REVA UNIVERSITY
Bengaluru, India

# SCHOOL OF CIVIL ENGINEERING

HANDBOOK

## M. Tech. in Construction Technology and Management

**2020-22**

Rukmini Knowledge Park,
Kattigenahalli, Yelahanka, Bangalore - 560 064
Phone No: +91-080-46966966

Rukmini Educational
Charitable Trust

www.reva.edu.in

# Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."

- Nelson Mandela.

There was a time when survival depended on just therealization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference, however, lies between those who look for information and those who look for knowledge.

It is deemed virtuous to serve seekers of knowledge and as educators it is in the ethos at REVAUniversity to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is power', we believe in building a community of perpetual learners byenabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student-centric and transformational approach. The excellent infrastructure at the University, both educational and extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students.

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

**Dr. P. Shyama Raju**
**The Founder and Hon'ble Chancellor,**
**REVA University**

# Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.

A strong believer and practitioner of the dictum "Knowledge is Power", REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this 'temple of learning' has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts from industries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduatesand postgraduates of Reva University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of "Technology Incubation Centers" in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

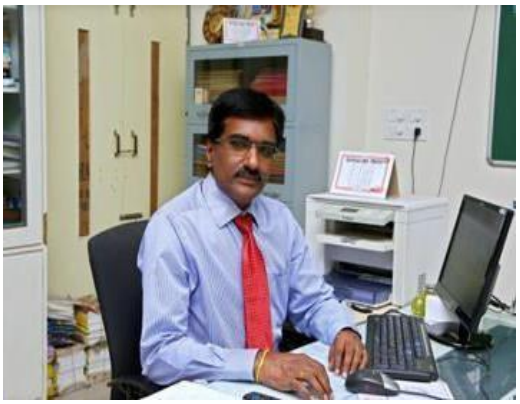
With firm faith in the saying, "Intelligence plus character –that is the goal of education" (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating "GLOBAL PROFESSIONALS".

Welcome to the portals of REVA University!

**Dr.M. Dhanamjaya**

**Vice Chancellor,**
**REVA University**

# Director's Message



The M. Tech in Construction Technology and Management is designed keeping in view future developments, both at national and global levels.

Construction technology and management are interlinked with each other. A construction engineer knows everything what that can be helpful build plans and to reshape an existing design. Construction industry has developed very much and has great importance in every society. A construction engineer does all efforts and use creative mind to build an architect. With the help of project management software and mobile technology, an engineer uses his personal experience and knowledge to plan. Technology is playing an important role in delivering quality service to the consumer according to his/ her expectations level. If someone is interested but have no clear vision what to do and what not do than he/ she should get help from construction technology and management course to get confidence and practical to get opportunities and chances to design something.

Designing, planning, construction, and management of infrastructures shows the actual potential of a construction engineer. Doing practice on infrastructures such as highways, bridges, airports, railroads, buildings, dams, and utilities shows the worth and creative approach of an expert engineer. People can help for any type of ideas before constructing their homes and other type of architectures. Project manager uses 3D and 4D software to build architectures and houses for the people. Construction Costs Analysis helps a professional to make plans on behalf of available resources and delay the less important items to accomplish tasks early. The construction industry is experiencing technological revolution to make unique and creative plans. Taking more and more interest by the new generations means creating much opportunities and potentials for newbies. People should take admissions to learn to constrictions related courses and professional degrees to become professionals and best engineers

- The benefits of choosing this Programme are:
- Flexibility to choose various fields upon post-graduation.
- Opportunity to work on live problems.
- Opportunity to work on latest technologies.
- Opportunity for designers & planner to plan & design live projects.

I am sure the students choosing M Tech in Construction Technology and Management in REVA University will enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. The cirruculum caters to and has relevance to local, regional, national, global developmental needs. We will strive to provide all needed comfort and congenial environment for their studies. Maximum number of courses are integrated with cross cutting issues with relevant to professional ethics, Gender, human values, environment and Sustainability. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

**Dr. Y. Ramalinga Reddy**
**Director**
**School of Civil Engineering,**

# CONTENTS

# RUKMINI EDUCATIONAL CHARITABLE TRUST

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of Rukmini Educational Charitable Trust (RECT), in the year 2002. Rukmini Educational Charitable Trust (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notched educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name afew.

The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by committed administrative and technical staff. Over 13,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

## ABOUT REVA UNIVERSITY

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette No. 80 dated 27thFebruary, 2013. The University is empowered by UGC to award degrees any branch of knowledge under Sec.22 of the UGC Act. The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

REVA University located in between Kempegowda International Airport and Bangalore city, has a sprawling green campus spread over 45 acres of land and equipped with state-of-the-art infrastructure that provide conducive environment for higher learning and research. The REVA campus has well equipped laboratories, custom-built teaching facilities, fully air-conditioned library and central computer centre, the well planned sports facility with cricket ground, running track & variety of indoor and outdoor sports activities, facilities for cultural programs. The unique feature of REVA campus is the largest residential facility for students, faculty members and supportive staff.

REVA consistently ranked as one of the top universities in various categories because of the diverse community of international students and its teaching excellence in both theoretical and technical education in the fields of Engineering, Management, Law, Science, Commerce, Arts, Performing Arts, and Research Studies. REVA offers 28 Undergraduate Programmes, 22 Full- time and 2 Part-time Postgraduate Programmes, 18 Ph. D Programmes, and other Certificate/ Diploma/Postgraduate Diploma Programmes in various disciplines.

The curriculum of each programme is designed with a keen eye for detail by giving emphasis on hands-on training, industry relevance, social significance, and practical applications. The University offers world-class facilities and education that meets global standards.

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis with knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on practice in respective areas and skill development to suit to respective job environment has been given while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of education has been introduced in all programs to facilitate students to opt for subjects of their choice in addition to the core subjects of the studyand prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught

by well experienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses, special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has also entered into MOUs with many industries, business firms and other institutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

REVA University recognizing the fact that research, development and innovation are the important functions of any university has established an independent Research and Innovation division headed by a senior professor as Dean of Research and Innovation. This division facilitates all faculty members and research scholars to undertake innovative research projects in engineering, science & technology and other areas of study. The interdisciplinary-multidisciplinary research is given the top most priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the core areas of research wherein our young faculty members are working include DataMining, Cloud Computing, Image Processing, Network Security, VLSI and Embedded Systems, Wireless Censor Networks, Computer Networks, IOT, MEMS, Nano- Electronics, Wireless communication,

Bio-fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, LED Lightings, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nana Tribology, Fuel Mechanics, Operation Research, Graph theory, Strategic Leadership and Innovative Entrepreneurship, Functional Development Management, Resource Management and Sustainable Development, Cyber Security, General Studies, Feminism, Computer Assisted Language Teaching, Culture Studies etc.

The REVA University has also given utmost importance to develop the much required skills through variety of training programs, industrial practice, case studies and such other activities that induce the said skills among all students. A full-fledged Career Development and Placement (CDC) department with world class infrastructure,

headed by a dynamic experienced Professor& Dean, and supported by well experienced Trainers, Counselors and Placement Officers.

The University also has University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director facilitating skill related training to REVA students and other unemployed students. The University has been recognized as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal VikasYojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student's variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Oklahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC2, VMware, SAP, Apollo etc., to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

The University has also given greater importance to quality in education, research, administration and all activities of the university. Therefore, it has established an independent Internal Quality division headed by a senior professor as Dean of Internal Quality. The division works on planning, designing and developing different quality tools, implementing them and monitoring the implementation of these quality tools. It concentrates on training entire faculty to adopt the new tools and implement their use. The division further works on introducing various examination and administrative reforms.

To motivate the youth and transform them to become innovative entrepreneurs, successful leaders of tomorrow and committed citizens of the country, REVA organizes interaction between students and successful industrialists, entrepreneurs, scientists and such others from time to time. As a part of this exercise great personalities such as Bharat Ratna Prof. C. N. R. Rao, a renowned Scientist, Dr. N R Narayana Murthy, Founder and Chairman and Mentor of Infosys, Dr. K Kasturirangan, Former Chairman ISRO, Member of Planning Commission, Government of India, Dr. Balaram, Former Director IISc., and noted Scientist, Dr. V S Ramamurthy, Former Secretary, DST, Government of India, Dr. V K Aatre, noted Scientist and former head of the DRDO and Scientific Advisor to the Ministry of Defence Dr. Sathish Reddy, Scientific Advisor, Ministry of Defence, New Delhi and many others have accepted our invitation and blessed our students and faculty members by their inspiring addresses andinteraction.

REVA organizes various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progressof the society. One of such cultural events is REVAMP conducted every year. The event not

only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take theirfuture career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognised by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga class's every day to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

## Vision

REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards".

## Mission

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers.
- To provide student-centric learning environment through innovative pedagogy and education reforms.
- To encourage research and entrepreneurship through collaborations and extension activities.
- To promote industry-institute partnerships and share knowledge for innovation and development.
- To organize society development programs for knowledge enhancement in thrust areas.
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

## Objectives

Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines

Smooth transition from teacher - centric focus to learner - centric processes and activities

Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position

Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation

Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

## ABOUT SCHOOL OF CIVIL ENGINEERING

The School of Civil Engineering is headed by highly experienced Professor and is supported by well qualified faculty members. The school has the state-of-art class rooms and well equipped laboratories. It offers B.Tech and M.Tech programs in various specialized streams. The school also has research program leading to doctoral degree. The curriculum of both graduate and post graduate degree programs have been designed to bridge the gap between industry – academia and hence they are industry application oriented. The B.Tech program aims to prepare human resources to play a leading role in the competitive construction field and excelin their endeavors. The Master's Degree programs focus on research and design in the core and Computer Aided Structural Engineering, Construction Technology and Management & Transportation Engineering & Management to supplement and create a sustainable world and to enhance the global quality of life by adopting enhanced techniques of design and application. This is reflected in various core subjects offered within the program. Currently Civil Engineering teaching was limited to planning, analysis, design and execution of different types of infrastructure like buildings, roads, bridges, dams and power plants. However, due to increase of technological sophistication and demand for higher living standards geared up by economic growth and concerns about environmental impact have changed the scope of Civil Engineering. The challenges of today's Civil Engineering infrastructure are much more complex and interdependencies between resources.

Even though there are a large number of institutions in the country which are producing Civil Engineers, there is acute shortage of quality Civil Engineers. The REVA UNIVERSITY would like to offer Civil Engineering Programme to produce quality engineers who are effective and efficient in problem solving and providing economical and sustainable infrastructural solutions.

### VISION

"To produce young Engineers of caliber, who would be committed to their profession with ethics, will be able to contribute to Civil Engineering and allied fields in optimizing usage of resources globally making the world more eco-friendly to live in."

### MISSION

To make the Department center of excellence for training the undergraduate students.

To promote involvement of staff and students in research and advanced training.

To develop good understanding skills in student communities about Civil Engineering, ethical practices, automation design and society need centric teaching and learning and impartingvalue addition skills.

# BOARD OF STUDIES COMMITTEE

| BOS MEMBERS LIST FOR M TECH CONSTRUCTION TECHNOLOGY AND MANAGEMENT | | | |
|---|---|---|---|
| **Sl. No.** | **Name, Designation & Affiliation** | **Status** | **Correspondence Address** |
| 1 | Dr.Y. Ramalinga Reddy<br>Director, School of Civil Engineering, REVA University | Chairperson | Rukmini Knowledge park, REVA University, Yelahanka, Bengaluru-560064<br>(M): 9448508996<br>Email: ramalingareddy@reva.edu.in |
| 2 | Dr. V. Ramachandra<br>Zonal Head, Technical Services,<br>Ultra Tech Cement Ltd., | Member | Zonal Head, Technical Services,<br>Ultra Tech Cement Ltd., Industry House, 6th floor, #45, Race Course Road, Bangalore 560 001, (M)97432-47985<br>Email: ramachandra.v@adityabirla.com |
| 3 | Dr. G. Anand<br>Director, APT Consulting Engineering Service, | Member | No. 55/2, 3rd floor, East Park Road, Malleshwaram, Bangalore- 560055<br>(M): 9845128153<br>Email: gananda36@gmail.com |
| 4 | Sri. N. Ranganath<br>Managing Director,<br>EIT Technology Pvt. Ltd., | Member | 35th 'C' Cross, 4th T block, Jaya Nagar, Bangalore- 560041<br>(M): 9449021149<br>Email: nranganatha@eitech.in |
| 5 | Dr. R.V. Ranganath<br>Professor, Department of Civil Engineering,<br>BMS College of Engineering | Member | Professor, Dept. of Civil Engineering,<br>BMS College of Engineering, Bull Temple Road, Bangalore-560 019<br>(M) 98450-86602<br>Email: rangarv@yahoo.com |
| 6 | Dr. K. M. Krishna Murthy<br>RAASTA- Centre for Road Technology | Member | Volvo Equipment Campus,<br>Phase-1, Peenya Industrial area, Bangalore-560058<br>(M): 9844119221<br>Email: group.rasta@raastaindia.com |
| 7 | Dr. Anil Kumar K S<br>Highway design lead,<br>WS Atkins India Pvt. Ltd., | Member | #81, 2nd cross, Munnireddy layout, Banaswadi, Horamavu, Bengaluru-560043<br>(M): 8105555778<br>Email: anilgowda1985@gmail.com |
| 8 | Sri. Raghavendra Y.B<br>Senior Manager – Quality Control & Research & Development, M/s Aparna Enterprises Limited. | Member | #4/2, Shri Kalabhyraveshwara Nilaya, 5th Cross, 3rd Main, Riffco Shantinikethan Layout, Medahalli, Virgonagar post, Bengaluru-560049<br>(M): 9886161233<br>Email: raghuyb82@gmail.com |

| | | | |
|---|---|---|---|
| 9 | Dr. Sunil Kumar Tengli<br>Professor, REVA University | Member<br>(Internal) | School of Civil Engineering,<br>Rukmini Knowledge park, REVA University, Yelahanka, Bengaluru-560064<br>(M): 9844057122<br>Email: dr.sktengali@reva.edu.in |
| 10 | Dr. P. Shivananda<br>Professor, REVA University | Member<br>(Internal) | School of Civil Engineering,<br>Rukmini Knowledge park, REVA University, Yelahanka, Bengaluru-560064<br>(M): 9448047250<br>Email: pshivananda@reva.edu.in |
| 11 | Dr. Seelam Srikanth Reddy<br>Assistant Professor, REVA University | Member<br>(Internal) | School of Civil Engineering,<br>Rukmini Knowledge park, REVA University, Yelahanka, Bengaluru-560064<br>(M): 9491303992<br>Email: srikanths.reddy@reva.edu.in |
| 12 | Vinayaka B.<br>Asst. Professor,<br>REVA University | Member<br>Alumni | Rukmini Knowledge park, REVA University, Yelahanka, Bengaluru-560064<br>(M): 9538959138<br>Email: vinayaka.b@reva.edu.in |
| 13 | Darshan G<br>Student,<br>REVA University | Current<br>Student | Rukmini Knowledge park, REVA University, Yelahanka, Bengaluru-560064<br>(M): 8861216143<br>Email: r19mct08@ce.reva.edu.in |

## Program Overview

Designing, planning, construction, and management of infrastructures shows the actual potential of a construction engineer. Without using all these 4 rules not one can get satisfactory response and results as per expectations. Doing practice on infrastructures such as highways, bridges, airports, railroads, buildings, dams, and utilities shows the worth and creative approach of an expert engineer. People can help for any type of ideas before constructing their homes and other type of architectures. Project manager uses 3D and 4D software to build architectures and houses for the people. Construction Costs Analysis helps a professional to make plans on behalf of available resources and delay the less important items to accomplish tasks early. The construction industry is experiencing technological revolution to make unique and creative plans. Taking more and more interest by the new generations means creating much opportunities and potentials for newbies. People should take admissions to learn to constrictions related courses and professional degrees to become professionals and best engineers.

