact on the local environment; toxicity of the material	06
2.	**Waste Assessment:** Life cycle assessment. Nature and Source, Direct and indirect waste; site types and origins; composition; quantity; current recycling/reuse potential of building materials.	06
3.	**Construction and Demolition Waste:** Construction and Demolition Waste Management Plans International good practice; planning requirements; DOEHLG guidance document; company policy; demolition plans;Site implementation; supplier agreements; sub–contractor management.	06

4.	**Roles and Responsibility:** Role of waste management contractor; training; auditing; skip management; current markets; current disposal options; health and safety; reporting to local authorities. Treatment of Construction and Demolition Waste, waste permits; waste licenses; waste transfer facilities; landfills; treatment technologies; hazardous waste facilities; reporting to EPA	**06**
5.	**Waste minimization:** Designing for Waste Prevention and Minimization Waste prevention and minimization; client, contractor and designer attitudes; proper maintenance of existing buildings; reuse of existing building structure; design flexibility; design for reuse and recycling; dimensional Co–ordination and standardization; modular design; material selection and control.	**06**
6.	**Waste forecasting:** Waste Forecasting Tools Application of WRAP's designing out waste tool for buildings and civil engineering; WRAP net waste tool; BRE SMART Waste; WRAP Site Waste Management Plan Tracker	**06**

Reference Books:

1. Springer, "Recycling and Resource Recovery Engineering" , Springer-Verlag Berlin Heidelberg

Text Books:

1. Greg Winkler, "Recycling Construction and Demolition waste: A LEED-Based Toolkit (Green Source) (Google ebook), Mc Graw Hill Professional
2. V M Tam, Chi Ming Tam, "Reuse of Construction and Demolition Waste in Housing Development" , Nova Science Publishers

Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1244**	Course Name: **Research Methodology & IPR**

L	T	P	Credits
1	1	--	2

Course Description:
This course is designed to make graduates aware of various steps involved in Research Process along with software used for Statistical Analysis. Also report and research proposal writing is incorporated in the syllabus. This course also deals with IPR; its process and developments.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Prepare abstract through literature review.
2. Formulate a research problem.
3. Prepare and present research proposal/paper by following research ethics.
4. Prepare and present a report on Intellectual Property Rights.

Prerequisite: Nil

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Meaning of research problem, Sources of research problem, Criteria and Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.	02
2.	**Literature Study:** Effective literature studies approaches, Plagiarism, Research ethics, Approaches of investigation of solutions for research problem, data collection, Data analysis with software, interpretation, Necessary instrumentation's	02
3.	**Technical Writing:** Effective technical writing, how to write technical report and paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee	02
4.	**Nature of Intellectual Property:** Patents, Designs, Trade and Copyright.	02

	Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT.	
5.	**Patent Rights:** Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications.	**02**
6.	**New Developments in IPR:** Administration of Patent System, New developments in IPR; IPR of Biological Systems, Computer Software etc., Traditional knowledge Case Studies, IPR and IITs.	**02**

Reference Books:

1. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction", Juta Academic
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd
3. Mayall, "Industrial Design", McGraw Hill
4. Niebel, "Product Design", McGraw Hill

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students, Juta & Co Ltd
2. Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners, SAGE Publication
3. Asimov, "Introduction to Design", Prentice Hall
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", Wolters Kluwar
5. T. Ramappa, "Intellectual Property Rights Under WTO, S. Chand

Class:-**F.Y. M. Tech**	Semester-**I**
Course Code : **SHP551**	Course Name : **Technical Communication**

L	T	P	Credits
2	-	-	Audit course

Course Description:
This course is designed to help students in improving skills that will enable them to produce well designed technical documents and to deliver impressive oral presentations. The course focuses on principles of effective writing and on types of documents common in technical fields. While the emphasis will be on writing, oral communication of technical information will form an important component of the course, as well. The course assists students in preparing them for oral presentations in various professional contexts.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Acquire skills required for good oral and written communication.
2. Demonstrate improved writing skills and level of readability.
3. Ensure the good quality of technical reports at very first-time submission

Prerequisite:
Students who enrol themselves to this course should have adequate LSRW abilities of English language.

Course Contents

Unit No.	Description	Hrs
1.	**Planning:** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	04
2.	**Process:** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism	03
3.	**Content Writing:** Sections of a Paper, Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	03
4.	**Key Skills:** Key skills needed when writing a Title, key skills needed when writing an Abstract, key skills needed when writing an Introduction, skills	04

	needed when writing a Review of the Literature,	
5.	**Skill Set:** Skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills needed when writing the Conclusions, useful phrases, how to ensure good quality of the paper at the time of submission	**04**
6.	**Professional skills:** Resume Writing, e-Mails, Interview skills , Dos and Dont's while Answering, FAQs, GROUP DISCUSSION: Structured and Unstructured GD, Opening and Closure, Showing Agreement and Disagreement	**06**

References -

1. John Seely, Oxford Guide to Effective Writing and Speaking; Oxford University Press
2. Jeff Butterfield, Soft Skills for Everyone, Cengage Learning India Private Limited
3. Goldbort R ,Writing for Science, Yale University Press
4. Day R , How to Write and Publish a Scientific Paper, Cambridge University Press
5. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London
6. Thomas N. Huckin and Leslie A. Olsen, Technical Writing and Professional Communication for Nonnative Speakers of English; Tata McGraw Hills,

