REVA UNIVERSITY
Bengaluru, India

SCHOOL OF CIVIL ENGINEERING

HANDBOOK

M. Tech. in Construction Technology and Management

2019-21

Rukmini Knowledge Park,

Kattigenahalli, Yelahanka, Bangalore - 560 064

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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 the realization 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 REVA University 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 by enabling 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".

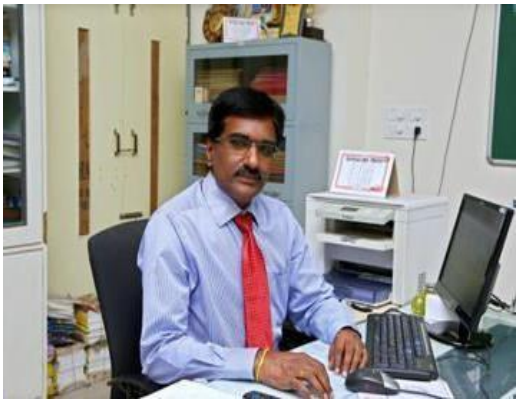
Welcome to the portals of REVA University!

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, Commerce, Education, Engineering, Environmental Science, 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 Degree College (Evening), 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 Engineering, Commerce, Management, Education, Arts 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 notch 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 a few.

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 M. Phil and 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 11,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conductive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

REVA University established under the Government of Karnataka Act 80 of the year 2012 and notified in the Karnataka Gazette dated 7th Feb, 2013, is located 14 kms away from the Bangalore International Airport on the way to Bangalore city. The university has a sprawling lush green campus spread over 42 acres of land equipped with state-of-the-art infrastructure and conductive environment for higher learning.

The REVA campus has well equipped laboratories, custom-built teaching facilities designed specifically to emulate working conditions, fully air-conditioned library and central computer centre. The well planned sports facility for variety of sports activities, facilities for cultural programs and friendly campus lifestyle add to the overall personality development of students. The campus also has residential facility for students, faculty and other staff.

Currently, REVA University offers 18 Post Graduate programs and 15 Graduate and P.G Diploma programs in Engineering and Technology, Science, Commerce and Management in addition to research degrees leading to PhD in different disciplines. The University aims to offer many more PG and UG programs in Science, Arts, Commerce, Engineering & Technology, Management Studies, Education, in the years to come.

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 study and 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.

ABOUT SCHOOL OF CIVIL ENGINEERING

The School of Civil Engineering is headed by highly experienced Professor of Civil Engineering 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 in Civil Engineering and M. Tech in Computer Aided Structural Engineering and M Tech in Transportation Engineering & Management. 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 M. Tech in Computer Aided Structural Engineering program aims to prepare human resources to play a leading role in the competitive construction field and excel in their endeavors. The program focuses on research and design in the core and Computer Aided Structural Engineering. The M.Tech in Transportation Engineering & Management aims 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 centre 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 imparting value addition skills.*

ACADEMIC OBJECTIVES

- To prepare graduates and post graduates in CIVIL ENGINEERING who will excel in their professional career and contribute with commitment and dedication to the progress of the society and the nation.
- To enhance the understanding of the engineering principles of Civil Engineering systems.
- Graduates will be prepared with a solid foundation in mathematics, sciences, and technical skills needed to analyze and design civil infrastructure systems.
- The professional careers of our graduates will be distinguished with a high degree of awareness of moral, ethical, legal and professional obligations to protect human health, human welfare, and the environment.
- A commitment to continue assessment in continuing education.
- Our graduates will become team leaders, and will successfully address open-ended problems applying critical thinking.
- To promote faculty, researchers and students to participate in national and international conferences, seminars, workshops etc. and present their research outputs. Also research output to publish in journals of repute, publish books in relevant fields and popular articles for the benefit of the society at large.
- To organize conferences, seminars, workshops, special lectures, summer schools, technical talks, faculty development programmes etc. on emerging areas.
- To establish incubation centre and center of excellence in thrust areas in collaboration with industries.
- To organize and promote co-curricular and extra-curricular activities that inculcate among students concerned to the society.