Instant Access to Learn and to Seek New Trends & Technological Revolutions in Constructions. Internet can help in great sense to learn and to get awareness from latest technology trends in construction and to adopt new standards of teaching to get qualifications and support from professionals. Online education can help students to get instant access to find all useful resources and professional support toseek latest trends and modern style of education to build unique constructions and to improve current standards. Show your interest and find the best and authentic source of knowledge from you can get knowledge and support to become a perfect construction engineer.

## Program Educational Objectives (PEO's)

After few years of post-graduation, the graduates of **M.Tech CE (Construction Technology & Management)** will be:

PEO-1 Have successful professional careers in industry, government, academia and military as innovative engineers.

PEO-2 Successfully solve engineering problems associated with the lifecycle of Civil Engineering system, in particular construction technology and management by communicating effectively either leading a team or as a team member **with ethical practices.**

PEO-3 Continue to learn and advance their careers through activities such as research and development, acquiring doctoral degree, participation in national level research programmes, teaching and research at university level etc.,

PEO-4 Active members ready to serve the society locally and internationally, may take up entrepreneurship for the growth of economy and to generate employment; and adopt the philosophy of lifelong learning to be aligned with economic and technological development.

## Program Outcomes (POs)

**On successful completion of the program, the graduates of M.Tech CE (Construction Technology & Management) program will be able to:**

**PO1.** Demonstrate in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyse and synthesize existing and new knowledge, and integration of the same for enhancement of knowledge.

**PO2.** Analyze complex engineering problems critically, apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.

**PO3.** Think laterally and originally, conceptualize and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.

**PO4.** Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.

**PO5**. Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.

**PO6.** Possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.

**PO7.** Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economic and financial factors.

**PO8.** Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.

**PO9:** Recognize the need for, and have the preparation and ability to engage in life-longlearning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

**PO10.** Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

**PO11.** Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback(SELF learning)

## Programme Specific Outcomes (PSO's)

After successful completion of the programme, the graduates shall be able to

An ability to plan, analyse, design, synthesize, execute, and manage complicated infrastructure projects within local and global context in a sustainable manner.

Implant the capacity to apply the concepts of Artificial intelligence, IoT, Advanced data modeling techniques, etc. in the design, development and implementation of application oriented engineering systems

Review scholarly work by referring journals, define a new problem, design, model, analyse and evaluate the solution and report as a dissertation in the area of construction technology and management.

GA1: Scholarship of knowledge
GA2: Critical thinking
GA3: Problem solving
GA4: Research skill
GA5: Usage of modern tools
GA6: Collaborative and multidisciplinary work
GA7: Project management and finance
GA8: Communication
GA9: Lifelong learning
GA10: Ethical practices and social responsibility
GA11: Independent and reflective learning.

# Regulations – M Tech., Degree Program
# Academic Year 2020-21 Batch

(Framed as per the provisions under Section 35 (ii), Section 7 (x) and Section 8 (xvi) & (xxi) of the REVA University Act, 2012)

## 1. Title and Commencement:

**1.1** These Regulations shall be called **"REVA University Academic Regulations – M Tech., Degree Program 2020-21 Batch subject to amendments from time to time by the Academic Council on recommendation of respective Board of Studies and approval of Board of Management**

**1.2** These Regulations shall come into force from the date of assent of the Chancellor.

## 2. The Programs:

These regulations cover the following M Tech., Degree programs of REVA University offered during 2020-21

**M Tech (Full Time) in:**

Artificial Intelligence
Computer Science and Engineering
Computer Aided Structural Engineering
Construction Technology & Management
Digital Communication and Networking
Machine Design
Power Energy & Systems
Transportation Engineering and Management
VLSI and Embedded Systems

**Also**

**M Tech (Part Time) in:**

Computer Science and Engineering
VLSI and Embedded Systems

## 3. Duration and Medium of Instructions:

**3.1** **Duration:** The duration of the M Tech degree program shall be **TWO years** comprising of **FOUR** Semesters. A candidate can avail a maximum of 8 semesters - 4 years as per double duration norm, in one stretch to complete M Tech degree. The duration for part time students is **THREE years** and a maximum of 6 years they are required to complete the program.

**3.2** The medium of instruction shall be English.

**4. Definitions:**

**4.1 Course: "Course" means a subject, either theory or practical or both, listed under a programme;** Example: "Finite Element Method of Analysis" in M Tech Civil Engineering program, "Advanced Theory of Vibration" in M Tech., Mechanical program are examples of courses to be studied under respective programs.

**5** Every course offered will have three components associated with the teaching-learning process of the course, namely:

| | |
|---|---|
| **L** | **Lecture** |
| **T** | **Tutorial** |
| **P** | **Practice** |

Where:

**L** stands for **Lecture** session consisting of classroom instruction.

**T** stands for **Tutorial** session consisting participatory discussion / self-study/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorband assimilate more effectively the contents delivered in the Lecture classes.

**P** stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies / Project Based Learning or Course end Project/Self Study/ Online courses from listed portals that equip students to acquire the much required skill component.

**4.2 Classification of Courses**

**Courses offered are classified as: Core Courses, Open Elective Courses, Project work/Dissertation**

4.2.1 **Core Course:** A course which should compulsorily be studied by a candidate choosing a particular program of study

4.2.2 **Foundation Course:** The foundation Course is a mandatory course which should be completed successfully as a part of graduate degree program irrespective of the program of study

4.2.3 **Hard Core Course (HC) simply core course:** The **Hard Core Course** is a Core Course in the main branch of study and related branch(es) of study, if any, that the candidates have to complete compulsorily

**Soft Core Course (SC) (also known as Professional Elective Course)**

A Core course may be a **Soft Core** if there is a choice or an option for the candidate to choose a course from a pool of courses from the main branch of study or from a sister/related branch of study which supports the main branch of study

**4.2.4 Open Elective Course (OE):**

An elective course chosen generally from other discipline / subject, with an intention to seek exposure to the basics of subjects other than the main discipline the student is studying is called an **Open Elective Course**

**4.2.5 Project Work / Dissertation:**

Project work / Dissertation work is a special course involving application of knowledge in solving / analysing /exploring a real life situation / difficult problems to solve a multivariable or complex engineering problems.

**5. Eligibility for Admission:**

5.1. The eligibility criteria for admission to M Tech Program (Full Time) of 2 years (4 Semesters) and (Part Time) of 3 years (6 Semesters) are given below:

| Sl. No. | Program | Duration | Eligibility |
|---|---|---|---|
| 1 | Masters of Technology (M Tech) in Artificial Intelligence | 4 Semesters (2 years) | B E / B.Tech. in CSE / ISE / TE / MCA / M. Sc. in Computer Science or Mathematics or Information Science or Information Technology with a minimum of 50% (45% in case of SC/ST) marks in aggregate of any recognized University / Institution or AMIE or any other qualification recognized as equivalent there to. |
| 2 | M Tech in Computer Science and Engineering | **Full Time** – 4 Semesters (2 years)<br>**Part Time** – 6 Semesters (3 years) | B E / B.Tech. in ECE / IT / EEE / CSE / ISE / TE / MCA / M.Sc. in Computer Science or Mathematics or Information Science or Information Technology with a minimum of 50% (45% in case of SC/ST) marks in aggregate of any recognized University / Institution or AMIE or any other qualification recognized as equivalent there to. |

| | | | |
|---|---|---|---|
| 3 | M Tech in Computer Aided Structural Engineering<br>Construction Technology & Management<br>Transportation Engineering and Management | 4 Semesters (2 years) | BE/ B.Tech. in Civil Engineering with a minimum of<br>50% (45% in case of SC/ST) marks in aggregate of any recognized University / Institution or AMIE or any other qualification recognized as equivalent there to. |
| 4 | M Tech in Power Energy & Systems | 4 Semesters (2 years) | BE/ B.Tech. in EE/ EEE/ ECE/ CSE/ MS / M.Sc. in Mathematics/Physics/Electronics / Information Technology or Information Science with a minimum of 50% (45% in case of SC/ST) marks in aggregate of any recognized University / Institution or AMIE or any other qualification recognized as equivalent there to. |
| 5 | M Tech in Digital Communication and Networking<br>Machine Design | 4 Semesters (2 years) | B E / B.Tech. in ECE /TE / EEE / CSE / ISE / Instrumentation Technology / Medical Electronics/M Sc in Electronics with a minimum of 50% (45% in case of SC/ST) marks in aggregate of any recognized University/Institution or AMIE or any other qualification recognized as equivalent there to. |
| 6 | M Tech in VLSI and Embedded Systems | **Full Time** – 4 Semesters (2 years)<br>**Part Time** – 6 Semesters (3 years) | B E / B.Tech. in ECE /TE / EEE / CSE / ISE / Instrumentation Technology / Medical Electronics/M Sc in Electronics with a minimum of 50% (45% in case of SC/ST) marks in aggregate of any recognized University/Institution or AMIE or any other qualification recognized as equivalent there to. |
| 7 | M Tech in Machine Design | 4 Semesters (2 years) | BE / B.Tech. in Mechanical/Aeronautical / Automobile / Industrial Production Engineering with a minimum of 50% (45% in case of candidate belonging to SC/ST category) marks in aggregate, of any recognized University / Institution or AMIE or any other qualification recognized as equivalent there to. |

5.2 Provided further that the eligibility criteria are subject to revision by the Government Statutory Bodies, suchas AICTE, UGC from time to time.

## 6 Courses of Study and Credits

6.2 Each course of study is assigned with certain credit value

6.3 Each semester is for a total duration of 20 weeks out of which 16 weeks dedicated for teaching and learning and the remaining 4 weeks for final examination, evaluation and announcement of results

6.4 The credit hours defined as below

In terms of credits, every one hour session of L amounts to 1 credit per Semester and a minimum of two hour session of T or P amounts to 1 credit per Semester or a three hour session of T / P amounts to 2 credits over a period of one Semester of 16 weeks for teaching-learning process.

1 credit = 13 credit hours spread over 16 weeks or spread over the semester.

**The total duration of a semester is 20 weeks inclusive of semester-end examination.**

**The following table describes credit pattern**

**Table -2: Credit Pattern**

| Lectures (L) | Tutorials (T) | Practice (P) | Credits (L:T:P) | Total Credits | Total Contact Ho |
|---|---|---|---|---|---|
| 4 | 2 | 0 | 4:1:0 | 5 | 6 |
| 3 | 2 | 0 | 3:1:0 | 4 | 5 |
| 3 | 0 | 2 | 3:0:1 | 4 | 5 |
| 2 | 2 | 2 | 2:1:1 | 4 | 6 |
| 0 | 0 | 6 | 0:0:3 | 3 | 6 |
| 4 | 0 | 0 | 4:0:0 | 4 | 4 |
| 2 | 0 | 0 | 2:0:0 | 2 | 2 |

a. The concerned BoS will choose the convenient Credit Pattern for every course based on size and nature of the course

**7.** Different C**ourses of Study**:

Different C**ourses of Study** are labeled as follows:

a. Core Course (CC)
b. Foundation Course (FC)
c. Hard Core Course (HC)
d. Soft Core Course (SC)
e. Open Elective Course (OE)
f. Minor Project
g. Major Project / Dissertation:

**The credits for minor projects, major project/Dissertation will be decided by the respective Schools.**

**8. Credit and Credit Distributions:**

**8.1** A candidate has to earn 72 credits for successful completion of M Tech degree with a distribution of credits for different courses as prescribed by the University.

**8.2** A candidate can enroll for a maximum of 24 credits per Semester. However s/he may not successfully earn

a maximum of 24 credits per semester. This maximum of 24 credits does not include the credits of courses carried forward by a candidate.

**8.3 Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to IV semester and complete successfully 72 credits in 4 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities**.

**9. Assessment and Evaluation**

9.1 The assessment and evaluation process happens in a continuous mode. However, for reporting purpose, a Semester is divided into 3 components as IA1, IA2 and SEE. The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.

**(i) Component IA1:**

The first Component (IA1), of assessment is for 25 marks. This will be based on test, assignment / seminar. During the first half of the semester (i.e. by 8th week), the first 50% of the syllabus (Unit 1&2) will be completed. This shall be consolidated during the first three days of 8th week of the semester. A review test based on IA1 will be conducted and completed in the beginning of the 9th week. In case of courses where test cannot be conducted, the form of assessment will be decided by the concerned school and such formalities of assessment will be completed in the beginning of the 9th week. The academic sessions will continue for IA2 immediately after completion of process of IA1.

**The finer split - up for the award of marks in IA1 is as follows:**

Assignment & Seminars ..... 10 marks for the first 20% of the syllabus

Test (Mid-Term) .....15 marks for the first 30% of the syllabus

Total ..... 25 marks

**(ii) Component IA2:**

**The second component (IA2), of assessment is for 25 marks.** This will be based on test, assignment /seminar. The continuous assessment and scores of second half of the semester (9th to 16th week) will be consolidated during 16th week of the semester. During the second half of the semester the remaining units in the course will be completed. A review test based on IA2 will be conducted and completed during 16th week of the semester. In case of courses where test cannot be conducted, the form of assessment will be decided by the concerned school and such formalities of assessment will be completed during 16th week.

The 17th week will be for revision of syllabus and preparation for the semester – end examination.