Class: - **First Year M. Tech. Civil-CM**	Semester: **I**
Course Code : **CCM1254**	Course Name : **Fundamentals of BIM Lab**

L	T	P	Credits
--	--	4	2

Course Description:
An upcoming and most related software for construction project management is evolved as Building Information Modelling (BIM), This course will help students to learn "Revit" and apply other futures to manage the project.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Develop drawings as per software requirement
2. Compute quantities of building items
3. Develop project schedule using "Revit" application

Course Content

Experiment No.	Description	Hrs
1.	Learning Revit software	16
2.	Learning 3D in Revit	08
3.	Develop models using Revit	08
4.	Take of quantities using Revit	08
5.	Monitor project with virtual models	08

Class: - **First Year M. Tech. Civil-CM**	Semester: **I**
Course Code : **CCM1264**	Course Name: **Project Planning Lab I**

L	T	P	Credits
--	--	4	2

Course Description:

Computer based project management is vital in construction industry. Microsoft project software is used for analyses complex projects. Microsoft project software offers planning, scheduling and controlling of civil engineering projects. Course is designed to make graduates familiar with the current planning software used in industry; in this course students will acquire knowledge and expertise/hands-on in Micro soft project software.

Course Learning Outcomes:

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

1. Develop Work Breakdown Structure for project.
2. Prepare project schedule using Microsoft project.
3. Modify construction schedule based on site progress.
4. Extract and present various types of reports.

Course Content

Experiment No.	Description	Hrs
1.	Acquiring expertise in Microsoft Project	16
2.	Solve 4 assignments on Construction planning and control	16
3.	Plan two projects using Microsoft Project	16

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Department of Civil Engineering

Class: **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **SHP 526**	Course Name: **Statistical Analysis**

L	T	P	Credits
3	---	--	3

Course Description:
This course will help students to take decisions by using Statistical techniques and Optimization requirements.

Course Learning Outcomes
After successful completion of this course students will be able to
1. Identify, formulate and analyze the engineering problem; and apply Mathematical concepts effectively to engineering fields.
2. Apply relevant probability distribution to solve the problems.
3. Apply sampling and testing methods to distribute the given data.
4. Solve problems on correlation and regression.

Prerequisite: Engineering Mathematics viz. Differential Equations and its Solution,

Course Content

Unit No.	Description	Hrs
1.	**Probability:** Probability theory and its importance: Definition of probability, Rules of Probability, The Baye's theorem. Random variable. Probability distribution. Mean or Expectation of Random variable. Properties of Mean of Expectation.	06
2.	**Theoretical probability Distributions**: Introduction, Binomial Distribution, Poisson Distribution. Normal Distribution, Exponential Distribution, Gamma distribution.	06
3.	**Sampling Methods:** Sampling and sampling distribution: Probability samples, Non-probability Samples, Random sampling, other sampling schemes, sampling distribution and Standard error, some Sampling and Quality control	06
4.	**Testing:** Testing Hypothesis: Sampling of distribution–Test based on Normal Distribution, t-test, chi-square test, K-S test for goodness of fit and	06

	distribution. Analysis of variance one Way and two way classification.	
5.	**Correlation Analysis:** Scatter Diagram, Correlation types, Correlation co-efficient. Bi-variate Frequency Distribution.	06
6.	**Regression Analysis:** Regression and Multivariate Analysis, Multiple Regression Analysis, Nonlinear Regression. Use of regression analysis in Construction Projects.	06

Reference Books:

1. David S. Moore, Statistics-Concepts and Controversies, Freeman Company, New York.
2. Kottegoda, Applied Statistics for Civil and Environmental Engineers, Stratford Books.

Text Books:

1. Montgomery and Runger, Applied Statistics and Probability for Engineers, Wiley, India.
2. Miller, Freund, Probability and Statistics for Engineers, Hall Prentice India Ltd.
3. Pipes and Harvill, Applied Mathematics for Engineers and Physicists, McGraw Hill International Edition.
4. Cochran, Sampling techniques, Wiley Series.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1274**	Course Name: **Project Economics & Financial Management**

L	T	P	Credits
3	---	--	3

Course Description:
Aim of including this subject is to make graduates familiar with Project Economics and its comparison in civil engineering. This course will help graduates to understand, manage and control the project finance in appropriate manner. Divided into six units this takes care of major roles played by project managers

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Select the best project of different alternatives.
2. Analyze projects using different techniques.
3. Identify and suggest sources of finance.
4. Analyze different financial statement.
5. Prepare and maintain different site accounts for civil engineering projects.

Prerequisite: Student should posses Basics of Mathematics, Basics of Economics

Course Content

Unit No.	Description	Hrs
1.	**Foundation of Engineering Economy:** Concept of Engineering economy, Interest rate- Simple and compound, Cash flow, Factors-Single payment Factors, Uniform series factors, gradient factors, Nominal and effective interest rate.	06
2.	**Analysis of Engineering Projects:** Present worth analysis, capitalized cost analysis, Annual worth analysis, Rate of return analysis.	06
3.	**Evaluation of Engineering Project:** Benefit cost analysis, Breakeven, Sensitivity and payback analysis, Replacement and retention decisions, Inflation and its effects.	06
4.	**Capital Structure:** Sources of finance (long term and short term sources) available for construction projects, Sources of long term finance –	06