ADVISORY BOARD

Sl. No.	Name of Members
1	**Dr. A. Veeraraghavan,** Professor, Department of Civil Engineering, IIT Madras, Room No:#234, Building Sciences Block, IIT Madras, Chennai-600036 (o) 044-22574272 Fax:044-22570509 Email: av@iitm.ac.in
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5	**Dr. R.V. Ranganath.** Dean (Academic), Principal Professor & HOD, Department of Civil Engineering, BMS College of Engineering, Bull Temple Road, Bangalore-560 019 Currently Principal BMSIT, Yelahanka, Bangalore (M) 98450-86602 Email: rangarv@yahoo.com

Program Educational Objectives (PEO's)

The programme educational objectives of the Civil Engineering of REVA University is to prepare graduates

PEO-1	To have successful professional careers in industry, government, academia and military as innovative engineers.
PEO-2	To 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
PEO-3	To 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	To be 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)

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

- PO1. **Demonstrate in-depth knowledge** of Construction Technology and Management, including wider and global perspective, with an ability to discriminate, evaluate, analyze 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 construction technology , wider theoretical, practical and policy context.
- PO3. **Think laterally and originally, conceptualize and solve Construction Management 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 construction management .
- PO4. **Extract information pertinent to unfamiliar problems** through literature survey and experiments, apply appropriate **research methodologies, techniques and tools, design**, conduct experiments, analyze 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 construction technology and management .

- PO5. **Create, select, learn** and **apply** appropriate techniques, resources, **and IT tools**, including prediction and modeling, to complex construction management 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 construction technology 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 economical and financial factors.

- PO8. **Communicate with the engineering community**, and with society at large, regarding complex construction management 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-long learning** 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)

1) Apply knowledge of Construction Technology and management in real time.
2) Analyse a system, component or process in the knowledge areas of Construction Technology in real time problems.
3) Design a system, component, or process in more than one areas of Construction Technology and management
4) Conduct investigations and address complex Construction management problems; Utilize and develop innovative tools and techniques that are appropriate in Construction Technology and management discipline.

Mapping of Course Outcomes with programme Outcomes

Course Code	POS/ COs	PO1	P02	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3	PSO4
M19CT1010	CO1		3								2	1	3			2
	CO2	3		3	2				2	3		3	3	3		3
	CO3	3			3	2	1			2	1		3	1	2	3
	CO4	3		3									3	2	3	3
M19CT1020	CO1	3	3										3			2
	CO2	3		3						2			3			2
	CO3	3								3			3			1
	CO4	3		3						3			3			2
M19CT1030	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		
M19CT1040	CO1		3	3	2	1						2	3			2
	CO2		3	3						2			3			2
	CO3	3	3	3						3			3			1
	CO4	3	3	3						3			3			2
M19CT1051	CO1	3	3	3		1	1						3			3
	CO2	3	3	3	3	2	3			3			3	3	3	
	CO3	3	3	2	3	2	3			3			3	3	3	
	CO4	3	3	3	2			2					3	3		
M19CT1052	CO1	3	3		2			2	1	3		1	3	2	3	1
	CO2	3		3			2	1	2	2			3	2	2	2
	CO3	3	3		3			2	2	1			3		1	1
	CO4	3		3	2								3			2
M19CT1061	CO1		3	3						2		2	2		2	
	CO2		3	3	3	1		2		2	1	2	3	2	3	1