**The finer split - up for the award of marks in IA2 is as follows:**

Assignment/Seminar…..... 10 marks for the second 20% of the syllabus

Review Test (Mid-Term).....15 marks for the second 30% of the syllabus

Total .....25 marks

**(iii) Component SEE:**

The Semester End Examination of 3 hours duration for each course shall be conducted during the 18th & 19th week. **This forms the third / final component of assessment (SEE) and the maximum marks for the final component will be 50.**

9.2 The schedule of continuous assessment and examinations are summarized in the following Table below.

| Component | Period | Syllabus | Weightage | Activity |
|---|---|---|---|---|
| IA1 | 1st Week to 8th Week | First 50% (two units) | | Instructional process and Continuous Assessment |
| | Last 3 days of 8th Week | | 25% | Consolidation of IA1 |
| IA2 | 9th week to 16th week | Second 50% (remaining two units) | | Instructional process and Continuous Assessment |
| | Last 3 days of 16th week | | 25% | Consolidation of IA2 |
| SEE | 17th and 18th week | | | Revision and preparation for Semester end examination |
| | 19th week to 20th week | Entire syllabus | 50% | Conduct of semester end examination and Evaluation concurrently |
| | 21st week | | | Notification of Final Grades |
| ***Evaluation shall begin very first day after completion of the conduct of examination of the first course and both examination and evaluation shall continue concurrently. The examination results / final grades be announced latest by 21st week** | | | | |

**Note:** 1. Practical examination wherever applicable shall be conducted before conducting of IA2 examination. The calendar of practical examination shall be decided by the respective school.

2. Finally**, awarding the Grades** be announced latest by 5 days after completion of the examination.

**9.3 The Assessment of MOOC and Online Courses shall be decided by the concerned School Board of Studies (BOS).**

**9.3.1 For > 3 credit courses**

| | | |
|---|---|---|
| i | IA-I | 25 marks |
| ii | IA-2 | 25 marks |
| iii | Semester end examination by the concern school board ( demo, test, viva voice etc) | 50 marks |
| | **Total** | **100 marks** |

**9.3.2 For 1 & 2 credit courses.**

| | | |
|---|---|---|
| i | IA-I | 15 marks |
| ii | IA-2 | 15 marks |
| iii | Semester end examination by the concern school board ( demo, test, viva voice etc) | 20 marks |
| | **Total** | **50 marks** |

9.3.3.The 50 marks meant for Internal Assessment (IA) of the performance in carrying out practical shall further be allocated as under:

| | | |
|---|---|---|
| i | Conduction of regular practical / experiments throughout the semester | 20 marks |
| ii | Maintenance of lab records / Activities /Models / charts etc | 10 marks |
| iii | Performance of mid-term test (to be conducted while conducting second test for theory courses); the performance assessments of the mid-term test includes performance in the conduction of experiment and write up about the experiment. | 20 marks |
| | **Total** | **50 marks** |

In case of an integrated course 20% marks be earmarked for laboratory work

**For example:**

During IA1

Laboratory work..... 10 marks

Test (Mid-Term) .....15 marks for the first 50% of the theory syllabus

Total ..... 25 marks

During IA2

Laboratory work..... 10 marks

Test (Mid-Term) .....15 marks for the second 50% of theory syllabus

Total ..... 25 marks

SEE to be conducted for theory portions only and assessed for 50 marks

**10. Setting Questions Papers and Evaluation of Answer Scripts:**

10.1 There shall be three sets of questions papers set for each course. Two sets of question papers shall be set by the internal and one set by external examiner for a course. The Chairperson ofthe BoE shall get the question papers set by internal and external examiners.

10.2 The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation.

10.3 There shall be double evaluation, viz, first valuation by the internal evaluator who has taught the course and second evaluation shall be an external examiner who is familiar with the course. The average marks of the two evaluations (internal examiner & external examiner) shall be the marks to be considered for declaration of results.

10.4 The examination for Practical work/ Field work/Project work will be conducted jointly by two examiners (internal and external). However, in case of non-availability of external examiner or vice versa, the Chairperson BoE at his discretion can invite internal / external examiners as the case may be, if required.

10.5 If a course is fully of (L=0):T: (P=0) type, then the examination for SEE Component will be as decided by the BoS concerned.

10.6 In case of a course with only practical component a practical examination will be conducted with two examiners and each candidate will be assessed on the basis of: a) Knowledge of relevant processes, b) Skills and operations involved, and c) Results / Products including calculation and reporting.

10.7 The duration for Semester-End practical examination shall be decided by the Controller of Examinations.

**11. Evaluation of Minor Project / Major Project / Dissertation:**

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the supervisor. At the end of the semester, the candidate has to submit final report of the project / dissertation, as the case may be, for final evaluation. The components of evaluation are as follows:

| | | |
|---|---|---|
| Component – I | (IA1) | Periodic Progress and Progress Reports (25%) |
| Component – II | (IA2) | Results of Work and Draft Report (25%) |
| Component– III | (SEE) | Final Evaluation and Viva-Voce (50%). Evaluation of the report is for 30% and the Viva-Voce examination is for 20%. |

**12.** All assessments must be done by the respective Schools as per the guidelines issued by the Controller of Examinations. However, the responsibility of announcing final examination results and issuing official transcripts to the students lies with the office of the Controller of Examinations.

**13. Requirements to Pass a Course**

13.1 A candidate's performance from all 3 components will be in terms of scores, and the sum of all three scores will be for a maximum of 100 marks (25 + 25 + 50). A candidate who secures a minimum of 40% in the SEE and an overall 40% (IA1+IA2+SEE) in a course is said to be successful.

13.2 **The Grade and the Grade Point:** The Grade and the Grade Point earned by the candidate in the subject will be as given below:

| Marks, P | Grade, G | Grade Point (GP=V x G) | Letter Grade |
|---|---|---|---|
| 90-100 | 10 | v*10 | O |
| 80-89 | 9 | v*9 | A+ |
| 70-79 | 8 | v*8 | A |
| 60-69 | 7 | v*7 | B+ |
| 55-59 | 6 | v*6 | B |
| 50-54 | 5.5 | v*5.5 | C+ |
| 40-49 | 5 | v*5 | C |
| 0-39 | 0 | v*0 | F |
| ABSENT | | | AB |

O - Outstanding; A+-Excellent; A-Very Good; B+-Good; B-Above Average; C+-Average; C-Satisfactory; F – Unsatisfactory.

Here, P is the percentage of marks (P=[(IA1+IA2)+SEE] secured by a candidate in a course which is **rounded to nearest integer**. v is the credit value of course. G is the grade and GP is the grade point.

**a. Computation of SGPA and CGPA**

The Following procedure to compute the Semester Grade Point Average (SGPA)

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

**SGPA (Si) = ∑(Ci x Gi) / ∑Ci**

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

**b. Illustration for Computation of SGPA and CGPA**

**Illustration No. 1**

| Course | Credit | Grade letter | Grade Point | Credit Point (Credit x Grade) |
|---|---|---|---|---|
| Course 1 | **3** | **A** | **9** | **3X9=27** |
| Course 2 | **3** | **B** | **8** | **3X8=24** |
| Course 3 | **3** | **C** | **7** | **3X7=21** |
| Course 4 | **3** | **O** | **10** | **3X10=30** |
| Course 5 | **3** | **D** | **6** | **3X6=18** |
| Course 6 | **3** | **O** | **10** | **3X10=30** |
| Course 7 | **2** | **A** | **9** | **2X 9 = 18** |
| Course 8 | **2** | **B** | **8** | **2X 8 = 16** |
| | **22** | | | **184** |

Thus, **SGPA = 184 ÷ 22 = 8.36**

**c. Cumulative Grade Point Average (CGPA):**

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (72) for two year post graduate degree in a specialization is calculated taking into account all the courses undergone by a student over all the semesters of a program, i. e **CGPA = ∑(Ci x Si) / ∑Ci**

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

**Illustration:**

**CGPA after Final Semester**

| Semester (ith) | No. of Credits (Ci) | SGPA (Si) | Credits x SGPA (Ci X Si) |
|---|---|---|---|
| 1 | 22 | 8.36 | 22 x 8.36 = 183.92 |
| 2 | 22 | 8.54 | 22 x 8.54 =187.88 |
| 3 | 16 | 9.35 | 16x9.35=149.6 |
| 4 | 12 | 9.50 | 12x9.50=114 |
| **Cumulative** | **72** | | 635.4 |

Thus, **CGPA** = $\frac{22x8.36+22x8.54+16x9.35+12x9.50}{}$ = 8.83

**13.3 Conversion of Grades Into Percentage:**

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

**Illustration**: CGPA Earned 8.83 x 10=88.30

**14. Classification of Results**

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows:

| CGPA | Grade (Numerical Index) | Letter Grade | Performance | FGP |
|---|---|---|---|---|
| | G | | | Qualitative Index |
| 9 >= CGPA 10 | 10 | O | Outstanding | Distinction |
| 8 >= CGPA < 9 | 9 | A+ | Excellent | |
| 7 >= CGPA < 8 | 8 | A | Very Good | First Class |
| 6 >= CGPA < 7 | 7 | B+ | Good | |
| 5.5> = CGPA < 6 | 6 | B | Above average | Second Class |
| > 5 CGPA < 5.5 | 5.5 | C+ | Average | |
| > 4 CGPA <5 | 5 | C | Satisfactory | Pass |
| < 4 CGPA | 0 | F | Unsatisfactory | Unsuccessful |

**Overall percentage=10*CGPA**

a. **Provisional Grade Card:** The tentative / provisional Grade Card will be issued by the Controller of Examinations at the end of every Semester indicating the courses completed successfully. The provisional grade card provides **Semester Grade Point Average** (SGPA).This statement will not contain the list of DROPPED courses.

b. **Final Grade Card:** Upon successful completion of the Post Graduate Degree a Final Grade card consisting of grades of all courses successfully completed by the Candidate will be issued by the COE.

**15. Attendance Requirement:**

15.1 All students must attend every lecture, tutorial and practical classes.

15.2 In case a student is on approved leave of absence (e g:- representing the University in sports, games or athletics, placement activities, NCC, NSS activities and such others) and / or any other such contingencies like medical emergencies, the attendance requirement shall be minimum of 75% of the classes taught.

15.3 Any student with less than 75% of attendance in aggregate of all the courses including practical courses / field visits etc., during a semester shall not be permitted to appear to the end semester examination and such student shall seek re-admission

**16. Re-Registration and Re-Admission:**

16.1 In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University, such a candidate is considered as dropped the semester and is not allowed to appear for semester end examination and he / she shall have to seek re-admission to that semester during
subsequent semester / year within a stipulated period.

16.2 In such case where in a candidate drops all the courses in a semester due to personal reasons, it is considered that the candidate has dropped the semester and he / she shall seek re-admission to such dropped semester.

**17. Absence during Internal Test:**

In case a student has been absent from an internal tests due to the illness or other contingencies he / she may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Director of the School, for conducting a separate internal test. The Director of the School may consider such request depending on the merit of the case and after consultation with course instructor and class teacher, and arrange to conduct a special internal test for such candidate(s) well in advance before the Semester End Examination of that respective semester. Under no circumstances internal tests shall be held / assignments are accepted after Semester End Examination.

**18. Eligibility to Appear for Semester End Examination (SEE)**

18.1 Only those students who fulfill 75% attendance requirement and who secure minimum 30% marks in IA1 and IA2 together in a course are eligible to appear for SEE examination in that course.

18.2 Those students who have 75% of attendance but have secured less than 30% marks in IA1 and IA2 together in a course are not eligible to appear for SEE examination in that course. They are treated as dropped the course and they will have to repeat that course whenever it is offered.

18.3 In case a candidate secures more than 30% in IA1 and IA2 together but less than 40% in aggregate of IA1, IA2 and SEE in a course is considered as unsuccessful and such a candidate may either opt to DROP that course or appear for SEE examination during the subsequent semesters / years within the stipulated period.

18.4 In such a case wherein he / she opts to appear for just SEE examination, then the marks secured in IA1 and IA2 shall get continued. Repeat SEE examination will be conducted in respective semesters.

**19. Provision for Supplementary Examination**

In case a candidate fails to secure a minimum of 40% (20 marks) in Semester End Examination (SEE) and a minimum of 40% marks overall (IA and SEE together), such candidate shall seek supplementary examination of only such course(s) wherein his / her performance is declared unsuccessful. The

supplementary examinations are conducted after the announcement of even semester examination results.

The candidate who is unsuccessful in a given course(s) shall appear for supplementary examination of odd and even semester course(s) to seek for improvement of the performance.

**20. Provision to Carry Forward the Failed Subjects / Courses:**

A candidate who secures a minimum of 40% in the SEE and an overall 40% (IA1+IA2+SEE) in a course is said to be successful otherwise considered that the candidate has failed the course. A candidate is required to successfully complete all thecourses before submission of major project report or dissertation report.

(It means that the candidate has no restrictions on the number of courses that can be carried forward)

**21. Provision for Appeal**

If a candidate is not satisfied with the evaluation of Internal Assessment components (Internal Tests and Assignments), he/she can approach the Grievance Cell with the written submission together with all facts, the assignments, and test papers, which were evaluated. He/she can do so before the commencement of respective semester-end examination. The Grievance Cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the University on the candidate

if his/her submission is found to be baseless and unduly motivated. This Cell may recommend for taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the Grievance committee is final.