	Securities (Ordinary shares, Preference shares, Debentures or bonds), Loan capital. Short term Sources of finance- Trade Credit, Accruals, Commercial Paper, Bank credit, Public Deposit, Inter-Corporate Deposits, Private Institutions, Factoring. Working capital management, Importance of Working capital management in construction projects.	
5.	**Financial Statement Analysis:** Financial Statements (Trading & Profit & Loss A/c, Balance Sheet etc.) and its uses, Techniques of financial statement analysis- comparative financial statement, common size statement, ratio analysis, Ratio Analysis- computation of liquidity ratios, leverage ratios, activity ratios & profitability ratios.	**06**
6.	**Practical Accounting:** Book Keeping & Accountancy, Preparation of different Site accounts for receiving materials, allocation of materials for various activities, stock records, day to day expenditures etc. Preparation of reports, budgets and budgetary control system in construction firms	**06**

Reference Books:

1. Leland Blank and Anhony Tarquin, Basics of Engineering Economy, Tata McGrawHill, NewDelhi.
2. Chandra Prasanna, Projects Planning, Analysis Selection, Implementation and Review, Tata McGrawHill, NewDelhi.

Text Books:

1. Mithani D. M., Managerial Economics, Himalaya publication.
2. Chandra Prasanna, Financial Management, Tata McGrawHill, NewDelhi.
3. Jain Khanand, Financial Management, Tata McGrawHill, NewDelhi.
4. Pande I. M., Financial Management, Vikas House Publication.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1284**	Course Name: **Construction Contracts**

L	T	P	Credits
3	---	--	3

Course Description:
This course will cover the entire process of construction contracts, starting from tender notice to arbitration.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Identify applications of contract types for construction projects.
2. Develop tender document for construction project.
3. Perform comparative analysis of types of contract.
4. Analyze arbitration documents for construction project.

Prerequisite: Should know the basics of Estimating Costing

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Essential of valid contract, Types of Contract, Void, Voidable & Valid contract, Offer, Proposal, All in contract, Lump sum contract, Cost plus contract, Item rate contract, Labour contract, BOT, BOOT, DBT contract.	06
2.	**Tender:** Tender documents, Invitation of tenders, re-qualification of contractor, Tender Notice, Preparation of tender, Submission of Tender, Opening Tender, Acceptance/ Rejection of tender.	06
3.	**Contract Documents:** Role of an Engineer, Contractor & Owner, Conditions of contract, Performance security, Security deposit, General conditions of contract, Specific conditions of contract, Suspension of work, Time limit for completion, Liquidated damage, Measurement & Payment, Additions, Alterations or variation & deviations, Defects, Maintenance & Improper work, Subletting, Breach of contract, Settlement of account of final payment, Claims	06
4.	**Contract of Indemnity & Guarantee:** Indemnity and Guarantee-	06

	Difference between the two contracts, consideration for guarantee, surety' s liability, discharge of surety. Bailment- Nature of transactions, delivery of bailee, Bailee' s responsibility, Termination, Bailment of pledges.	
5.	**Arbitration:** Meaning of arbitration, Advantages of arbitration, Types of arbitration, Distinction between arbitration & expert determination, Arbitrator, Valuer, Engineer, Architect, Referee, Conciliator, Mediator, Arbitral award, arbitral tribunal.	**06**
6.	**Arbitration Agreement:** Composition of arbitral tribunals, termination of mandate & substitution of arbitrator, Conduct of Arbitrator proceedings, Termination of proceedings, Setting aside awards.	**06**

Reference Books:

1. Namawati Roshan H., Professional practice with Elements of Estimating Valuation Contract and the arbitration Act, Lakhani Book Depot.

Text Books:

1. Patil B. S., Contracts & Estimates, CRC Press.
2. Saraf B. P., Jhunjhunuwala S. M., Law of Arbitration and Conciliation,

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1294**	Course Name: **Special Construction Methods**

L	T	P	Credits
3	---	--	3

Course Description:
This course has been offered to make students aware of various new construction techniques used in industry, course aims at providing students insight of various special areas of Construction engineering and methods adopted to execute such projects.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Select proper technique and equipment for a project,
2. Decide type of pile foundation for a project,
3. Plan site investigation.

Prerequisite: Basics of Construction Equipment, Concrete technology

Course Content

Unit No.	Description	Hrs
1.	**Concreting Techniques and Equipment:** Concrete placing underwater, concrete pumps, boom placers, mixers, conventional methods.	06
2.	**Grouting and Shortcreting:** Grouting: Field procedures, methods, materials and applications and limitations, Col-Crete process. Resin grouting Polymerization technique.	06
3.	**Pile Foundations:** Construction details: precast piles, pre-stressed piles, steel piles, and friction piles. Driven and bored piles, large diameter piles, and negative and positive skin friction. Multiple under reamed piles, raker piles, sand piles and Anchor piles. Methods of pile driving through different strata, Concept of micro piles	06
4.	**Highway Construction:** Highway planning, geometric design of highways, highway construction materials, Various Road Types, construction of flexible pavement, construction of rigid pavements.	06

5.	**Construction Cranes:** Cranes: Mobile cranes, Tower cranes, Hydraulic cranes, Sizes and capacity, Application and operations	**06**
6.	**Site Investigation Techniques:** Objectives of the site investigation, Desk study, Site Reconnaissance, Ground investigation Methods, Reporting	**06**

Reference Books:

1. James J. O' Brien, John A. Havers and Frank W. Stubbs "Standard handbook of Heavy construction",Mc Graw-Hill Publication,

Text Books:

1. Robert wade Brown, Practical foundation engineering hand book, McGraw Hill Publications.
2. Sankar S. K. and Saraswati S., Construction Technology, Oxford University Press, New Delhi.
3. Vajirani V. N. and S. P. Chandola, Transportation engineering vol I, Khanna Publications, Delhi
4. Peurifoy C. , R. L., Ledbetter, W. B. and Schexnayder Construction Planning, Equipment and Methods, TataMcGrawHill Singapore.