	CO3	3	3	3	3	1		2		2	1	2	3	2	3	1
	CO4	3	3	3	3	1		2		2	1	2	3	2		
M19CT1062	CO1			3			2	2	1	1			3			1
	CO2	3		3		2	1		3	2		2	3	2		2
	CO3	3		3	3	2	1			3			3	2		2
	CO4	3		3	3	3		2	3				3			3
M19CT1070	CO1		3	2	3		2	2	1	1			3	2	3	1
	CO2	3	2	3	3	2	1		3	2		2	3	1	3	2
	CO3	3	3	3	3	2	1			3			3	2	3	2
	CO4	3	2	3	3	3		2	3				3	2	3	3
M19CT2010	CO1	3	3	3		1	2	3	2			2		3		
	CO2	3	3	3		2	3					1	2	3	1	
	CO3	3	3	3	2		3		1					3	2	
	CO4	3	3	3		3		1				3			2	
M19CT2020	CO1	3	3	3	2	1				1			3			2
	CO2	3	3	3		2				2		2	3	2	1	2
	CO3	3	3	3	2	3				3	3	1	3			2
	CO4	3	3	3		2				3		2	3		2	2
M19CT2030	CO1		3	3						3		2	3	2	3	
	CO2		3	3				1		3		2	3	2	3	3
	CO3		3	3	2	2				3	2	1	3			
	CO4		3	3						3		2	3	2	3	
M19CT2040	CO1	3	3	3						3		2	3	2	3	2
	CO2	3	3	3		3				2			3	2	1	1
	CO3	3	3	3	2					3		2	3	2	3	
	CO4	3	3	3									3	1	2	
M19CT2051	CO1	3	3	3		2				2		2		3		3
	CO2	3	3	3				2		2		2	3			1
	CO3	3	3	3	2							2		2	3	
	CO4	3	3	3							3	2	3	2		1
M19CT2052	CO1		3	3	2				3		3	2	3	2	3	2
	CO2		3	3			3		2				3	2		2
	CO3	3	3	3	2						3		3	2		1
	CO4	3	3	3									3			2
M19CT2053	CO1	3	3						3	3		3	3		2	3
	CO2	3		3		2			2	1	2	2	3	3	3	2
	CO3	3			2			2					2	2		1
	CO4	3		3					3	3		3	3		2	3
M19CT2061	CO1	3	3						2		3		3			3
	CO2	3	3	3					2		3		3		1	
	CO3	3	3						2		3		3		2	
	CO4	3	3	3					2		3		3			3
M19CT2062	CO1	3	3	3			2		2		3		3	2	1	2

	CO2	**3**							**2**		**3**		**3**	**1**	**2**	
	CO3	**3**		**3**	**3**				**2**		**3**		**3**			**3**
	CO4	**3**					**2**		**2**		**3**		**3**		**2**	
M19CT2063	**CO1**	**3**	**3**								**2**		**3**	**2**	**1**	**2**
	CO2	**3**		**3**									**3**	**1**	**2**	
	CO3	**3**	**3**		**3**					**2**	**2**		**3**			
	CO4	**3**		**3**									**3**			
M19CT2070	**CO1**	**3**	**3**	**3**	**3**	**3**						**3**	**3**	**2**	**1**	**2**
	CO2	**3**	**3**	**3**	**3**	**3**						**3**	**3**	**2**	**1**	
	CO3	**3**	**3**	**3**	**2**				**2**	**2**		**1**	**3**	**2**	**1**	**2**
	CO4	**3**	**3**	**3**	**2**							**1**	**3**	**2**	**1**	
M19CT3010	**CO1**		**3**								**2**	**1**	**3**			**2**
	CO2	**3**		**3**	**2**				**2**	**3**		**3**	**3**	**3**		**3**
	CO3	**3**			**3**	**2**	**1**			**2**	**1**		**3**	**1**	**2**	**3**
	CO4	**3**		**3**									**3**	**2**	**3**	**3**

Mapping of PEOS with Respect to POs

	PO1	P2	PO3	PO4	PO5	PO6	P7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3
PEO1	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PEO2	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PEO3	√	√	√	√	√	√	√	√	√	√	√	√	√	√
PEO4	√	√	√	√	√	√	√	√	√	√	√	√	√	√

CBCS (CHOICE BASED CREDIT SYSTEM) AND CAGP (CONTINUOUS ASSESSMENT AND GRADING PATTERN) OF EDUCATION AND ITS ADVANTAGES

CBCS is a proven, advanced mode of learning in higher education. It facilitates students to have freedom in making their own choices for acquiring a Degree / Master's Degree program. It is more focused towards the student's choice in providing a wide range of Units available in a single campus across various disciplines offered by experts in the subjects. It leads to quality education with active teacher-student participation.