**22. Grievance Committee:**

In case of students having any grievances regarding the conduct of examination, evaluation and announcement of results, such students can approach Grievance Committee for redressal of grievances. Grievance committees will be formed by CoE in consultation with VC

For every program there will be one grievance committee. The composition of the grievance committee is as follows:-

- The Controller of Examinations - Ex-officio Chairman / Convener
- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.
- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

**23.** With regard to any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellor shall be final.

REVA UNIVERSITY
Bengaluru, India

Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru-560064

# SCHOOL OF CIVIL ENGINEERING

## M. Tech in CONSTRUCTION TECHNOLOGY & MANAGEMENT

## (2020-2022)

## I SEMESTER

| Sl. No | Course Code | Title of the Course | HC/SC/OE | Pre requisite | Credit Pattern & Credit Value | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | |
| 1 | M20TE0101 | Advanced design of pre-stressed & precast structures | HC | BE / B. TECH in Civil Engineering | 2 | 1 | - | 3 | 4 |
| 2 | M20TE0102 | Building services | HC | | 2 | 1 | - | 3 | 4 |
| 3 | M20TE0103 | Concrete Construction Technology | HC | | 2 | 1 | - | 3 | 4 |
| 4 | M20TE0104 | Construction Methods and Equipment | HC | | 2 | 1 | - | 3 | 4 |
| 5 | M20TE0105 | Construction Project and Management with MSP | HC | | 2 | 1 | - | 3 | 4 |
| 6 | M20TE0106 | Foundation Design and Construction | HC | | 2 | 1 | - | 3 | 4 |
| 7 | M20TE0108 | Mini Project-I | Practical/Report | | 0 | 0 | 2 | 2 | 2 |
| | **TOTAL** | | | | | | | **20** | **26** |
| | **Practical** | | | | | | | | |
| 8 | M20TE0107 | Construction Materials lab | Practical | | 0 | 0 | 2 | 2 | 3 |
| | **TOTAL** | | | | | | | **02** | **03** |
| | **TOTAL SEMESTER CREDITS** | | | | | | | **22** | |
| | **TOTAL CUMULATIVE CREDITS** | | | | | | | **22** | |
| | **TOTAL CONTACT HOURS** | | | | | | | **29** | |

REVA UNIVERSITY
Bengaluru, India

**Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru-560064**

## SCHOOL OF CIVIL ENGINEERING

## M. Tech in CONSTRUCTION TECHNOLOGY AND MANAGEMENT

## (2020-2022)

## II SEMESTER

| Sl. No | Course Code | Title of the Course | HC/SC/OE | Pre requisite | Credit Pattern & Credit Value | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | |
| 1 | M20TE0201 | Composite Materials | HC | BE / B. TECH in Civil Engineering | 2 | 1 | - | 3 | 4 |
| 2 | M20TE0202 | Construction Costing and Financial Management | HC | | 2 | 1 | - | 3 | 4 |
| 3 | M20TES211 | Bridge Engineering, | SC | | 2 | 1 | - | 3 | 4 |
| | M20TES212 | Pavement Design, Construction and Management | SC | | 2 | 1 | - | 3 | 4 |
| 4 | M20TES221 | Environmental Engineering and Management | SC | | 2 | 1 | - | 3 | 4 |
| | M20TES222 | Special Concretes | SC | | 2 | 1 | - | 3 | 4 |
| 5 | M20TES231 | Construction Planning and Control | SC | | 2 | 1 | - | 3 | 4 |
| | M20TES232 | Green Building Technology | SC | | 2 | 1 | - | 3 | 4 |
| | M20TES233 | Modern Construction Materials | SC | | 2 | 1 | - | 3 | 4 |
| 6 | M20TES241 | Applications of IoT in Civil Engineering | SC | | 2 | 1 | - | 3 | 4 |
| | M20TES242 | Disaster Reduction and Management | SC | | 2 | 1 | - | 3 | 4 |
| | M20TES243 | Shoring, Scaffolding and Formwork | SC | | 2 | 1 | - | 3 | 4 |
| 7 | M20TE0204 | Mini Project-II | Practical/report | | 0 | 0 | 2 | 2 | 2 |
| | | **TOTAL** | | | | | | **20** | **26** |
| | | **Practical** | | | | | | | |
| 8 | M20TE0203 | Construction Software Lab | Practical | | 0 | 0 | 2 | 2 | 3 |
| | | **TOTAL** | | | | | | **02** | **03** |
| | | **TOTAL SEMESTER CREDITS** | | | | | | **22** | |
| | | **TOTAL CUMULATIVE CREDITS** | | | | | | **44** | |
| | | **TOTAL CONTACT HOURS** | | | | | | **29** | |

REVA UNIVERSITY
Bengaluru, India

**Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru-560064**

## SCHOOL OF CIVIL ENGINEERING

## M. Tech in CNSTRUCTION TECHNOLOGY AND MANAGEMENT

## (2020-2022)

## II SEMESTER

| Sl. No | Course Code | Title of the Course | Practical /Term Work / Sessions | Pre requisite | Credit Pattern & Credit Value | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | |
| 1 | M20TEON01 | MOOC/SWAYAM Online Course | ON | BE / B. TECH in Civil Engineering | 3 | 1 | 0 | 4 | -- |
| 2 | M20TE0301 | Internship with Report | Practical/ Term Work and Viva - Voce | | 2 | 0 | 4 | 6 | -- |
| 3 | M20TE0302 | Project Phase-I | Practical/ Report and Viva -Voce | | 2 | 0 | 4 | 6 | -- |
| **TOTAL** | | | | | | | | **16** | |
| **TOTAL SEMESTER CREDITS** | | | | | | | | **16** | |
| **TOTAL CUMULATIVE CREDITS** | | | | | | | | **60** | |
| **TOTAL CONTACT HOURS** | | | | | | | | **--** | |

REVA UNIVERSITY
Bengaluru, India

**Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru-560064**

**SCHOOL OF CIVIL ENGINEERING**

## M. Tech in CONSTRUCTION TECHNOLOGY AND MANAGEMENT

## (2020-2022)

## IV SEMESTER

| Sl. No | Course Code | Title of the Course | Practical /Term Work / Sessions | Pre requisite | Credit Pattern & Credit Value | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | |
| 1 | M20TE0401 | Dissertation Phase-II | Practical/ Thesis Submission and Viva-Voce | | 2 | 0 | 6 | 8 | -- |
| 2 | M20TE0402 | Technical Seminar With Report | Practical/ | | 0 | 0 | 4 | 4 | -- |
| **TOTAL** | | | | | | | | **12** | **--** |
| **TOTAL SEMESTER CREDITS** | | | | | | | | **12** | |
| **TOTAL CUMULATIVE CREDITS** | | | | | | | | **72** | |
| **TOTAL CONTACT HOURS** | | | | | | | | **--** | |

| M20TE0101 | ADVANCED DESIGN OF PRESTRESSED AND PRECAST STRUCTURES | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | 0 | 3 |

Prerequisite: Design of Prestressed Concrete Structures

**COURSE OBJECTIVES:** Student will be able to learn

- To impart the knowledge about behaviour, analysis and design of end blocks of post tensioned members.
- To study the shear and Torsional resistance of prestressed members
- To analyze and design the prestressed concrete tension, compression members and composite beams for subjected to flexure and shear.
- To develop an understanding of the design of continuous beams and simple portal frames.
- To study the analysis and design of prestressed slabs and grid floors.
- To study the precast elements such as prestressed concrete poles, railway sleepers and wall panels.

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Design anchorage zones of prestressed concrete menbers.
- Calculate the shear and torsional resistance of prestressed members
- Develop skills in the analysis and design of pre-stressed tension and compression members and as well as composite beams.
- Design the prestressed statically indeterminate structures.
- Analyse and design the prestressed slabs and grid floors.
- Understand the concepts and techniques of various precast elements.

| UNIT-I | 12HOURS |
|---|---|

Anchorage zone stresses in post-tensioned members: Introduction, stress distribution in end block, investigations on Anchorage zone stresses, Magnel and Guyon's Methods, Comparative Analysis, Anchorage zone reinforcement.

Shear and torsional resistance: Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, Torsion, Design of reinforcement for torsion.

| UNIT-II | 12HOURS |
|---|---|

Tension members: Introduction, Ties, Pressure pipes – fabrication process, analysis, design and specifications. Cylindrical containers- construction techniques, analysis, design and specifications.

Compression members: Introduction, Columns, short columns, long columns, biaxially loaded columns, Design specifications.

Composite beams: Introduction, types of composite beams, analysis for stresses, differential shrinkage, serviceability limit state. Design for flexural and shear strength.

| UNIT-III | 12HOURS |
|---|---|

Statically indeterminate structures: Introduction, Advantages of continuous members, effect of pre-stressing in indeterminate structures, methods of analysis for secondary moments, concordant cable profile, Guyon's theorem, Ultimate load analysis, Design of continuous beams and portal frames.

Slab and grid floors: Types of floor slabs, Design of one way, two way and flat slabs. Distribution of pre-

stressing tendons, Analysis and design of grid floors.

| UNIT-IV | 12HOURS |
|---|---|

Precast elements: Introduction, Prestressed concrete poles manufacturing techniques, shapes and cross sectional properties, design loads, design principles. Railway sleepers-classification and Manufacturing techniques, design loads, analysis and design principles. Prestressed concrete pavements, slab and wall panels.

**REFERENCE BOOKS**


1. Design of Prestressed concrete structures - Lin T.Y. and H. Burns- John Wiley & Sons, 1982.
2. Prestressed Concrete- N. Krishna Raju - Tata McGraw Hill, 3rd edition, 1995.
3. Prestressed Concrete Structures- P. Dayaratnam - Oxford & IBH, 5th Edition, 1991.
4. Prestressed Concrete- G.S. Pandit and S.P. Gupta – CBS Publishers, 1993.
5. Prestressed concrete- N. Rajagopalan; Narosa Publishing House.2nd edition, 2005.
6. Design of Prestressed Concrete- A. Nilson; John Willey & Sons.2nd edition, 1987.

IS : 1343 : 1980.


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0101 | CO1 | 2 | 3 | | 3 | 3 | | | 2 | 3 | | | 3 | 3 | 3 | |
| | CO2 | 2 | 3 | 3 | 3 | 3 | | | 2 | 3 | | | 3 | 3 | 3 | |
| | CO3 | 3 | 3 | 2 | 3 | 3 | | | 2 | 2 | | | 3 | 3 | | |
| | CO4 | 3 | 3 | 3 | 1 | 3 | 1 | | | | | 1 | 3 | 3 | | |
| | CO5 | 3 | 3 | 3 | 1 | 3 | 1 | | | | | 1 | 3 | 3 | | |
| | CO6 | 3 | 3 | 3 | 1 | 3 | 1 | | | | | 1 | 3 | 3 | | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TE0102 | | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | BUILDING SERVICES | 2 | 1 | 0 | 3 |

Prerequisite: building construction

**COURSE OBJECTIVES:** Student will be able to learn

- Applications of services for different types of buildings
- Design considerations of the lifts, their locations and sizes
- Airconditioning and design considerations of ventilation
- General requirements of fire resisting building
- Electrical services in buildings
- Factors in Noise control in residential building

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Design the required services for different types of buildings
- Implementation and design of the lifts, their locations and sizes
- To bring about an exposure to air conditioning and ventilation
- Provisions to make fire resisting buildings
- Design of Electrical services in buildings
- To study the factors of noise control in residential building

| UNIT-I | 12HOURS |
|---|---|
| Definitions, Objective and uses of services, Applications of services for different types building considering, Classification of building services ,Types of services and selection of services, Natural and artificial lighting principles and factors, Arrangement of luminaries, Distribution of illumination, Utilization factors, Necessity of Ventilation Types –Natural and Mechanical Factors to be considered in the design of Ventilation | |
| **UNIT-II** | **12HOURS** |
| Introduction of mechanical services, Lift -Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts- Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push, Elevators & Escalators-Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators, Uses of different types of elevators Escalators. Dumbwaiters, Different types of Dumbwaiters Uses of different types of Dumbwaiter. Conveyors -Different types of Conveyors, Uses of different types of Conveyors, Air Conditioning-Definition, Purpose, Principles, Temperature Control, Air Velocity Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric preceptors, Types of Air Conditioners, (Central type, Window Type, Split Unit). | |
| **UNIT-III** | **12HOURS** |
| Introduction: Causes of fire and Effect s of fire, General Requirements of Fire Resisting building as per IS and NBC 2005,Characteristics of Fire resisting materials, Maximum Travel Distance, Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs, Requirement of good Acoustic, Various sound absolvent, Factors to be followed for noise control in residential building. | |
| **UNIT-IV** | **12HOURS** |
| electrical services in the building Technical terms and symbols for electrical installations and Accessories of wiring ,Systems of wiring like wooden casing, cleat wiring, CTS wiring conduit wiring, Types of insulation, electrical layout for residence, small work shop, show room, school building, etc<br>Rain water Harvesting for buildings, Concept of GREEN buildings, Components of GREEN building Introduction and Significance to Grey water, Components of Grey water system, Management of Grey water system. | |

**REFERENCE BOOKS**


1. Frederick S. Merritt, Jonathan T. Ricketts, Building design and construction Handbook, McGraw-Hill Inc., 5th edition, 1994
2. Fred hall and Roger Greeno, Building Services Handbook, Routledge, 7th edition, 2013
3. M.David Egan, Architectural Acoustics, J. Ross Pub., 2007
4. Gurcharan Singh, Jagdish Singh, Water Supply & Sanitary Engineering, Standard Publishers Distributors, 2007
5. Shri V.K. Jain, Fire Safety in Buildings, New age publishers, 2010
6. BIS, National Building Code 2005, New Delhi, 2005
7. Shan Wang, Handbook of Air Conditioning and Refrigeration, 2n d Edition, McGraw Hill, 2000


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0102 | CO1 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO2 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO3 | | 3 | 3 | | | | 1 | | 3 | | 2 | 3 | 2 | 3 | 3 |
| | CO4 | | 3 | 3 | 2 | 2 | | | | 3 | 2 | 1 | 3 | | | |
| | CO5 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO6 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | 3 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TE0103 | CONCRETE CONSTRUCTION TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | 0 | 3 |

Prerequisite: Concrete Technology

**COURSE OBJECTIVES:** Student will be able to learn

- To get a knowledge of chemical admixtures and mix design procedure
- To Understand the strength and durability properties
- To understand the concreting operations and equipment used
- To know different special concrete operations to be carried out
- To design and fabrication of form work for R.C.C elements.
- To understand the prestressed concrete construction principles and statistical quality control

**COURSE OUTCOME:** After successful completion of this course the student will be able :

- To decide the dosage of chemical admixtures to be used and mix design procedure
- To assess the strength and durability properties
- To implement the concreting operations and equipment to be used
- To decide different special concrete operations to be carried out for specific requirements
- To Design and the fabricate the form work for R.C.C elements.
- To implement and decide the prestressed concrete construction principles and statistical quality control

| UNIT-I | 12HOURS |
|---|---|

Introduction of Concrete materials, Admixtures, Fly Ash, Polymers, Early Age Properties,
Strength, Permeability & Durability. Principles of Concrete mix design, Concrete Mix Design procedure by: IS/ACI/British Standards.

| UNIT-II | 12HOURS |
|---|---|

Concreting Operations-Practices and Equipment, batching; Mixing; Transporting; Placing and
Compacting; curing. Properties and technique of construction for concrete, Fiber reinforced concrete, light weight concrete, Heavy weight concrete, Foam concrete, High performance Concrete.

| UNIT-III | 12HOURS |
|---|---|

Special concrete operations shot Crete, grouting, Grunting, under water concreting, hot and cold
Weather concrete, pumpabale concrete. Construction techniques for reinforced concrete elements-materials, Principles and procedures for beams, slabs, columns, Foundations, walls and tanks, design and fabrication of form workfor R.C.C elements.

| UNIT-IV | 12HOURS |
|---|---|

Prestressed concrete construction-Principle, methods, materials, Tools and equipment for the construction of a prestressed bridge. Inspection and Quality Control of Concrete Construction-Stages, Principles, Checklist, Statistical Controls, procedures.