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1304**	Course Name: **Health and Safety Management**

L	T	P	Credits
3	---	--	3

Course Description:
Major accidents in industries across the world during the last two or three decades have led to generation of enormous interest in Occupational Safety and Health, as well as in the environment. On any project there is always the possibility of an accident or damage to someone's health. The work exposes people to hazards, be they: loads which have to be manually handled; dangerous machinery; toxic substances; electricity; working with display screen equipment or even psychological hazards such as stress. The course addresses the codal provisions and regulations to be followed on site.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Classify hazards to employees on construction site
2. Determine safe practices necessary for a project site
3. Identify the causes of accidents and suggest preventive measures to avoid accident.
4. Prepare safety management plan.

Prerequisite: Nil

Course Content

Unit No	Description	Hrs
1.	**Introduction:** Hazards and causes of accidents, safety measures	06
2.	**Safety Laws:** Safety legislation and standards for construction industry	06
3.	**Safety in Construction I:** Safety precautions and practices in various construction activities like excavation, concreting	06
4.	**Safety in Construction II:** scaffold erection and dismantle, concreting, steel erection and demolition of structures	06
5.	**Accident Management:** Management of accidents Organization for safety	06
6.	**Construction Site Safety:** Occupational hazards and personal protective equipment, site management, safety manual and check lists safety officer, safety committee, safety training, safety audit	06

Reference Books:

1. Hudson R and R W King, Construction hazard & Safety handbook, Butterworths.

Text Books:

1. NSC, Accident Prevention Manual for Industrial Operations.
2. Fulman, J.B., Construction Safety, Security, and Loss Prevention, John Wiley and Sons.
3. ILO, Safety and Health in Construction, ,

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1314**	Course Name: **Human Resource Management**

L	T	P	Credits
3	---	--	3

Course Description:
This course satisfies the requirement of managing human resource in an enterprise, this course covers manpower planning, organization and human well fare. Also covers human behavior and its impact and development of personnel for the organization.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Plan manpower for a project,
2. Develop organization for a project,
3. Apply aspects of human behavior to HRM.
4. Identify right person to build the team.
5. Discuss solutions for human resource problems.

Prerequisite: Know the personnel operating construction projects

Course Content

Unit No.	Description	Hrs
1.	**Manpower Planning**: Manpower Planning, Organizing, Staffing, directing, and controlling – Personnel Principles	06
2.	**Organization:** Organization – Span of Control – Organization Charts – Staffing Plan - Development and Operation of human resources - Managerial Staffing – Recruitment – Selection - Placement, Training and Development.	06
3.	**Human Behavior:** Introduction to the field of people management - basic individual psychology; motivation - Job design and performance management - Managing groups at work - self-managing work teams - inter group behavior and conflict in organizations – Leadership - Behavioral aspects of decision-making; and communication for people management	06
4.	**Welfare Measures:** Compensation – Safety and health – GPF – EPF – Group Insurance – Housing - Pension – Laws related to welfare measures.	06

5.	**Management and Development Methods:** Compensation - Wages and Salary, Employee Benefits, employee appraisal and assessment - Employee services - Safety and Health – Discipline and discharge	06
6.	**Special Problems:** Special Human resource problems, Performance appraisal. - Employee hand book and personnel manual - Job descriptions and organization structure and human relations – Productivity of Human resources.	06

Reference Books:

1. Carleton Counter II and Jill Justice Coutler, The Complete Standard Handbook of Construction Personnel Management, Prentice-Hall, Inc., New Jersey.
2. Memoria, C.B., Personnel Management, Himalaya Publishing Co.

Text Books:

1. Josy.J. Familaro, Handbook of Human Resources Administration by, McGraw-Hill International Edition.
2. Charles D Pringle, Justin Gooderi Longenecter, Management, CE Merril Publishing Co.
3. Dwivedi R.S, Macmillian, Human Relations and Organisational Behaviou, India Ltd.

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1324**	Course Name: **Management Information System**

L	T	P	Credits
3	---	--	3

Course Description: This course is designed to introduce students to (1) IT management practices (e.g., intelligent supply chain management, IT in business process management, etc.), (2) Data analyses in Microsoft Excel and Access, (3) Enterprise resource planning in SAP. This course provides students with an overview of the utilization of business application software and problem-solving using that software. Topics include computer systems, management information systems, microcomputer operating systems, word processing, electronic spreadsheets, database management, business graphics, networks, and integrated packages. Industry accepted microcomputer software will be used.

Course Learning Outcomes:

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

1. Demonstrate Information Systems used in organizations for meeting strategic and operational goals.
2. Develop skills using current end-user software for communication, data transformation, collaboration, and problem solving.

Prerequisite: basic knowledge of project life cycle is expected.