Studying under CBCS has following advantages:

- Students may undergo training in cross-disciplinary and multi-disciplinary subjects and acquire more focused and preferred knowledge.
- Students may get more skills from other subject(s) which are required for the career path in addition to their regular subject knowledge.
- Students may get ample opportunities to use the laboratories and gain practical exposure to the much needed Units available in other departments/schools for want of scientific inputs.
- Courses are conducted by subject experts identified on the basis of their experiences. Courses taught by such experts may provide in-depth information and clear understanding of the Units.
- Students may get an opportunity to study courses with other students of different programs and exchange their views and knowledge in a common class room.
- CBCS provides a cross-cultural learning environment.
- Students may benefit much from selecting the right options to successfully face the public service examinations like UPSC, KPSC, IES wherein the knowledge of additional subjects become mandatory for general or optional papers.
- Students are exposed to the culture of universal brotherhood during their campus life.
- Students are allowed to practice various methods of learning a subject.

Summary of REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Post Graduate Degree Program

1.0 Teaching and Learning Process

The teaching and learning process under CBCS-CAGP of education in each course of study will have three components, namely-

(i) L= Lecture (ii) T= Tutorial (iii) 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 absorb and 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 that equip students to acquire the much required skill component.

2.0. A course shall have either or all the three components. That means a course may have only lecture component, or only practical component or combination of any two or all the three components.

2.1. Various course of s**tudy** are labeled and defined as: (i) Core Course (CC) (ii) Hard Core Course

(HC), (iii) Soft Core Course (SC), (iv) Foundation Core Course (FC) and (v) Open Elective Course (OE).

(i) **Core Course:** A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course.

(ii) **Foundation Course (FC):**

The foundation Course is a core course which should be completed successfully as a part of graduate degree program irrespective of the branch of study.

(iii) **Hard Core Course (HC):**

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.

(iv) **Soft Core Course (SC):**

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.

(v) O**pen Elective Course:**

An elective course chosen generally from other discipline / subject, with an intention to seek exposure is called an O**pen Elective Course.**

2.2. Project Work:

Project work is a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem.

2.3. Minor Project:

A project work up to **Six to Eight credits** is called **Minor Project** work. A Minor Project work may be a hard core or a Soft Core as decided by the BOS / concerned.

2.4. Major Project / Dissertation:

A project work of **EIGHT, TEN, TWELVE, SIXTEEN or TWENTY** credits is called **Major Project** work. The Major Project / Dissertation shall be Hard Core.

3.0. Minimum Credits to be earned:

3.1. A candidate has to earn 96 credits for successful completion of M Tech degree with a distribution of credits for different courses as prescribed by the university.

3.2. A candidate can enroll for a maximum of 26 credits per Semester. However he / she may not successfully earn a maximum of 26 credits per semester. This maximum of 26 credits does not include the

credits of courses carried forward by a candidate.

3.3. 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 96 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.

4.0. Add- on Proficiency Certification:

In excess to the minimum of 96 credits for the M. Tech Degree program, a candidate can opt to complete a minimum of 4 extra credits either in the same discipline/subject or in different discipline / subject to acquire **Add on Proficiency Certification** in that particular discipline / subject along with the M .Tech degree.

4.1. Add on Proficiency Diploma:

In excess to the minimum of 96 credits for the M. Tech degree program, a candidate can opt to complete a minimum of 18 extra credits either in the same discipline/subject or in different discipline / subject to acquire Add on Proficiency Diploma in that particular discipline / subject along with the B. Tech degree. The A**dd - on Proficiency Certification / Diploma** so issued to the candidate contains the courses studied and grades earned.

5.0. Continuous Assessment, Earning of Credits and Award of Grades.

5.1. The assessment and evaluation process happen in a continuous mode. However, for reporting purpose, **a semester is divided into 3 components as C1, C2, and C3.**The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.

(i) Component C1:

The first Component (C1), 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 C1 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 C2 immediately after completion of process of C1.