**REFERENCE BOOKS**


1. Concrete Technology by M.L. Gambhir
2. Concrete Technology, by Neville and Brooks
3. Properties of Concrete by Neville.
4. Concrete Microstructure, Properties and Materials
P.K. Mehta and PJM Monteiro
5. Concrete Technology – M.S. Shetty.

## Mapping of Course Outcomes with programme Outcomes

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE 0103 | CO1 | | 3 | 3 | 2 | 1 | | | | | | 2 | 3 | | | 2 |
| | CO2 | | 3 | 3 | 2 | 1 | | | | | | 2 | 3 | | | 2 |
| | CO3 | | 3 | 3 | | | | | | 2 | | | 3 | | | 2 |
| | CO4 | 3 | 3 | 3 | | | | | | 3 | | | 3 | | | 1 |
| | CO5 | 3 | 3 | 3 | | | | | | 3 | | | 3 | | | 1 |
| | CO6 | 3 | 3 | 3 | | | | | | 3 | | | 3 | | | 2 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TE0104 | | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | CONSTRUCTION METHODS AND EQUIPMENT | 2 | 1 | 0 | 3 |

Prerequisite: Building Construction

**COURSE OBJECTIVES:** Student will be able to learn

- To study different methods of excavations and equipment used for excavation.
- To familiarize the elements of equipment cost and appraise the investment strategies.
- To get a knowledge of scaffolding and formwork used for high-rise structures.
- To know the construction and erection techniques for bridges.
- To know the paving methods and equipment used.
- To study the working of the tunnelling and port equipment and apply scientific principles for efficiently utilizing them

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- To implement methods of excavations and equipment's for the excavations
- To Implement scaffolding and formwork used for high-rise structures
- To decide the provision of scaffolding and formwork to be used for high rise structures
- To implement construction and erection techniques for bridges
- To implement the highway equipment's for highway construction.
- To decide for implementing the different paving methods and equipments

| UNIT-I | 12HOURS |
|---|---|
| Earth Work: Methods: Trenching – Excavations - Braced Excavations – Shafts – Embankments – Dewatering Methods – compaction methods – Stabilising vertical cuts and slopes. Equipments: Compacting equipments, Scrapers, Dozers, Hydraulic Excavators, Trenching Machines, Graders, Trimmers, Trucks and hauling equipments - Draglines and Cam Shells. | |
| **UNIT-II** | **12HOURS** |
| High Rise Structures: Methods and Equipments for foundations (Raft and pile foundations), well foundations, Shoring, Scaffolding, Formwork, Cranes and hoisting equipment. Slip form technique for tall chimneys and shafts. | |
| **UNIT-III** | **12HOURS** |
| Construction and Erection Techniques: Concrete Bridges - In-situ and precast construction methods, Balanced | |

cantilever Methods, Span by Span Method, Incremental launching, Steel Bridges, Cable Stayed Bridges and Suspension Bridge.

| UNIT-IV | 12HOURS |
|---|---|

Highway Construction: Asphalt Plants, Paving Equipments, Tunnels-stages, methods and lining, Grouting Methods. Ports: Types, Breakwaters – berthing structures, mooring accessories – dredgers and dredging methods.

**REFERENCE BOOKS**


1. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co., 1982.
2. Peurifoy, R.L., Ledbette. W.B., Construction Planning, Equipment and Methods, McGraw Hill Co., 2000.
3. Ratay, R.T., Hand Book of Temporary Structures in Construction, McGraw Hill, 1984.
4. Koerner, R.M.,Construction & Geotechnical Methods in Foundation Engineering, McGraw Hill,1984.
5. Varma,M., Construction Equipment and its Planning & Applications, Metropolitan Book Co., 1979.
6. Smith, R.C, Andres, C.K., Principles and Practice of Heavy Construction, Prentice Hall, 1986.


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE 0104 | CO1 | 3 | 3 | | | | | | | | | | 3 | | | 2 |
| | CO2 | 3 | 3 | | | | | | | | | | 3 | | | 2 |
| | CO3 | 3 | | 3 | | | | | | 2 | | | 3 | | | 2 |
| | CO4 | 3 | | | | | | | | 3 | | | 3 | | | 1 |
| | CO5 | 3 | | | | | | | | 3 | | | 3 | | | 1 |
| | CO6 | 3 | | 3 | | | | | | 3 | | | 3 | | | 2 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO**

| M20TE0105 | CONSTRUCTION PROJECT AND MANAGEMENT WITH MSP | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | 0 | 3 |

Prerequisite: Building Planning and Construction

**COURSE OBJECTIVES:** Student will be able to learn

- Understand the various management techniques for successful completion of construction projects.
- Understand to prepare the project feasibility report economic analysis
- Understand the Importance of Various planning techniques such as CPM and PERT
- Understand the effect of management for project organization with the application MSP
- Time cost management, scheduling and monitoring
- How to perform Resource Planning-Levelling and Allocation

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Apply the management techniques for the successful completion of the project
- Prepare the project feasibility report and analyses the economics of the project
- Prepare various project plans using planning techniques such as Wok break down structure (WBS), Bar charts.
- Implement project organization charts such as bar chart, CPM and PERT
- To provide time cost management, scheduling and implementation
- Perform Resource Planning-Levelling and Allocation

| UNIT-I | 12HOURS |
|---|---|

Introduction: Construction Projects- Concept, Project Categories, Characteristic of projects, project life cycle phase. Project Management- Project Management Function, Role of Project Manager. Organizing For Construction - Principles of organization, type of organization structure.

| UNIT-II | 12HOURS |
|---|---|

Project Feasibility Reports: Introduction, Significance in feasibility report- Technical analysis, financial analysis, Economic analysis, Ecological analysis, Flow diagram for feasibility study of a project. Project planning Scope: Planning Process, Objectives, Types of Project plans, Resource Planning Process.

| UNIT-III | 12HOURS |
|---|---|

Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT A-O-N Network-Logic and Precedence diagrams, advantages, Drawing A-O-N network from A-O-A network and related problems.

| UNIT-IV | 12HOURS |
|---|---|

Time Cost relationship: Direct and indirect cost, step in optimization of cost, related problem. Allocation of resources: Histogram, Resource smoothening, Resource leveling and related problem. Project updating using CPM network and related numerical problems.

Scheduling, Monitoring and Updating. Line of Balance Scheduling. Resource Planning-Leveling and Allocation.

**REFERENCE BOOKS**


1. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. Choudhury. S, "Project Management", McGraw-Hill Publishing Company, New Delhi, 1988.
3. Chris Hendrickson and Tung Au, "Project Management for Construction Fundamental Concepts for Owners, Engineers, Architects and Builders"Prentice Hall, Pittsburgh, 2000.
4. Srinath L.S, "PERT and CPM", East West Press Pvt Ltd New Delhi.

Frank Harris and Roland McCaffer, "Modern Construction Management"- 4thEd Blackwell Sci


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0106 | CO1 | | 3 | | | | | | | | 2 | 1 | 3 | | | 2 |
| | CO2 | | | | | | | | | | | | | | | |
| | CO3 | 3 | | 3 | 2 | | | | 2 | 3 | | 3 | 3 | 3 | | 3 |
| | CO4 | 3 | | | 3 | 2 | 1 | | | 2 | 1 | | 3 | 1 | 2 | 3 |
| | CO5 | | | | | | | | | | | | | | | |
| | CO6 | 3 | | 3 | | | | | | | | | 3 | 2 | 3 | 3 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TE0106 | | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16 weeks | FOUNDATION DESIGN AND CONSTRUCTION | 2 | 1 | 0 | 3 |

Prerequisite: RCC Design of Structures

**COURSE OBJECTIVES:** Student will be able to learn

- To learn method of estimating bearing capacity and design of shallow foundations
- To learn to design different types of footing
- To learn design of raft and pile foundations
- To learn caisson types and stability of caissons
- To learn types of machines and foundations
- To learn the mechanism of liquefaction and design of block foundation

**COURSE OUTCOME:**

After successful completion of this course the student will be able to:

- Estimate bearing capacity and design of shallow foundations
- Design different types of footing
- Design of raft and pile foundations
- Stabilize the caisson foundations with different types
- Design the machine foundations
- Implement the mechanism of liquefaction for designs

| UNIT-I | 12HOURS |
|---|---|

**Shallow Foundation -**Functions and requisites of a foundation - Different types – Bearing capacity determination – Field Tests – Settlement determination – Proportioning of shallow foundation – Design guidelines - Codal recommendations - Construction aspects.

| UNIT-II | 12HOURS |
|---|---|

**Raft Foundation -**Codal Recommendations – Construction aspects – Ground modification for shallow foundations.
**Pile Foundation -**Function – classification of piles – Factors governing choice of pile foundation – Load transfer principles - load evaluation of piles and pile groups – Static method – Dynamic method –pile load test – Under reamed piles - Pile raft system – Laterally loaded piles - Codal Recommendations – Construction aspects.

| UNIT-III | 12HOURS |
|---|---|

**Caisson Foundation**

Caissons types – Stability of caissons – Loads - principles of analysis and design - IS Guidelines- Construction aspects.

| UNIT-IV | 12HOURS |
|---|---|

**Machine Foundation**

Types of Machines and Foundations – General requirements –Principles of measuring dynamic properties – Field tests – Factors affecting dynamic properties- Mechanism of Liquefaction–Influencing factors-Evaluation of Liquefaction potential –Design of Block Foundation – Codal Recommendations – Construction aspects - Vibration Isolation.

**REFERENCE BOOKS**


1. Bowles, J.E., Foundation Analysis and Design, Fifth Edition, McGraw Hill, New York, 1995.
2. Das, B.M., Principles of Foundation Engineering, Design and Construction, Fourth Edition, PWS Publishing, 1999.
3. Vaidyanathan, C.V., and Srinivasalu, P., Handbook of Machine Foundations, McGraw Hill, 1995.
4. Koerner, R.M., Construction & Geotechnical methods in foundation engineering, MGH, New York,1985
5. Hausmann.M.R. Engineering principles of Ground Modification, mcGraw-Hil
6. Peurifoy, R.L., Ledbette. W.B Construction Planning , Equipment and Methods McGraw Hill Co, 2000


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO 1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE 0106 | CO1 | 3 | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | 2 |
| | CO2 | 3 | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | 2 |
| | CO3 | 3 | 3 | 3 | | 3 | | | | 2 | | | 3 | 2 | 1 | 1 |
| | CO4 | 3 | 3 | 3 | 2 | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO5 | 3 | 3 | 3 | | | | | | | | | 3 | 1 | 2 | |
| | CO6 | 3 | 3 | 3 | | | | | | | | | 3 | 1 | 2 | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TE0107 | CONSTRUCTION MATERIALS LAB | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 0 | 0 | 2 | 2 |

Prerequisite: Concrete Technology, Chemical admixtures

**COURSE OBJECTIVES:** Student will be able to learn

- To gain experience regarding the determination of properties of different building materials
- To provide an opportunity to learn how to measure the parameters, which governs the quality of the materials
- To Perform Nondestructive Testing using Rebound hammer and Ultrasonic apparatus.
- To study the effect of Mineral and Chemical admixtures of strength properties of hardened concrete.
- To impart knowledge of mix design of concrete
- To gain experimental knowledge of using bitumen for the pavements

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implement good quality construction techniques.
- Identify the quality of the materials used for construction.
- Apply the knowledge of Nondestructive Testing apparatus using Rebound hammer and Ultrasonic.
- Identify the proportion of the mix design.
- Implement the usage of Mineral and Chemical admixtures to improve the properties of fresh and hardened concrete.
- Identify the usage of bitumen in the construction of pavements.

**LIST OF EXPERIMENTS:**

1. Mix Design of Concrete
2. Tests on fresh concrete
3. Tests on hardened concrete
4. In-situ Strength determination by Rebound Hammer.
5. Measurement of Moisture content in aggregates, soil and hardened concrete surface using NDT techniques.
6. Pull-Out Tests on concrete
7. Effect of Chemical admixtures on fresh and harden properties of concrete
8. Effect of mineral admixtures on fresh and harden properties of concrete
9. Tests on Bitumen materials
10. Tests on Course aggregates for road construction

**REFERENCE BOOKS:**

1) Mehta P.K and Monteiro. P. J. M. " CONCRETE", Microstructure, Properties and Materials, Third Edition, Tata McGraw- Hill Publishing company Limited, New Delhi, 2006

2) Shetty .M.S., " Concrete Technology, Theory and Practice", Revised Edition, S. Chand & company Ltd., New Delhi,2006

3) Neville. A.M. , " Properties of Concrete", 4th Edition Longman,1995

4) Mindass and Young, " Concrete", Prentice Hall.1998

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0108 | CO1 | | 3 | 2 | 3 | | 2 | 2 | 1 | 1 | | | 3 | 2 | 3 | 1 |
| | CO2 | | 3 | 2 | 3 | | 2 | 2 | 1 | 1 | | | 3 | 2 | 3 | 1 |
| | CO3 | 3 | 2 | 3 | 3 | 2 | 1 | | 3 | 2 | | 2 | 3 | 1 | 3 | 2 |
| | CO4 | 3 | 3 | 3 | 3 | 2 | 1 | | | 3 | | | 3 | 2 | 3 | 2 |
| | CO5 | 3 | 3 | 3 | 3 | 2 | 1 | | | 3 | | | 3 | 2 | 3 | 2 |
| | CO6 | 3 | 2 | 3 | 3 | 3 | | 2 | 3 | | | | 3 | 2 | 3 | 3 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **M20TE0108** | **Mini Project-I** | **Practical/Report** | | **0** | **0** | **2** | **2** | **2** |

The student is required to carry out a mini project individually on experimental investigation on Special concretes specimens and gain the knowledge on material characteristics

# SECOND SEMESTER

| **M20TE0201** | | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **Duration: 16weeks** | **COMPOSITE MATERIALS** | 2 | 1 | - | 3 |

Prerequisite: Building Materials

**COURSE OBJECTIVES:** Student will be able to learn

- To obtain the knowledge on composite materials and its action.
- To implement the concept of composite materials.
- To understand the behaviour of load bearing mechanism and designs.
- To understand by Analogy on Flexible, rigid connections and seismic behaviour of composite structures.
- To understand the behaviour of box girder bridges.
- To apply the design concepts.