Course Content

Unit No.	Description	Hrs
1.	**Introduction**: Information Systems - Establishing the Framework - Business Models - Information System Architecture - Evolution of Information Systems	06
2.	**System Development:** Modern Information System - System Development Life Cycle - Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs.	06

3.	**Information Systems**: Integrated Construction Management Information System - Project Management Information System - Functional Areas, Finance, Marketing, Production, Personnel - Levels, DSS, EIS, and ES - Comparison, Concepts and Knowledge Representation - Managing International Information System	**06**
4.	**Implementation And Control:** Control - Testing Security - Coding Techniques - Defection of Error - Validating - Cost Benefit Analysis - Assessing the value and risk of Information System	**06**
5.	**System Audit:** Software Engineering qualities - Design, Production, Service, Software specification, Software Metrics, Software quality assurance	**06**
6.	**Systems Methodology:** Objectives - Time and Logic, Knowledge and Human Dimension - Software life cycle models - Verification and Validation	**06**

Reference Books:

1. Kenneth C Laudon and Jane Price Laudon, Management Information Systems - Organisation and Technology, Prentice Hall.
2. Gordon B. Davis, Management Information System: Conceptual Foundations, Structure and Development, McGraw Hill.
3. Card and Glass, Measuring Software Design quality, Prentice Hall.

Text Books:

1. Joyce J Elam, Case series for Management Information Systems , Simon and Schuster, Custom Publishing.
2. Ralph H Sprague and Huge J Watson, Decision Support for Managers, Prentice Hall.
3. Michael W. Evans and John J Marciniah, Software Quality assurance and Management, John Wiley and Sons.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1334**	Course Name: **Disaster Management**

L	T	P	Credits
3	---	--	3

Course Description
The course covers various man made and natural disasters, risk and risk reduction also takes care of managing processes applied for disaster management. The course also focuses on post disaster problems and mitigation.

Course Learning Outcomes:
After completion of the course, the student will be able to: -
1. Summarize effects of natural and man-made disasters.
2. Develop disaster management program.
3. Analyze vulnerable conditions and risk assessment.
4. Prepare plan for post disaster management
5. Describe stakeholder's role in disaster response.

Prerequisites: Basic knowledge of Environmental Engineering, Engineering Management

Course Content

Unit No.	Description	Hrs
1.	**Disasters:** Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man Made Disaster (Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Risks, Relationship between Disasters and Development and vulnerabilities, different stake holders in Disaster Relief.	06
2.	**Approaches to Disaster Risk Reduction:** Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness, Components of Disaster Relief-(Water, food, sanitation, shelter, Health and Waste Management), Community based DRR, Structural non structural measures in DRR, Factors affecting Vulnerabilities, , Mainstreaming disaster risk reduction in development, Undertaking risk and vulnerability assessments, Policies for Disaster	08

	Preparedness Programs, Preparedness Planning, Roles and Responsibilities, Public Awareness and Warnings, Conducting a participatory capacity and vulnerability analysis, , Sustainable Management, Survey of Activities Before Disasters Strike, Survey of Activities During Disasters, DRR Master Planning for the Future, Capacity Building, Sphere Standards. Rehabilitation measures and long term reconstruction. Psychosocial care provision during the different phases of disaster.	
3.	**Disaster Management:** Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.	**06**
4.	**Risk Assessment and Vulnerability Analysis:** Disaster preparedness plan, use and application of emerging technologies, role and responsibilities of various agencies and mitigation strategies	**04**
5.	**Disaster Response:** Immediate impact and post-impact phase of disasters, Disaster Response Plan, Communication, Participation, and Activation of Emergency Preparedness Plan, Logistics Management, Needs and Damage Assessment, Disaster Response: Central, State, District, and Local Administration, Role of Multiple Stockholders in Disaster Response.	**06**
6.	**Rehabilitation, Reconstruction and Recovery:** Damage Assessment, Role of Various Agencies in Disaster Management and Development, Information Management Structure, Parameters of Vulnerability, Development of Physical and Economic Infrastructure, Creation of Long-term Job Opportunities and Livelihood Options, Role of Housing/Building Authorities, Education and Awareness, Long-term Recovery, Long-term Counter Disaster Planning	**06**

Reference Books:

1. Mac Daniels T.L. and Small M.J. (eds.) Risk Analysis and Society: An Interdisciplinary Characterization of the Field, Cambridge University Press.
2. Carter, W.N., Manila, ADB - Disaster Management: A Disaster Managers Handbook.

Text Books:

1. Reiter, L., Earthquake Hazard Analysis: Issues and Insights, Columbia University Press.
2. Mileti D.S., Disasters by Design: A Reassessment of Natural Hazards in United States; The National Academic Press.
3. Anbalagan R., Singh B., D. Chakraborthy and Kohli A. - A field manual for landslide investigations, DST, Government of India, New Delhi
4. Singh R.B. (Ed) Disaster Management, Rawat Publication, New Delhi.

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1344**	Course Name: **Material Management**

L	T	P	Credits
3	---	--	3

Course Description:
The course deals with most costly resource for any project; Materials, materials consume about 60-70 % of project cost. This course will help students to find, procure, store, manage and utilize materials in an optimized manner. Students will also be familiar with international purchase, negotiation and decision making related to materials.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Apply supplier selection methods,
2. Produce optimal stores layout,
3. Perform codification and classification,
4. Perform material requirement planning,
5. Apply inventory control techniques for materials management,