The finer split - up for the award of marks in C1 is as follows:

Assignment ……..…….. 05 marks for Unit 1&2

Seminar ……..……. 05 marks for Unit 1&2

Test (Mid-Term) ……..……..15 marks for Unit 1&2

Total ……..…… ……..25 marks

(ii) Component C2:

The second component (C2), 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 C2 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 C2 is as follows:

Assignment ……..……... 05 marks for Unit 3 & 4

Seminar ……..……..……..05 marks for Unit 3 & 4

Review Test (Mid-Term) ……..…….15 marks for Unit 3 & 4

Total ……..……..25 marks

(iii) Component C3:

The end semester examination of 3 hours duration for each course shall be conducted during the 18th & 19th week. **This forms the third / final component of assessment (C3) and the maximum marks for the final component will be 50.**

5.2. Setting Questions Papers and Evaluation of Answer Scripts:

5.2.1. 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 of the BoE shall get the question papers set by internal and external examiners.

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

5.2.3. There shall be single valuation for all theory papers by internal examiners. In case, the number of internal examiners falls short, external examiners may be invited. The answer scripts evaluated both by internal and external examiners shall be moderated by the external examiner / moderator.

5.2.4. 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.

5.2.5. If a course is fully of (L=0): T: (P=0) type, then the examination for C3 Component will be as decided by the BOS concerned.

5.2.6. In case of a course with only practical component a practical examination will be conducted with two examiners (ref: 6.3.4 above) 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.

5.2.7. The duration for semester-end practical examination shall be decided by the School / Council.

5.3. 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	(C1)	Periodic Progress and Progress Reports (25%)
Component – II	(C2)	Results of Work and Draft Report (25%)
Component– III	(C3)	Final Evaluation and Viva-Voce (50%). Evaluation of the report is for 30% and the Viva-Voce examination is for 20%.

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

Component	Period	Syllabus	Weightage	Activity
C1	1st Week to 8th Week Last 3 days of 8th Week	First 50% (two units)	25%	Instructional process and Continuous Assessment
	1st Week to 8th Week Last 3 days of 8th Week	First 50% (two units)	25%	Consolidation of C1
C2	9th week to 16th week	Second 50% (remaining two units)	25%	Instructional process and Continuous Assessment
	Last 3 days of 16th week	Second 50% (remaining two units)		Consolidation of C2
C3	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 conduct of C2 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.

6.0 Requirements to Pass a Course

6.1. 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 30% in C1 and C2 together, and 40% and above in aggregate of C1, C2 and C3 in a course is said to be successful.

6.2. **Eligibility to Appear for C3 (Semester - end) Examination and Provision to Drop the Course.**

Only those students who fulfill 75% attendance requirement and who secure minimum 30% marks in C1 andC2 together in a course are eligible to appear for C3 examination in that course.

6.3. Those students who have 75% of attendance but have secured less than 30% marks in C1 and C2 together in a course are not eligible to appear for C3 examination in that course. They are treated as dropped the course and they will have to repeat that course whenever it is offered.

Teachers offering the courses will place the above details in the School Council meeting during the last week of the Semester, before the commencement of C3, and subsequently a notification pertaining to the above will be brought out by the Director of the School before commencement of C3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

6.4. In case a candidate secures more than 30% in C1 and C2 together but less than 40% in aggregate of C1, C2 and C3 in a course is considered as unsuccessful and such a candidate may either opt to DROP that course or appear for C3 examination during the subsequent semesters / years within the stipulated period.

In such a case wherein he / she opts to appear for just C3 examination, then the marks secured in C1 and C2 shall get continued. Repeat C3 examination will be conducted in respective semesters.

6.5. In case a candidate opts to drop the course he / she has to re-register for the dropped course only in subsequent semesters whenever it is offered if it is Hard Core Course and he / she may choose alternative course if it is Soft Core Course or Open Elective course or Skill Development Course. **The details of any dropped course will not appear in the Grade Card.**

6.6. **Provision to Withdraw Course:**

A candidate can withdraw any course within ten days from the date of notification of final results. Whenever a candidate withdraws a course, he/she has to register for the same course in case it is hard core course, the same course or an alternate course if it is soft core/open elective. **A DROPPED course is automatically considered as a course withdrawn.**

7.0. Provision for Make- up Examination:

For those students who have secured less than 40% marks in C1, C2 and C3 (end semester examination) together; the university shall conduct a make-up C3 examination within three weeks after the end of each semester.

Such of those students who have secured more than 30% marks in C1 and C2 together and less than 40% marks in C1, C2, and C3 together in a course shall appear for make-up examination in that course. This make-up examination is only for C3examination.