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Knowledge on composite materials and its action.
- Implement the concept of composite materials.
- Understand the behaviour of load bearing mechanism and designs.
- Analogy on Flexible, rigid connections and seismic behaviour of composite structures.
- Understand the behaviour of box girder bridges.
- Apply design concepts.

| **UNIT-I** | **12HOURS** |
|---|---|

Introduction to steel - concrete composite construction - theory of composite structures –Comparison of composite and non-composite beam action- Introduction to steel - concrete - steel sandwich construction. Materials in composite construction- profiled steel decking-fabricated sections.

| **UNIT-II** | **12HOURS** |
|---|---|

Shear Connectors: types-behaviour-load bearing mechanism-failure mechanism-standard test. Design and strength of shear connectors. Design of Composite members – simply supported slabs – simple and continuous beams. Composite columns: Types-Design of concrete encased columns, concrete filled

tubular columns. Design of Composite trusses.

| UNIT-III | 12HOURS |
|---|---|

Connections in Composite construction- flexible and rigid connections- moment resisting connections. Seismic behaviour of composite structures.

| UNIT-IV | 12HOURS |
|---|---|

Composite Box Girder Bridges: Introduction - behaviour of box girder bridges - design concepts. Case studies: Case studies on steel-concrete composite construction in buildings and bridges.

**REFERENCE BOOKS**


1. Johnson R.P, Composite structures of steel and concrete, Blackwell Scientific Publications (Second Edition), UK, 1994.
2. Owens, G.W. and Knowles.P, Steel Designers manual (Fifth edition), Steel Concrete Institute (UK), Oxford Blackwell Scientific Publications, 1992.
3. Nethercot, D.A. Composite Construction, Spon Press, London, 2003.
4. Oehlers.O.J, Bradford, M.A. Elementary Behavior of Composite Steel and Concrete structural members, Butterworth-Heinemann, London, 1999.


**Mapping of Course Outcomes with programme Outcome**

| Course Code | POS /COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0201 | CO1 | 3 | 3 | 3 | 2 | 1 | | | | 1 | | | 3 | | | 2 |
| | CO2 | 3 | 3 | 3 | 2 | 1 | | | | 1 | | | 3 | | | 2 |
| | CO3 | 3 | 3 | 3 | | 2 | | | | 2 | | 2 | 3 | 2 | 1 | 2 |
| | CO4 | 3 | 3 | 3 | 2 | 3 | | | | 3 | 3 | 1 | 3 | | | 2 |
| | CO5 | 3 | 3 | 3 | 2 | 3 | | | | 3 | 3 | 1 | 3 | | | 2 |
| | CO6 | 3 | 3 | 3 | | 2 | | | | 3 | | 2 | 3 | | 2 | 2 |

| M20TE0202 | | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | **CONSTRUCTION COSTING AND FINANCIAL MANAGEMENT** | 2 | 1 | - | 3 |

Prerequisite: Estimation and Costing, Engineering Economics

**COURSE OBJECTIVES:** Student will be able to learn

- Scope for financial management and supply-demand mechanism
- Production and cost theory analysis and pricing
- To prepare fund flow statement and analyse budgetary control
- Time value for money and discounted cash flow
- Accounting information and application in construction industry
- The Legal aspects of financial management in construction industry.

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implement financial management and supply-demand mechanism
- Implement the knowledge of budgetary control
- Application of Production and cost theory analysis and pricing
- Value for time management and getting discounts
- Implementation in the construction industry

| UNIT-I | 12HOURS |
|---|---|

Financial Management; Meaning and Scope, Economics and Scope, Supply and Demand Mechanism, analysis and forecasting. Balance sheet, profit & loss account, fund flow statement

| UNIT-II | 12HOURS |
|---|---|

Production and Cost theory, analysis. Pricing; objectives, determinants, absorption, marginal costing. Financial analysis, Decisions. Capital Budgeting, budgetary control,standard costing and variance, investment appraisal Practical problems and case studies

| UNIT-III | 12HOURS |
|---|---|

Engineering economics, Time value of money, discounted cash flow, NPV, ROR, Bases of comparison, Incremental analysis, Benefit-Cost analysis, Replacement analysis, Breakeven analysis, Capital budgeting, Taxation and Inflation, Working capital management, Construction
accounting, Income statement, Financial statements.

| UNIT-IV | 12HOURS |
|---|---|

Construction Finance: Accounting information and application, Financial versus economic evaluation, financial statements and project appraisal. Project yield, taxation and inflation, risk and uncertainty, Turnkey activities; finance and working capital, depreciation and amortization; cost control, performance budgeting, equipment rentals.Bidding and awards, work pricing, cost elements of contracts, letters of credit, financing plans, multiple sources of finance. Qualifying, bidding, bidders, comparing the bids, under- writing. unforeseen revisions, costs and rates escalation, cost progress reporting. Legal aspects

**REFERENCE BOOKS**


1. Blank, L. T. and Tarquin,A. J.,"Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.

2. Bose, D. C.,"Fundamentals of Financial management", 2nd ed.,PHI, New Delhi, 2010.

3. Boyer, C.B. and Merzbach, U. C.,"A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.

4. Gould, F.E.,"Managing the Construction Process", 2nd ed.,Prentice Hall, Upper Saddle River, New Jersey, 2002.

5. Gransberg, D. G.,Popescu, C. M. and Ryan, R. C.,"Construction Equipment Management for Engineers,Estimators, and Owners, CRC/Taylor & Francis,Boca Raton, 2006.

6. Harris, F. , McCaffer, R. and Edum-Fotwe, F.,"Modern Construction Management", 6th ed.,Blackwell Publishing, 2006.

7. Jha,K. N.,"Construction Project Management, Theory and Practice",Pearson, New Delhi, 2011.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0202 | CO1 | 3 | 3 | 3 | | 1 | 2 | 3 | 2 | | | 2 | | 3 | | |
| | CO2 | 3 | 3 | 3 | | 1 | 2 | 3 | 2 | | | 2 | | 3 | | |
| | CO3 | 3 | 3 | 3 | | 2 | 3 | | | | | 1 | 2 | 3 | 1 | |
| | CO4 | 3 | 3 | 3 | 2 | | 3 | | 1 | | | | | 3 | 2 | |
| | CO5 | 3 | 3 | 3 | | 3 | | 1 | | | | 3 | | | 2 | |
| | CO6 | 3 | 3 | 3 | | 3 | | 1 | | | | 3 | | | 2 | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES211 | | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | **BRIDGE ENGINEERING** | 2 | 1 | - | 3 |

Prerequisite: Design of RCC and PSC structures

**COURSE OBJECTIVES:** Student will be able to learn

- Construction of substructures such as pile foundations
- Pile concreting under various soil conditions and Testing of Piles
- Caisson construction and sinking methods
- Construction of superstructure in reinforced , Composite and Pre-stressed concrete
- Construction techniques of different superstructures and segmental construction
- Cable Profiling in Superstructures of bridges in deck section

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Conceptualise the Construction of substructures such as pile foundations
- Conceptualise Testing of Piles and concreting under various soil conditions
- Knowledge of Caisson construction and sinking methods
- Knowledge of Practice Techniques of methods of construction of superstructure in reinforced, Composite and Pre-stressed concrete construction
- Conceptualise the Construction of box girder deck slab and segmental construction Knowledge of Cable Profile in deck section.
- Conceptualise the Construction of box girder deck slab and segmental construction

| **UNIT-I** | **12HOURS** |
|---|---|
| Construction of Substructure for Bridges: Pile foundations – site investigation – depth of exploration – in-situ testing-soil exploration techniques. Piling methods – pile types – pile driving methods – non-displacement piles – micro piles – durability problems in pile construction – integrity testing – pile testing. Spacing of Piles - size of concrete piles - tolerance in pile alignment - pile cap. Pile concreting under various soil conditions. | |
| **UNIT-II** | **12HOURS** |
| Caissons or well foundations: Caisson construction and sinking methods - construction of well curb (shoe) - towing a floating caisson to sinking site - bed preparation - supporting structures - lowering caissons - sinking open Well caissons - excavation method - de-watering for freeing a 'hanging' caisson. Sand Blow -jetting and lubrication - rectifying tilt in wells - skin friction in caissons - construction details of pneumatic sinking of caissons - construction methods of steining and bottom plugging | |
| **UNIT-III** | **12HOURS** |
| Construction of superstructure - reinforced concrete superstructure- prestressed concrete superstructure - composite | |

and steel superstructure - special superstructures. Geometrical alignment - lighting - Drainage - traffic lane width, road width, footpaths, and clearance for vehicles / boats - road kerb, crash barrier, parapet and handrail - expansion and roadway joints -super-elevation.

| UNIT-IV | 12HOURS |
|---|---|

Slab, T-beam and Box girder deck slab construction: Slab type, T-beam and box-girder bridges Decks Construction methods. Span lengths -deck and stiffening system.Segmental Construction, Cantilever Construction and Successive Launching- Precast segmental construction for long-span bridges- cables and their profiling - deck section - soffit surface -deflection and pre-camber - expansion joint - bearings - aesthetics

**REFERENCE BOOKS**


1. Chew Yit Lin, Michael, Construction Technology for Tall Buildings (2nd Ed.), Singapore University Press, World Scientific, Hong Kong, 2001.
2. Victor.D.J, Essentials of Bridge Engineering, Oxford IBH, 2001
3. Ponnuswamy.S, Bridge Engineering, Tata McGraw Hill, 1989.
4. Raina V.K. Concrete Bridge practice, Tata McGraw Hill Publishing Co., 1991
5. Derrick Beckett, An Introduction to Structural Design of Concrete Bridges, Surry University Press, Oxford Shire, 1973.
6. Fleming. W. G. K., et al., Piling Engineering, Surrey University Press, London, 1985.


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES211 | CO1 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO2 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO3 | | 3 | 3 | | | | 1 | | 3 | | 2 | 3 | 2 | 3 | 3 |
| | CO4 | | 3 | 3 | 2 | 2 | | | | 3 | 2 | 1 | 3 | | | |
| | CO5 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO6 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES212 | PAVEMENT DESIGN ,CONSTRUCTION AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Transportation Engineering

**COURSE OBJECTIVES:** Student will be able to learn

- To develop a fundamental understanding of the Pavement Materials used for road construction
- To know the different types of pavements and their functions
- To learn about the various construction procedures of both Flexible and Rigid pavements.
- To understand the design of flexible pavements as per Indian Roads Congress standards and AASHTO standards
- To understand the design of rigid pavements as per Indian Roads Congress standards and AASHTO standards
- To understand the embankment constructions

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implement the different types of pavements and their functions as per requirements.
- To design of flexible pavements as per Indian Roads Congress standards and AASHTO standards.
- Understand the material characteristics and selection criteria for the use in pavement design.

- To design of rigid pavements as per Indian Roads Congress standards and AASHTO standards.
- Explain the techniques and principles followed in concrete road construction.
- To implement the construction steps for embankment constructions.

| UNIT-I | 12HOURS |
|---|---|
| Factors Affecting Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Legal Axle and Gross Weights. Tire Pressure, Contact Pressure, EAL and ESWL Concept, Lane Distributions and Vehicle Damage Factors, Subgrade support - CBR and plate bearing tests, CSA. Numerical examples | |
| **UNIT-II** | **12HOURS** |
| **Design of Flexible Pavements:** Design methods and principle, design steps, advantages and applications of different pavement design methods. IRC: 37-2001, AASHTO and Asphalt Institute methods.Specifications and guidelines. Numerical examples. | |
| **UNIT-III** | **12HOURS** |
| **Design of Rigid Pavements:**IRC: 58-2011 Method of design by stress ratio method. Design of continuously reinforced concrete pavements and airfield pavements. Design of joints. Specifications and guidelines.Design features of CRCP, SFRC and ICBP- Numerical examples. | |
| **UNIT-IV** | **12HOURS** |
| **Embankment Construction:** Specifications and steps for the construction of road in embankment and cut, construction steps for sub grade and preparation of sub grade. | |

**MANAGEMENT**

**REFERENCE BOOKS**


1. Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., `Highway Engineering', NemChandandBros, Roorkee.
2. Yoder, E.J., and Witzack, 'Principles of Pavement Design', 2nd Edition, John Wiley and Sons
3. Yang H.Huang, 'Pavement Analysis and Design', Prentice Hall Inc.
4. Yang, "Design of functional pavements"- McGraw Hill Book Co.
5. IS- 1888 (1978): Plate Load Test
6. IS – 6403 (1981): Bearing capacity of shallow Foundation


## Mapping of Course Outcomes with programme Outcomes

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES212 | CO1 | 3 | 3 | 3 | | 1 | | | | | | | 3 | | | 3 |
| | CO2 | 3 | 3 | 3 | | 1 | | | | | | | 3 | | | 3 |
| | CO3 | 3 | 3 | 3 | 3 | 3 | | | | 3 | | | 3 | 3 | 3 | |
| | CO4 | 3 | 3 | 2 | 3 | 3 | | | | 3 | | | 3 | 3 | 3 | |
| | CO5 | 3 | 3 | 3 | 2 | | 2 | | | | | | 3 | 3 | | |
| | CO6 | 3 | 3 | 3 | 2 | | 2 | | | | | | 3 | 3 | | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES221 | ENVIRONMENTAL ENGINEERING AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Environmental Engineering

**COURSE OBJECTIVES:** Student will be able to learn

- Concepts of environmental impact assessment
- Unique pollution problems and public participation
- The EIA Regulations in India
- Measurement of environmental impact and organisation
- Environmental management, principles and strategies
- The Concepts of Environmental audit

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implement the assessment techniques for environmental impact
- Measure the pollution level and suggest solution to the problems and public participation
- Implement the EIA Regulations
- Organise systematically to implement the methodologies for assessment
- Apply the principles and strategies for environmental management
- Implement the Concepts of Environmental audit

| UNIT-I | 12HOURS |
|---|---|

Environmental impact assessment (EIA):Introduction, definitions and concepts, rationale and historical development of EIA, EIA for civil engineers.
Broad components of EIA: Initial environmental examination, environmental impact statement, environmental appraisal, environmental impact factors and areas of consideration.

| UNIT-II | 12HOUR |
|---|---|

Broad components of EIA**:**Pertinent institutional information, unique pollution problems, existing visual quality, public participation techniques.Composite consideration, potential cultural resources, potential visual impacts, geographical study area.
Status of EIA in India: EIA Regulations in India, TOR for Hydropower Projects and other projects. Case studies from hydropower projects, hazardous industries and mining.

| UNIT-III | 12HOURS |
|---|---|

Methodologies: Measurement of environmental impact, organization, scope and methodologies of EIA pertinent environmental factors. Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system. Public involvement techniques, comprehensive environmental impact study, various project types, archaeological properties, leachate testing, evaluation species, proposing agency, EIA Models.

| UNIT-IV | 12HOURS |
|---|---|

Environmental management: Principles, problems and strategies; Review of political, ecological and remedial actions. Future strategies; multidisciplinary environmental strategies, the human, planning, decision-making and management dimensions.
Environmental audit: Definitions and concepts, partial audit, compliance audit, methodologies and regulations.