Prerequisite: Know the Construction Materials

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Introduction, Need, Objectives and functions and scope of materials management. Integrated concept of materials management, Types of materials. Material management organization.	06
2.	**Purchase and Supply Chain Management:** Introduction, objectives and functions of purchasing. Types of purchasing purchase procedure, Supplier selection, supplier's evaluation and performance measurement, Vendor rating methods.	06
3.	**Stores Management and Control:** Classification, objectives and functions, Stores layout, Standardization and Codification, systems of codification. Purchase process and negotiation	06
4.	**Break Even Analysis:** Introduction, Break even chart and Point, Computing Breakeven Point and margin of Safety, Graphical representation of BEP, Cost volume and profit analysis, Make or buy decision.	06

5.	**Inventory and Material Requirement Planning:** Introduction, Necessity, Types and functions of Inventory. Inventory costs, advantages and disadvantages of Inventory carrying. Inventory planning and control systems. Introduction to MRP, M.R.P. system, Development of M. R. P. M.R.P. Flow chart, Application of MRP.	06
6.	**Inventory Control:** Introduction, Types of Inventory control Systems, Safety Stock, Essentials of Inventory control, Classification and characteristics of Inventory problems, Inventory control models I, II & III. Economic order quantity, EOQ Models.	06

Reference Books:

1. Materials and Financial Management, C. M. Sadiwala, Ritesh C. Sadiwala, New Age International Publishers.
2. Introduction to Materials Management, J. R. Tony Arnold, Stephen N. Chapman and Lloyd M. Clive, Pearson Publication
3. Arnold, Introduction To Materials Management, Pearson Education India
4. Richard J. Tersine ,Principles Of Inventory and Materials ,Management, Prentice Hall

Text Books:

1. Jhamb L. C., Materials and Logistic Management, EPH Publisghing.
2. Gopalkrishnan P. & M. Sundaresan, Materials Management an Integrated Approach, PHI.
3. Datta K. , Materials Management: Procedures, Text and Cases, PHI Learning Pvt. Ltd.
4. Gopalakrishnan P., Handbook of Materials Management,PHI Learning Pvt. Ltd.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**I**
Course Code : **CCM1354**	Course Name: **Building Materials**

L	T	P	Credits
3	---	--	3

Course Description:
Materials play important role in projects; they cost around 60% of total project cost. Type and quality of materials will influence the performance and sustainability of construction. It is important to study new materials being developed by industry for application in project construction.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Justify the need of new material development.
2. Choose material for construction process based on material properties.

Prerequisite: Construction materials are important, student should be aware of basic properties of materials used in construction.

Course Content

Unit No.	Description	Hrs
1.	**Introduction:** Necessity and importance of sustainable construction materials. Material composition and properties, production, storage, distribution, testing, acceptance criteria, limitations of use, economic consideration, recent development related to the following materials to be studied	06
2.	**Construction Chemicals:** Various construction chemicals/admixtures , Fly ash and its use in concrete ,Silica fume concrete ,Self-compacting concrete, Fiber Reinforced plastics and concrete ,Light weight concrete	06
3.	**Modified Materials:** Crumb modified bitumen Rubber, Glenium Concrete, Materials used in nuclear-containment structures	06
4.	**High Performance Materials:** High performance concrete, Nano technology in cement concrete, Ferro cement Technology	06

5.	**Ceramic Materials:** Classification, Refractories, glass, glass wool, mechanical, thermal and electrical properties, fire resistant materials, Uses and application New types of floor finishes and tiling, liquid granite	**06**
6.	**Non Structural Materials:** Thermal insulation and acoustic absorption materials, Sound barriers used on motorway railways. Materials for intelligent buildings- Sensitile, aluminums radiant barriers, solar panel roof tiles, use of old jeans for roofing, flexi comb-electrical installation, kinetic glass, unfired clay bricks, richlite (recycled paper),carbon fibers.	**06**

Reference Books:

1. William P Spence, Yesdee, Construction Materials, Methods & Techniques.
2. Ashby, M.F. and Jones. D.R., H.H., Engineering Materials: An introduction to Properties, applications and designs, Elsevier Publications.
3. Mamlouk, M.S. and Zaniewski, J.P., Materials for Civil and Construction Engineers, Prentice Hall.

Text Books:

1. Mehta P.K & Mantreio P.J.M, Concrete Structure properties & Materials, Prentice hall.
2. M L Gambhir, Neha Jamwal, Building Materials, Tata McGraw Hill Publ.
3. Neville, Concrete Technology.
4. Dr. D.B.Divekar, Ferrocement Construction Mannual.

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1364**	Course Name : **Shoring, Scaffolding and Formwork**

L	T	P	Credits
3	---	--	3

Course Description:
Temporary works are very important as they provide shape and stability to concrete in its green state. The form work and scaffold needs to be so designed that it does not vary in its shape or performance. It is Important to study this course as a civil engineer

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Develop proper plan for form-work,
2. Select appropriate material and type of form-work,
3. Design form-work for components,
4. Design scaffold for construction task.