A student who is absent to End Semester Examination (C3) due to medical emergencies or such other exigencies and fulfills the minimum attendance and performance requirements in C1 & C2 shall appear for make-up examination.

7.1 The candidate has to exercise his/her option immediately within 10 days from the date of notification of results. A MAKE-UP examination will be conducted within 25 days from the date of notification of results. If the candidate still remains unsuccessful after MAKE-UP examination he/she is said to have DROPPED that course

7.2 **Re-Registration and Re-Admission:**

A candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University and is considered as dropped the semester and is not allowed to appear for end semester examination (C3) shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

In case a candidate fails in more than 2 courses in odd and even semesters together in a given academic year, he / she may either drop all the courses and repeat the semester or reappear (C3 semester end examination) to such of those courses where in the candidate has failed during subsequent semester / year within a stipulated period.

7.3 In such a case where in a candidate drops all the courses in 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.

7.4 **Requirements to Pass the Semester and Provision to Carry Forward the Failed Subjects / Courses:**

7.4.1 A candidate who secures a minimum of 30% in C1 and C2 and 40% and above in aggregate of C1, C2 and C3 in all the courses with credits prescribed in a semester is said to have passed that semester.

7.5. Provision to Carry Forward the Failed Subjects / Courses:

A student who has failed in 4 courses in 1st and 2nd semesters together shall move to 3rd semester. And he / she shall appear for C3 examination of failed courses of the said semesters concurrently with 3rd semester end examinations (C3) and 4th semester end examinations (C3) of second year of study.

8.0 **Attendance Requirement:**

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

8.2. 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.

8.3. Any student with less than 75% of attendance in a course in aggregate during a semester shall not be permitted to appear to the end semester (C3) examination.

8.4. Teachers offering the courses will place the above details in the School / Department meeting during the last week of the semester, before the commencement of C3, and subsequently a notification pertaining to the above will be brought out by the Head of the School before the commencement of C3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

8.5. **Absence during mid semester examination**

In case a student has been absent from a mid semester examination 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 Head of the School, for make-up examination. The Head of the School may consider such request depending on the merit of the case and after consultation with course instructor and class teacher, and permit such student to appear for make-up mid semester examination.

8.6. Absence during end semester examination:

In case a student is absent for end semester examination on medical grounds or such other exigencies, the student can submit request for make-up examination, with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Director of the School. The Director of the School may consider such request depending on the merit of the case and after consultation with class teacher, course instructor and permit such student to appear for make-up mid semester examination

9. **Provisional Grade Card:**

The tentative / provisional Grade Card will be issued by the Registrar (Evaluation) 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.

9.1 **Challenge Valuation:**

A student who desires to apply for challenge valuation shall obtain a Xerox copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the Grade awarded to him/her by surrendering the Grade Card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 15 days after the announcement of the results. This challenge valuation is only for C3 component.

The answer scripts for which challenge valuation is sought for shall be sent to another external examiner. The marks awarded will be the higher of the marks obtained in the challenge valuation and in maiden valuation.

9.2 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 Registrar (Evaluation).

9.3 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	B
60-69	7	v*7	C
50-59	6	v*6	D
40-49	5	v*5	E
0-39	0	v*0	F

O - Outstanding; A-Excellent; B-Very Good; C-Good; D-Fair; E-Satisfactory; F - Fail;

Here, P is the percentage of marks (P=[(C1+C2)+M] 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.

9.4 **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.

Illustration for Computation of SGPA and CGPA
Illustration No. 1

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade)
Course 1	**4**	**A**	**9**	**4X9=36**
Course 2	**4**	**B**	**8**	**4X8=32**
Course 3	**4**	**C**	**7**	**4X7=28**
Course 4	**4**	**O**	**10**	**4X10=40**
Course 5	**4**	**D**	**6**	**4X6=24**
Course 6	**4**	**O**	**10**	**4X10=40**
	24			**200**