**REFERENCE BOOKS**

TEXTBOOKS:

1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

**REFERENCES:**

1. John G. Rau and David C Hooten "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.
2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES221 | CO1 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO2 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO3 | | 3 | 3 | | | | 1 | | 3 | | 2 | 3 | 2 | 3 | 3 |
| | CO4 | | 3 | 3 | 2 | 2 | | | | 3 | 2 | 1 | 3 | | | |
| | CO5 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |
| | CO6 | | 3 | 3 | | | | | | 3 | | 2 | 3 | 2 | 3 | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES222 | SPECIAL CONCRETES | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Concrete Technology

**COURSE OBJECTIVES: Student will be able**

- To learn the various types of alternative cement materials and admixtures
- To understand the knowledge of light weight concrete and its mix design.
- To know about High Density concrete and Ferro-cement
- To gain knowledge about fibre reinforced concrete and its properties
- To learn about High performance concrete, properties and applications
- To familiarise about other special types of concretes

**COURSE OUTCOME:**

**After successful completion of this course the student will be able:**

- To identify the constituents of cement, other cementitious materials and admixtures
- To enumerate the concept of light weight concrete and demonstrate its mix design
- To explain about High Density concrete and Ferro-cement
- To describe about fibre reinforced concrete and its properties
- To explain High performance concrete, properties and applications
- To categorise special types of concretes

| UNIT-I | 12HOURS |
|---|---|

Components of modern concrete and developments in the process and constituent materials: Role ofconstituents, Development in cements and cement replacement materials, pozzolona, fly ash, silica fume, rice husk ash,

recycled aggregates, chemical admixtures. Mix proportioning of Concrete: Principles and methods.Light Weight concrete: Introduction, classification, properties, strength and durability, mix proportioning and problems.

| UNIT-II | 12HOURS |
|---|---|

High density concrete: Radiation shielding ability of concrete, materials for high density concrete, mixproportioning, properties in fresh and hardened state, placement methods. Ferro cement: Ferrocement materials, mechanical properties, cracking of ferrocement, strength and behaviour in tension, compression and flexure, Design of ferrocement in tension, ferrocement constructions, durability, and applications.

| UNIT-III | 12HOURS |
|---|---|

Fibre reinforced concrete: Fibre materials, mix proportioning, distribution and orientation, interfacial bond,properties in fresh state.Strength and behaviour in tension, compression and flexure of steel fibre reinforced concrete, mechanical properties, crack arrest and toughening mechanism, applications.

| UNIT-IV | 12HOURS |
|---|---|

High Performance concrete: constituents, mix proportioning, properties in fresh and hardened states,applications and limitations. Ready Mixed Concrete, Self Compacting Concrete, Self Curing Concrete, Reactive powder concrete, Bacterial Concrete.

**REFERENCE BOOKS**


1.Neville A.M, "Properties of Concrete" Pearson Education Asis, 2000

2.P. Kumar Mehta, Paul J.N.Monterio, CONCRETE, "Microstructure, Properties and Materials"-Tata McGraw Hill

3.A.R.Santhakumar, (2007) "Concrete Technology"-Oxford University Press, New Delhi, 2007.

4.Short A and Kinniburgh.W, "Light Weight Concrete"- Asia Publishing House, 1963

5.Aitcin P.C. "High performance concrete"-E and FN, Spon London 1998

6.Rixom.R. and Mailvaganam.N., "Chemical admixtures in concrete"- E and FN, Spon London 1999


## Mapping of Course Outcomes with programme Outcomes

| Course Code | POS /COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES222 | CO1 | | 3 | 3 | | | | | | 2 | | 2 | 2 | | 2 | |
| | CO2 | | 3 | 3 | | | | | | 2 | | 2 | 2 | | 2 | |
| | CO3 | | 3 | 3 | 3 | 1 | | 2 | | 2 | 1 | 2 | 3 | 2 | 3 | 1 |
| | CO4 | 3 | 3 | 3 | 3 | 1 | | 2 | | 2 | 1 | 2 | 3 | 2 | 3 | 1 |
| | CO5 | 3 | 3 | 3 | 3 | 1 | | 2 | | 2 | 1 | 2 | 3 | 2 | | |
| | CO6 | 3 | 3 | 3 | 3 | 1 | | 2 | | 2 | 1 | 2 | 3 | 2 | | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES231 | CONSTRUCTION PLANNING AND CONTROL | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Building Planning and Construction, Concrete Technology

**COURSE OBJECTIVES:** Student will be able to learn

- How to plan for Resource Planning
- Utilization of actual resources required and tools of measurement of resources
- Time of purchase and quantity of materials and distribution
- Time and planning management
- Quality of materials to be maintained
- How to prepare Documentation and Reporting

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implement Resource Planning and Procurement.
- Identify actual resources required and tools of measurement of resources
- Confident in implementing the quantity of materials and distribution
- Implement time and planning management
- Strictly adhere to the quality of materials to be maintained
- To Prepare Sample Report for Quality Control.

| UNIT-I | 12HOURS |
|---|---|

Resource Planning: Resource Planning, Procurement, identification, Personnel, Planning for material, Labour, time schedule and cost control. Types of resources, manpower, Equipment, Material, Money, Time. Resources: Systems approach in resource management, characteristics of resources, Resources, Utilization, measurement of actual resources required. Tools for measurement of resources, Labour, classes of Labour, Cost of Labour, Labour Schedule, optimum use of labour.

| UNIT-II | 12HOURS |
|---|---|

Materials: Time of purchase, Quantity of material, sources, Transportation, Delivery and Distribution. Equipment: Planning and selecting by optimistic choice with respect to cost, Time, Source and handling.

| UNIT-III | 12HOURS |
|---|---|

**T**ime: Personnel time, Management and planning, Managing time on the project, forecasting the future, Critical path measuring the changes and their effects. Cost control: Cash flow and cost control, objectives of cost, Time and Quality.

| UNIT-IV | 12HOURS |
|---|---|

Quality control:Construction Quality Control Inspection Program Content and Proposed Outline for QCIP, Field Tests and Frequency of Testing, Field Laboratory or Commercial Testing Facilities, Inspection Plan Including Documentation and Reporting, Sample Report Forms Nonconformance Report Environmental Deficiency Report, Sample Civil Inspection Checklists.

**REFERENCE BOOKS**

1. Andrew, D, Szilagg, Hand Book of Engineering Management, 1982.

2. Glenn, A. Sea's and Reichard, H Clough, Construction Project Management, John Willey and Sons, Inc. 1979.

3. Harvey, A. Levine, Project Management using Micro Computers, Obsome-McGraw Hill C.A. Publishing Co., Inc. 1988,
4. James, A., Adrain, Qauntitative Methods in Construction Management, American Elsevier Publishing Co., Inc. 1973.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES 231 | CO1 | 3 | 3 | 3 | | 2 | | | | 2 | | 2 | | 3 | | 3 |
| | CO2 | 3 | 3 | 3 | | 2 | | | | 2 | | 2 | | 3 | | 3 |
| | CO3 | 3 | 3 | 3 | | | | 2 | | 2 | | 2 | 3 | | | 1 |
| | CO4 | 3 | 3 | 3 | 2 | | | | | | | 2 | | 2 | 3 | |
| | CO5 | 3 | 3 | 3 | | | | | | | 3 | 2 | 3 | 2 | | 1 |
| | CO6 | 3 | 3 | 3 | | | | | | | 3 | 2 | 3 | 2 | | 1 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES232 | GREEN BUILDING TECHNOLOGY | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Concrete Technology

**COURSE OBJECTIVES:** Student will be able to learn

- To implement the life cycle impacts of materials and products and adopt sustainable design concepts.
- To obtain the Knowledge on Strategies to utilize solar energy & its impacts on building energy.
- To simulate the building energy and design for efficiency.
- To adopt indoor environmental quality management.
- To apply energy conservation technique on plug loads.
- To Implement the green building concepts.

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implement the life cycle impacts of materials and products and adopt sustainable design concepts.
- Knowledge on Strategies to utilize solar energy & its impacts on building energy.
- Simulate the building energy and design for efficiency.
- To adopt indoor environmental quality management.
- Apply energy conservation technique on plug loads.
- Implementation of green building concepts.

| UNIT-I | 12HOURS |
|---|---|

Introduction : Life Cycle impacts of materials and products – sustainable design concepts – strategies of Design for the Environment -The sun-earth relationship and the energy balance on the earth's surface, climate, wind – Solar radiation and solar temperature – Sun shading and solar radiation on surfaces – Energy impact on the shape and orientation of buildings – Thermal properties of building materials.

| UNIT-II | 12HOURS |
|---|---|

Energy Efficient Buildings : Passive cooling and day lighting – Active solar and photovoltaic- Building energy analysis methods- Building energy simulation- Building energy efficiency standards- Lighting system design- Lighting economics and aesthetics- Impacts of lighting efficiency – Energy audit and energy targeting- Technological options for energy management.

| UNIT-III | 12HOURS |
|---|---|

Indoor Environmental Quality Management : Psychometric- Comfort conditions- Thermal comfort- Ventilation and air quality-Air conditioning requirement- Visual perception- Illumination requirement- Auditory requirement- Energy management options- -Air conditioning systems- Energy conservation in pumps- Fansand blowers- Refrigerating machines- Heat rejection equipment- Energy efficient motors- Insulation.

| UNIT-IV | 12HOURS |
|---|---|

Green Building Concepts: green building concept- Green building rating tools- Leeds and IGBC codes. – Material selection Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics, green building design case study

**REFERENCE BOOKS**

**TEXTBOOKS:**


1. Kibert, C. "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2005
2. Edward G Pita, "An Energy Approach- Air-conditioning Principles and Systems", Pearson Education, 2003.


**REFERENCES:**


1. Colin Porteous, "The New Eco-Architecture", Spon Press, 2002.
2. Energy Conservation Building Codes: www.bee-india.nic.in
3. Lever More G J, "Building Energy Management Systems", E and FN Spon, London, 2000.
4. Ganesan T P, "Energy Conservation in Buildings", ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, "Design with Energy: The Conservation and Use of Energy in Buildings", Cambridge University Press, 1984.


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES232 | CO1 | 3 | 3 | | | | | | 3 | 3 | | 3 | 3 | | 2 | 3 |
| | CO2 | 3 | 3 | | | | | | 3 | 3 | | 3 | 3 | | 2 | 3 |
| | CO3 | 3 | | 3 | | 2 | | | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 2 |
| | CO4 | 3 | | | 2 | | | 2 | | | | | 2 | 2 | | 1 |
| | CO5 | 3 | | | 2 | | | 2 | | | | | 2 | 2 | | 1 |
| | CO6 | 3 | | 3 | | | | | 3 | 3 | | 3 | 3 | | 2 | 3 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES233 | | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | MODERN CONSTRUCTION MATERIALS | 2 | 1 | - | 3 |

Prerequisite: Concrete Technology

**COURSE OBJECTIVES:** Student will be able to learn

- Properties and specifications of concrete making materials
- Properties of hardened concrete- mechanical properties and durability aspects
- Different concreting techniques and types of concretes
- Use of waste industrial waste products
- Concept of painting and varnishing
- Various Repair materials for smart concrete structures.

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Implementing the specifications for concrete making materials
- Understand the Mechanical and Durability Characteristics of hardened concrete.
- Practical implementation of concreting techniques
- Practicing the waste industrial waste products
- Application of painting and varnishing

- Apply the knowledge various Repair materials for smart concrete structures.

| UNIT-I | 12HOURS |
|---|---|

Properties and specifications of concrete making material – alternatives of cement – alternatives of aggregates. Properties of fresh concrete. Modern techniques in handling- compacting and curing concretes – Properties of hardened concrete- mechanical properties and durability aspects. Additives and admixtures of concrete.

| UNIT-II | 12HOURS |
|---|---|

Materials and methods: Hot and cold weather concreting – underwater concreting - mass concreting - high strength and high-performance concretes - Polymer concrete composites- fibre reinforced concrete- GFRC- Ready mixed concrete - light weight concrete – Ferrocement- Self compacting concrete. Engineered cementitious composites.

| UNIT-III | 12HOURS |
|---|---|

Use of waste products and industrial by-products: Fly ash, micro-silica, GGBFS and other mineral products- Geo-textiles and geo-synthetics – applications in Civil Engineering – Concrete under special environment – high density concrete – concrete for nuclear reactors.

| UNIT-IV | 12HOURS |
|---|---|

Concept of painting, varnishing, white washing. Thermal insulation and acoustic absorption materials- Water proofing materials and compounds- Flooring materials, Repair materials- Hybrid systems in concrete- smart concrete.

**REFERENCE BOOKS**


1. Neville, A.M., Properties of Concrete, Pearson Education Asia (P) Ltd, England, 2000.
2. Mehta, P.K and Montevic. P.J., Concrete- Microstructure, Properties and Materials, ICI, 1997.
3. Santhakumar, A.R, Concrete Technology, Oxford University Press, New Delhi, 2007.
4. Jackson, N., Civil Engineering Materials, ELBS, 1983.
5. Diamant, R.M.E., Thermal and Acoustic Insulation, Butterworths, 1986.
6. Vedhikizen Van Zanten, R., (Ed), Gerotextiles and Geomembranes in Civil Engineering.
7. Koerner, R.M., Construction and Geotechnical Methods in Foundation Engineering, McGraw Hill Co., 1985.