Prerequisite: nil

Course Content

Unit No.	Description	Hrs
1.	**Planning, site equipment and plant for form work:** Overall Planning – Detailed Planning – Standard units – Corner units – Schedule for column form-work – Form-work elements – Planning at Tender stage – Development of basic system – Planning for maximum reuse – Economical form construction – Planning examples – Crane size, effective scheduling estimate – Recheck plan details – Detailing the forms. Crane arrangement – Site layout plan – Transporting plant – Form-work beams – Form-work ties – Wales – Scaffold frames - Form accessories – Vertical transport table form work.	06
2.	**Form materials and pressures on form-work:** Lumber – Types – Finish – Sheathing boards - Working stresses – Repetitive member stress – Plywood – Types and grades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminum Form lining materials – Hardware and fasteners – Nails in Plywood – Bolts lag screw and connectors – Bolt loads. Pressures on Form-work - Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic Adjustment for non standard condition.	06

3.	**Shores and form design:** Simple wood stresses – Slenderness ratio – Allowable loads – Tubular steel shores - Patented shores – Site Preparation - Size and spacing – Steel Tower Frames – Safety practices – Horizontal shoring for multi-levels – More concentrated shore loads - T-heads – Two tier wood shores – Ellis shores – Dayton sure grip and Baker Roos shores – Safway Symons shores – Beaver Advance shores - Dead shores – Raking and Flying shores Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam form – Ties, Anchors and Hangers – Column forms – Examples in each.	**06**
4.	**Dome forms, tunnel forms and safety practices for scaffolds:** Shells of translation and revolution - Hemispherical – Parabolic - Barrel vaults – Hypar Shells – Conoidal Shells - Folded plates – Shell form design – Building the form – Placing concrete – Strength requirements – Tunnel forming components – Curb and Invert forms – Arch and Wall forms - Telescopic forms – Concrete placement methods – Cut and Cover construction – Continuous Advancing slope method - Bulk head method – General design considerations influence of placing equipment – Tolerances – Form construction for Shafts.	**06**
5.	**Slipforms:** – Principles – Types – Advantage – Functions of various components – Planning of Slipform operations – Desirable characteristics of concrete – Common problems faced – Safety in slip forms -	**06**
6.	**Special structures built with Slipform Technique:** – Codal provisions – Types of scaffolds – Putlog and Independent scaffold – Single pole scaffolds – Fixing ties – Spacing of ties - Plan Bracing – Knots – Safety nets – Generalsafety requirements – Precautions against particular hazards – Truss, Suspended – Gantry and system scaffolds.	**06**

Reference Books:

1. Hurd, M.K., Formwork for Concrete, Special Publication No. 4.
2. Detroit, American Concrete Institute..
3. Michael P. Hurst, Formwork, Construction Press, London and New York.

Text Books:

1. Austin, C.K., Formwork for Concrete, Cleaver – Hume Press Ltd., London.
2. Tudor Dinescu and Constantin Radulescu, Slipform Techniques, Abacus Press, Turn Bridge Wells, Kent.

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Class: - **First Year M. Tech. Civil-CM**	Semester: **II**
Course Code : **CCM1374**	Course Name : **Project Planning Lab II**

L	T	P	Credits
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Course Description:
Project management software has the capacity to help plan, organize, and manage resource tools and develop resource estimates. Depending on the sophistication of the software, it can manage estimation and planning, scheduling, cost control and budget management, resource allocation, collaboration software, communication, decision-making, quality management and documentation or administration systems. Prima-Vera is one of the computer based PM software used worldwide to handle construction projects. By this software complex civil engineering problems are handled. Project Planning lab is designed to make graduates familiar with the current planning software used in industry; in this course students will acquire knowledge and expertise/hands-on in Prima-Vera software.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Prepare schedule plan for construction project.
2. Develop residential building construction project in primavera software
3. Analyze construction project using primavera.
4. Prepare and present various types of reports.

Prerequisite: Project Planning, Scheduling Techniques, Estimating & Costing

Course Content

Experiment No.	Description	Hrs
1.	Learning basics of Primavera.	16
2.	Solving assignments given in Construction planning and control	16
3.	Planning Scheduling of any two construction projects	16

Class: - **First Year M. Tech. Civil-CM**	Semester: **II**
Course Code : **CCM1384**	Course Name : **Geographic Information System Lab**

L	T	P	Credits
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Course Description:
This lab course is designed to make graduates familiar with advanced surveying equipment and Geographic information system software and its application in civil engineering.

Course Learning Outcomes:
After successful completion of the course, students will be able to:
1. Justify the application of GIS in construction industry.
2. Analyze data using GIS software.
3. Prepare and present maps in GIS.

Prerequisite: Basics of Engineering Geology/Geography

Course Content

Experiment No.	Description	Hrs
1.	Learning use of instrument/software	16
2.	Application of instrument/software to complete a given task,	12
3.	Apply knowledge of software to a given project	20

Class: - **First Year M. Tech. Civil-CM**	Semester-**II**
Course Code : **CCM1394**	Course Name: **Mini project**

L	T	P	Credits
-	-	4	2

Course Description:
Mini project shall be delivered on one of the advanced topics chosen in consultation with the supervisor, based on dissertation work/societal problem/special structure. Here parametric study is not expected. Some lifelong learning abilities should be developed. A hard copy of the report (25 to 30 pages A4 size, 12 fonts, Times New Roman, single spacing single side printed, preferably in TRM format) should be submitted to the Department Post Graduate Committee (DPGC) before delivering the seminar. A copy of the report in soft form must be submitted to the supervisor, along with other details, if any. Minimum 03 presentations should be delivered by the students.

Prerequisite: Basics of Research Methodology

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Select mini project problem.
2. Prepare and present statement of purpose.
3. Develop solution to the selected problem.
4. Prepare and present report related to project undertaken.