Thus, **SGPA = 200 ÷ 24 = 8.33**

Illustration No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	**5**	**A**	**9**	**5X9=45**
Course 2	**5**	**C**	**7**	**5X7=35**
Course 3	**5**	**A**	**9**	**5X9=45**
Course 4	**5**	**B**	**8**	**5X8=40**
Course 5	**4**	**O**	**10**	**4X10=40**
	24			**205**

Thus, **SGPA = 205 ÷ 24 = 8.54**

9.5 Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (96) for two year post graduate degree in Computer Science & Engineering 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	24	8.33	24 x 8.33 = 199.92
2	24	8.54	24 x 8.54 =204.96
3	24	9.35	24x9.35=224.4
4	24	9.50	24x9.50=228.0
Cumulative	96		857.28

Thus, **CGPA** = $\frac{24x8.33+24x8.54+24x9.35+24x9.50}{96}$ = 8.93

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 8.93 x 10=89.30

9.6 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	Numerical Index	FGP Qualitative Index
> 4 CGPA < 5	**5**	SECOND CLASS
5 > = CGPA < 6	6	
6 >= CGPA < 7	7	FIRST CLASS
7 >= CGPA < 8	8	
8 >= CGPA < 9	9	DISTINCTION
9 >= CGPA 10	10	

Overall percentage=10*CGPA

10.0. Provision for Appeal

If a candidate is not satisfied with the evaluation of C1 and C2 components, he/she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of 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 taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the

grievance cell is final.

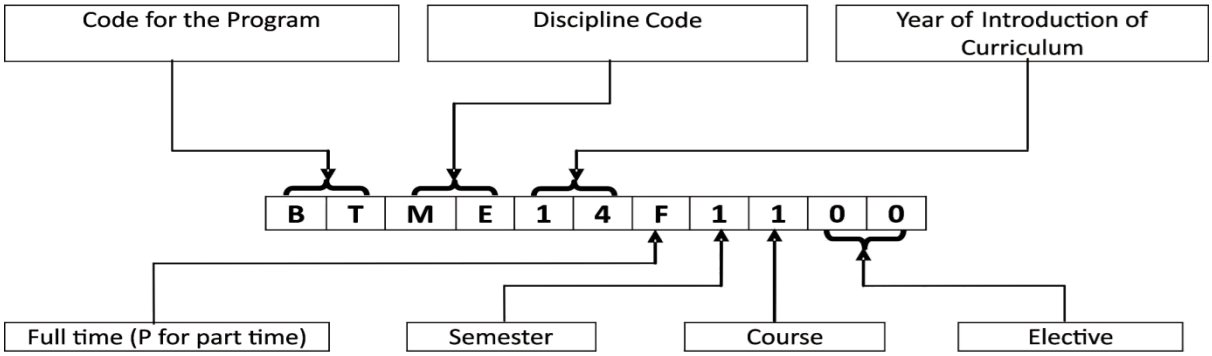
11.0. Grievance Cell

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

- The Registrar (Evaluation) - 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.

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

Course Numbering Scheme



List of Codes for Programs and Disciplines / Branch of Study

Program Code	Title of the Program	Discipline Code	Name of the Discipline / Branch of Study
BA	Bachelor of Arts	AE	Advanced Embedded Systems
BB	BBM (Bachelor of Business	AI	Advanced Information Technology
BC	B.Com (Bachelor of Commerce)	AP	Advanced Power Electronics
BR	B. Arch (Bachelor of Architecture)	CA	Computer Aided Structural Engineering
BS	B Sc, BS (Bachelor of Science)	CE	Civil Engineering
BT	B.Tech (Bachelor of Technology)	CH	Chemistry
BP	Bachelor of Computer Applications	CO	Commerce
BL	LLB (Bachelor of Law)	CS	Computer Science and Engineering /
MA	Master of Arts	DE	Data Engineering and Cloud
MB	MBA (Master of Business Administration)	EC	Electronics and Communication Engineering
MC	M.Com (Master of Commerce)	EN	English
MS	M.Sc / MS (Master of Science)	MD	Machine Design and Dynamics
MT	M Tech (Master of Technology)	ME	Mechanical Engineering
MC	Master of Computer Applications	EE	Electrical & Electronics Engineering