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES233 | CO1 | | 3 | 3 | 2 | | | | 3 | | 3 | 2 | 3 | 2 | 3 | 2 |
| | CO2 | | 3 | 3 | 2 | | | | 3 | | 3 | 2 | 3 | 2 | 3 | 2 |
| | CO3 | | 3 | 3 | | | 3 | | 2 | | | | 3 | 2 | | 2 |
| | CO4 | 3 | 3 | 3 | 2 | | | | | | 3 | | 3 | 2 | | 1 |
| | CO5 | 3 | 3 | 3 | | | | | | | | | 3 | | | 2 |
| | CO6 | 3 | 3 | 3 | | | | | | | | | 3 | | | 2 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES241 | APPLICATIONS OF IoT IN CIVIL ENGINEERING | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |
| Internal Assessment: 50 Marks | Semester End Examination: 50 Marks (Minimum 20 Marks) | | | | |

Prerequisite: Strength of materials, Structural analysis, Concrete Technology

**COURSE OBJECTIVES:** Student will be able to learn about

- Basics of Internet of Things (IoT) and sensors.
- Applications of IoT and sensors and Basics of networking
- Machine to machine communications & programming using IoT
- Broad applications of IoT in civil engineering & construction industry

- Enhancement of various aspects of construction projects using IoT
- Adoption of IoT in structural health monitoring

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Understand the basics of IoT, types of sensors & devices used.
- Understand the applications of IoT and sensors with basics of networking
- Understand machine to machine communications & programming using IoT
- Interpret the adoption of IoT in various civil engineering activities.
- Understand use of IoT in enhancing various aspects of construction projects.
- Understand the use of IoT in structural health monitoring

| **UNIT-I** | 12 HOURS |
|---|---|

Internet of Things, promises, definition, scope, sensors for IoT applications, structure of IoT, IoT Map device

Industry Sensors: Definitions and Characteristics of first generation sensors, advanced generation sensors, Integrated IoT sensors, Polytronics systems, Sensor Swarm, Printed Electronics and IoT generation Road Map

| **UNIT-II** | 12 HOURS |
|---|---|

Basics of Networking, Communication Protocols, Sensor Networks, Machine to Machine

Communications, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino

**UNIT-III** 12 HOURS

Internet of Things devices and sensors for collecting job site data, construction crew management, construction equipment management, IoT adoption to enhance productivity, maintenance, safety and security in construction industry.

**UNIT-IV** 12 HOURS

Structural health monitoring using Internet of Things and Microelectromechanical systems (MEMS) – introduction to MEMS, wireless sensor networks, smart sensors, Piezo sensors, Piezo generators & IoT, case studies of IoT & MEMS application in civil infrastructure projects.

**REFERENCE BOOKS**


1. Ashwin Pajankar, Internet of Things with Arduino and Bolt, BPB Publications (2018)
2. Krishnan Saravanan, Implementation and Deployment of IoT Projects in Smart Cities, IGI Global Publications (2020)
3. Qusay F Hassan, Internet of Things A to Z: Technologies and Applications, Wiley-IEEE Press (2018)
4. ICCCBE 2020, Proceedings of the 18th International Conference on Computing in Civil and Building Engineering, Springer (2020)


**Mapping of Course Outcomes with programme Outcomes.**

| Course Code | POS/COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES241 | CO1 | 3 | 1 | 2 | | 2 | | 2 | 2 | 1 | | 1 | 3 | 1 | 3 | 2 |
| | CO2 | 3 | | 2 | | 2 | | 2 | 2 | 1 | | 1 | 3 | 1 | 3 | 2 |
| | CO3 | 3 | | 2 | | 2 | | 2 | 2 | 1 | | 1 | 3 | 1 | 3 | 2 |
| | CO4 | 3 | | 2 | | 2 | | 2 | 2 | 1 | | 1 | 3 | 1 | 3 | 2 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES242 | DISASTER REDUCTION AND MANAGEMENT | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Design of Earthquake resistant structures

**COURSE OBJECTIVES:** Student will be able to learn

- Concept of natural and manmade disasters and risks involved
- The Concepts of Disaster Risk Reduction Strategies
- Phases of disasters and preparedness
- Disaster life cycle, planning and preparations
- Disaster management scenario in Indian context
- Concepts of National Flood Risk Mitigation Project (NFRMP)

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- Thorough understanding of natural and manmade disasters and risks involved and implementation
- Implement the Concepts of Disaster Risk Reduction Strategies
- To design for preparedness to manage disasters
- Plan and prepare for Disaster life cycle
- Management of disasters with available resources in Indian scenario
- Implement the Concepts of National Flood Risk Mitigation Project (NFRMP)

| UNIT-I | 12HOURS |
|---|---|

**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. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters,Inter-sectoral coordination during disasters, Models in Disasters.

| UNIT-II | 12HOURS |
|---|---|

**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 nonstructural measures in DRR

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

| UNIT-III | 12HOURS |
|---|---|

**Medical Management** Introduction to disaster medicine, Various definitions in disaster medicine, Disaster life cycle, Disaster planning, Disaster preparation, Disaster recovery in relation

to disaster medical management, Medical surge, Surge capacity, Medical triage, National Assessing the nature of hazardous material - Types of injuries caused, Self protection contaminated area and decontaminated area – Pre hospital medical management of victims –

Polytrauma Care - Specific treatment in emergency and Intensive Care Units – allocation of specialists in Local EMS System including equipment, safe use of equipment

| UNIT-IV | 12HOURS |
|---|---|

Hazard and Vulnerability Profile India,, Disaster Management Indian scenario, India's vulnerability profile, Disaster Management Act 2005 and Policy guidelines, National Institute of Disaster Management, , National Disaster Response Force (NDRF)National Disaster Management Authority, States Disaster Management

Authority, District Disaster Management Authority Cases Studies : Bhopal Gas Disaster ,Gujarat Earth Quake, Orissa Super-cyclone, south India Tsunami, Bihar floods, Plague-Surat, Landslide in North East, Heat waves of AP& Orissa, 278 Cold waves in UP. Bengal famine, best practices in disaster management, National Flood Risk Mitigation Project (NFRMP), Mines Safety in India, Indian Meteorological Department, National Crisis

Management Committee, Indian NATIONAL Centre for Oceanic Information System (INCOIS)

**REFERENCE BOOKS**


1. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012.)
2. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
3. Guerisse P. 2005 Basic Principles of Disaster Medical Management. Act Anaesth.Belg;56:395-401
4. Aim and Scope of Disaster Management. Study Guide prepared by Sharman and Hansen. UW-DMC, University of Washington.

5. Sphere Project (2011). Humanitarian Charter and Minimum Standards in Disaster Response.


**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/ COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES242 | CO1 | 3 | 3 | | | | | | 2 | | 3 | | 3 | | | 3 |
| | CO2 | 3 | 3 | | | | | | 2 | | 3 | | 3 | | | 3 |
| | CO3 | 3 | 3 | 3 | | | | | 2 | | 3 | | 3 | | 1 | |
| | CO4 | 3 | 3 | | | | | | 2 | | 3 | | 3 | | 2 | |
| | CO5 | 3 | 3 | | | | | | 2 | | 3 | | 3 | | 2 | |
| | CO6 | 3 | 3 | 3 | | | | | 2 | | 3 | | 3 | | | 3 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TES243 | SHORING, SCAFFOLDING AND FORMWORK | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 2 | 1 | - | 3 |

Prerequisite: Concrete Technology

**COURSE OBJECTIVES: Student will be able to learn**

- Understand the planning of formwork installations
- Understand the scheduling of formwork for various elements
- Materials to be used in the form
- Design the forms and shoring
- Check the inadequacies in shoring and formwork
- Location of job mill and storage

**COURSE OUTCOME: After successful completion of this course the student will be able to:**

- Implement the planning of formwork installations
- Implement the scheduling of formwork for various elements
- Decide the materials to be used in the form
- Design the forms and shoring
- Check the inadequacies in shoring and formwork
- Storage, installation and location of job mill and storage

**UNIT-I** **12HOURS**

PLANNING AND SITE EQUIPMENT & PLANT FOR FORM WORK

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. Overall Planning – detail planning – Standard units – Corner units – Schedule for column formwork

– Formwork elements – Planning Crane arrangements – Site layout plan – Transporting plant – Formwork beams – Formwork ties – Wales and ties – scaffold frames from accessories – Vertical transport table form work.

**UNIT-II** **12HOURS**

FORM MATERIALS

Lumber – Types – Finish – Sheathing boards working stresses – Repetitive member stress – Plywood – Types and grades – Textured surfaces and strength – Reconstituted wood – Steel – Aluminium Form lining materials – Hardware and fasteners – Nails in Plywood Concrete density – Height of discharge – Temperature – Rates of Placing – Consistency of concrete – Live loads and wind pressure – Vibration Hydrostatic pressure and pressure distribution – Examples – Vertical loads - Uplift on shores

**UNIT-III** **12HOURS**

DESIGN OF FORMS AND SHORES

Basic simplification – Beam formulas – Allowable stresses – Deflection bending lateral stability – Shear, Bearing – Examples in wall forms – Slab forms – Beam forms – Ties, Anchors and Hangers – Column forms – Examples in each. Simple wood stresses – Slenderness ratio – Allowable load – Tubular steel shores patented shores – Site Preparation, Size and spacing – Steel Tower Frames – Safety practices – Horizontal shores shoring for multi stories – More concentrated shore loads T- heads – Tow Tier wood shores – Ellis

shores – Dayton sure grip and Baker Roofs shores – Safeway Symons shores – Beaver – advance shores Dead shore – Raking and Flying shores.

**UNIT-IV** **12HOURS**

FORMWORK FOR BUILDINGS

Location of job mill – Storage – Equipment – Footings – Wall footings – Column footings Sloped footing forms – Curb and gutter forms – Wall forms –Prefabricated panel systems – Giant forms curved wall forms – Column heads – Beam or girder forms – Beam pockets – Suspended forms – Concrete joint construction – Flyingsystem forms. Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping – Errors in design – Failure to follow codes – How formwork affects concretes quality – ACI – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – Advantages of reshoring

**REFERENCE BOOKS**

1. Robert L Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996

2. Michael P. Hurst, Construction Press, London & New York, 2003

3. Austin, C.K., Formwork for Concrete, Cleaver – Hume Press Ltd., London, 1996.

4. Peurifoy and Garold D. Oberlender, Formwork For Concrete Structures, McGraw – Hill , 1996.

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO1 | PO2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TES243 | CO1 | 3 | 3 | | | | | | | | 2 | | 3 | 2 | 1 | 2 |
| | CO2 | 3 | 3 | | | | | | | | 2 | | 3 | 2 | 1 | 2 |
| | CO3 | 3 | | 3 | | | | | | | | | 3 | 1 | 2 | |
| | CO4 | 3 | 3 | | 3 | | | | | 2 | 2 | | 3 | | | |
| | CO5 | 3 | | 3 | | | | | | | | | 3 | | | |
| | CO6 | 3 | | 3 | | | | | | | | | 3 | | | |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| M20TE0203 | CONSTRUCTION SOFTWARE LAB | L | T | P | C |
|---|---|---|---|---|---|
| Duration: 16weeks | | 0 | 0 | 2 | 2 |

Prerequisite: AUTOCAD, STAAD PRO and ETABS

**COURSE OBJECTIVES:** Student will be able to learn

- Importing and exporting data
- Project management modules
- Prepare the resource sheet, assign and level the resource
- Linking the project management and Contract manager modules
- Transferring the data to Primavera Contractor users
- Plot the variance graphs for the given Project

**COURSE OUTCOME:** After successful completion of this course the student will be able to:

- To plan the building and scheduling for multi-storeyed building
- Prepare the resource sheet, assign and level the resource
- To plan and schedule the road projects
- To prepare resource sheet and assign the level of resources
- Transfer the data to Primavera Contractor users
- Plot the variance graphs for the assigned Projects

**MS PROJECT SOFTWARE:**

1. Basics and application of MS Project Software
2. Planning and Scheduling of Multi storied building
3. Planning and scheduling of Road Project

**PRIMAVERA SOFTWARE:**

**Basics and application of Primavera software referring the Primavera Manual**

**And solving the problems as following:**

1. Planning and Scheduling of Multi storied building
2. Planning and scheduling of Road Project
3. Prepare the resource sheet, assign and level the resource
4. Preparing different reports available in Primavera
5. Plot the variance graphs for the given Project

**REFERENCE:**

Primavera® P6™ Project Management Reference Manual

**Mapping of Course Outcomes with programme Outcomes**

| Course Code | POS/COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO11 | PSO 1 | PSO 2 | PSO 3 | PSO 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M20TE0204 | CO1 | 3 | 3 | 2 | 3 | | 2 | 2 | 1 | 1 | | | 3 | 3 | 2 | 1 |
| | CO2 | 3 | 3 | 2 | 3 | | 2 | 2 | 1 | 1 | | | 3 | 3 | 2 | 1 |
| | CO3 | 3 | 2 | 3 | 3 | 2 | 1 | | 3 | 2 | | 2 | 3 | 3 | 1 | 2 |
| | CO4 | 3 | 3 | 3 | 3 | 2 | 1 | | | 3 | | | 3 | 3 | 2 | 2 |
| | CO5 | 3 | 2 | 3 | 3 | 3 | | 2 | 3 | | | | 3 | 3 | 2 | 3 |
| | CO6 | 3 | 2 | 3 | 3 | 3 | | 2 | 3 | | | | 3 | 3 | 2 | 3 |

**Where, 1 (Low), 2 (Medium) and 3 (High) represents strength of correlation between CO and PO.**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **M20TE0204** | **Mini Project-II** | **Practical/report** | | **0** | **0** | **2** | **2** | **2** |

The student is required to carry out a mini project individually and Project Management on small buildings using M S Project and Primavera software.

## III SEMESTER

| Sl. No | Course Code | Title of the Course | Practical /Term Work / Sessions | Pre requisite | Credit Pattern & Credit Value | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | |
| 1 | M20TEON01 | MOOC/SWAYAM Online Course | OE | BE / B. TECH in Civil Engineering | 3 | 1 | 0 | 4 | -- |
| 2 | M20TE0301 | Internship with Report | Practical/ Term Work and Viva - Voce | | 2 | 0 | 4 | 6 | -- |
| 3 | M20TE0302 | Project Phase-I | Practical/ Report and Viva -Voce | | 2 | 0 | 4 | 6 | -- |

1. Students will have to choose an online course offered in MOOC/SWAYAM/COURSERA, this course will enhance additional knowledge studying online course of student's choice
2. Students have to undergo Internship in reputed companies for a minimum period of three months and gain the field related challenges and make himself/herself industry ready
3. During third semester students will be allotted Supervisor/Guide for carrying out dissertation for the full fourth semester term. Identification of dissertation topic, deciding the objectives and Literature review will be done with the discussion with their supervisor/guide.

## IV SEMESTER

| Sl. No | Course Code | Title of the Course | Practical /Term Work / Sessions | Pre requisite | Credit Pattern & Credit Value | | | | Contact Hours |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | |
| 1 | M20TE0401 | Dissertation Phase-II | Practical/ Thesis Submission and Viva-Voce | | 2 | 0 | 6 | 8 | -- |
| 2 | M20TE0402 | Technical Seminar With Report | Practical/ Term Work | | 0 | 0 | 4 | 4 | -- |

1. The student is required to deliver a seminar and submit a report on the latest development in the construction technology and management

2. Elaborate studies on their dissertation work with regard to experimental/analytical/software based investigations, preparing the dissertation report as per university regulations and publication of a paper in reputed journals.