Course Content

Unit No.	Description	Hrs
1.	The topic for the Mini projects may be related to Civil Construction Management area and interdisciplinary area related to Civil Engineering or an innovative idea; Student should perform analysis/design work. Student should prepare model of their work. Evaluation of Mini projects report will be done by the DPGC Committee at the end of semester I.	48

Class: - **First Year M. Tech. Civil-CM**	Semester-**III**
Course Code : **CCM2014**	Course Name: **Industry Internship**

L	T	P	Credits
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Course Description:
The course has been introduced so as to give exposure of industry culture and various tasks and departments in the industry. Students will be inducted through the training program and will be able to relate theory and its applications in the industry.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Relate theory to practice.
2. Compile technical data of the project.
3. Prepare daily work reports of ongoing activities.
4. Prepare and present internship report.

Course Content

Unit No.	Description	Hrs
1.	In the industry training work, the student is expected to undergo training in industry, related to subject specialization for duration of 21 days (minimum) for at least 6 hrs. Per day. Student should write a report on the industry training and submit to department for ISE evaluation at the beginning of third semester. Student should include the certificate from company regarding satisfactory completion of the industry training.	90

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Class: - **First Year M. Tech. Civil-CM**	Semester-**III**
Course Code : **MOE2030**	Course Name: **MOOCS Course**

L	T	P	Credits
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Course Description:
In a world where change is constant, there is a perpetual need to learn new skills, acquire knowledge and gain qualifications that are relevant in today's technologically driven marketplace. In a thriving digital economy, the demand for skilled professionals with both technical and analytical skills is stimulating job creation and creating competition among employers looking to secure valuable talent.
All of this means that students, from working professionals to recent high school graduates, find many reasons to take all or some of their courses online.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Apply techniques/processes/tools learned through MOOC in appropriate situation.

Course Content

Unit No.	Description	Hrs
1.	Students to undergo one online certificate course and produce a certificate of passing. The course selected should be an approved course by DPGC and from the approved institutes like, NPTEL, Udemy….	4 - 12 weeks

Class: - **First Year M. Tech. Civil-CM**	Semester-**III**
Course Code : **CCM2034**	Course Name: **Dissertation Phase-I**

L	T	P	Credits
-	-	8	4

Course Description:

Synopsis approval presentation:

Under the guidance of faculty called as 'Supervisor', PG student from second year is required to do innovative and research oriented work related to various theory and laboratory courses he/she studied during previous semesters. Dissertation work should not be limited to analytical formulation, experimentation or software based project. Student can undertake an interdisciplinary type project with the prior permission of DPGC from both departments.

Synopsis:

Student need to carry out exhaustive literature survey with consultation of his/her supervisor for not less than 25 reputed national international journal and conference papers. Student should make the Synopsis Submission Presentation (SSP) with literature survey report to DPGC and justify about the innovativeness, applicability, relevance and significance of the work. At the time of presentation, student shall also prepare Synopsis of the work and submit to department for approval. Student shall submit synopsis of dissertation as per the prescribed format in 02 copies to department.

Course Learning Outcomes:

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

1. Select research problem through literature survey.
2. Develop research design for research problem.
3. Prepare and present synopsis report.

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Class: - **First Year M. Tech. Civil-CM**	Semester-**III**
Course Code : **CCM2054**	Course Name: **Dissertation Phase-II**

L	T	P	Credits
-	-	12	6

Course Description:

Phase II evaluation is based on End Semester Examination (ESE) which is based on the work during the semester. It is expected that student shall present preliminary results from his/her work during the semester with report as per prescribed format. DPGC including 1 external examiner as expert will approve the report and progress of student.

ISE will be evaluated by DPGC and ESE will be evaluated by DPGC and one external expert. Student will submit a report (soft bound before 1 week of date of presentation) as per prescribed format and present to DPGC for ISE and ESE. If student is not showing satisfactory performance, then he/she will be given grace period of two weeks. After two weeks' student will be again evaluated with grade penalty.

Course Learning Outcomes:

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

1. Perform data/experimental data collection for the project.
2. Analyze collected data using appropriate tools/techniques/ software.
3. Perform experimental/software analysis for validation of research work.
4. Prepare and present report.

Class: - **First Year M. Tech. Civil-CM**	Semester-IV
Course Code : **CCM2024**	Course Name: **Dissertation Phase-III**

L	T	P	Credits
-	-	12	6

Course Description:

Student is required to give a presentation on the progress of his/her dissertation work in front of supervisor and DGPC. It is expected that up to this stage almost 90% of dissertation work is almost completed. Student will make the presentation and seek the suggestions from the supervisor and DPGC. Supervisor and DPGC will ensure that work carried out by the student till this stage is satisfactory and in compliance with synopsis of the dissertation submitted by student. This is In Semester Evaluation (ISE).

Course Learning Outcomes:

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

1. Analyze collected data using appropriate tools/techniques/ software's.
2. Prepare and present/publish technical paper.
3. Prepare and present report.

Class: - **First Year M. Tech. Civil-CM**	Semester-IV
Course Code : **CCM2044**	Course Name: **Dissertation Phase IV (viva-voce)**

L	T	P	Credits
-	-	20	10

Course Description:

In Dissertation Phase-IV, it is expected that student should complete

1. 100% implementation of the proposed system
2. Simulation/ experimentation work on the proposed system
3. Performance evaluation of the proposed system
4. Comparison of the proposed system with existing systems
5. Writing of the conclusion
6. Preparation of a draft-copy of the dissertation report with Plagiarism report

Course Learning Outcomes:

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

1. Compile the work done in appropriate sequence.
2. Derive conclusion of the work done of the project.
3. Analyze proposed system.
4. Perform plagiarism analysis of compiled report.
5. Prepare and present the final dissertation report in desired format.