REVA UNIVERSITY
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SCHOOL OF CIVIL ENGINEERING
M. Tech in CONSTRUCTION TECHNOLOGY & MANAGEMENT
(2019-2021)
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	M19CT1010	Building planning and Design	HC	BE / B. TECH in Civil Engineering	3	1	-	4	5
2	M19CT1020	Construction Methods and Equipment	HC		3	1	-	4	5
3	M19CT1030	Advanced design of pre-stressed & precast structures	HC		3	1	-	4	5
4	M19CT1040	Concrete Construction Technology	HC		3	1	-	4	5
5	M19CT1051	Pavement Design , Construction and Management	SC		3	1	-	4	5
	M19CT1052	Bridge Engineering	SC		3	1	-	4	5
6	M19CT1061	Special Concretes	SC		3	1	-	4	5
	M19CT1062	Environmental Engineering and Management	SC		3	1	-	4	5
TOTAL								**24**	**30**
Practical									
7	M19CT1070	Construction Materials lab	HC		0	0	4	4	3
TOTAL								**04**	**03**
TOTAL SEMESTER CREDITS								**28**	
TOTAL CUMULATIVE CREDITS								**28**	
TOTAL CONTACT HOURS								**33**	

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(2019-2021)
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	M19CT2010	Construction Costing and Financial Management	HC	BE / B. TECH in Civil Engineering	3	1	-	4	5
2	M19CT2020	Composite Materials	HC		3	1	-	4	5
3	M19CT2030	Building services	HC		3	1	-	4	5
4	M19CT2040	Foundation Design and Construction	HC		3	1	-	4	5
5	M19CT2051	Construction Planning and Control	SC		3	1	-	4	5
	M19CT2052	Modern Construction Materials	SC		3	1	-	4	5
	M19CT2053	Green Building Technology	SC		3	1	-	4	5
6	M19CT2061	Disaster Reduction and Management	SC		3	1	-	4	5
	M19CT2062	Low Cost Construction	SC		3	1	-	4	5
	M19CT2063	Shoring, Scaffolding and Formwork	SC		3	1	-	4	5
TOTAL								**24**	**30**
Practical									
7	M19CT2070	Construction Software Lab	HC		0	0	4	4	3
TOTAL								**04**	**03**
TOTAL SEMESTER CREDITS								**28**	
TOTAL CUMULATIVE CREDITS								**56**	
TOTAL CONTACT HOURS								**33**	

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SCHOOL OF CIVIL ENGINEERING
M. Tech in CNSTRUCTION TECHNOLOGY AND MANAGEMENT
(2019-2021)
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	M19CT3010	Roads and Building Structures	OE	BE / B. TECH in Civil Engineering	4	0	0	4	4
2	M19CT3020	Internship with Report	Term Work and Viva - Voce		2	0	10	12	
3	M19CT3030	Project Phase-I	Report and Viva -Voce		0	0	4	04	
TOTAL								**20**	
TOTAL SEMESTER CREDITS								**20**	
TOTAL CUMULATIVE CREDITS								**76**	
TOTAL CONTACT HOURS								**-**	

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Bengaluru, India

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SCHOOL OF CIVIL ENGINEERING

M. Tech in CONSTRUCTION TECHNOLOGY AND MANAGEMENT (2019-2021)

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	M19CT4010	Technical Seminar With Report	Term Work		0	0	4	4	
2	M19CT4020	Dissertation Phase-II	Thesis Submission and Viva-Voce		4	0	12	16	
TOTAL								**20**	
TOTAL SEMESTER CREDITS								**20**	
TOTAL CUMULATIVE CREDITS								**96**	
TOTAL CONTACT HOURS								**-**	

Note: 1)OPEN ELECTIVE Courses are offered for the students of other Schools. The students of the School of Civil Engineering have to **choose ONE Open Elective offered by other schools**.

2) Open elective Classes will be conducted on Saturdays only

PROGRAMME OUTCOMES (PO's):

On successful completion of the Programme the students shall be able to:

a. Apply the fundamental knowledge of mathematics topics like calculus, matrix theory, and Finite differences, Optimization methods and the fundamental knowledge of Physics, Chemistry, Basics of Engineering.
b. Design and conduct experiments, as well as to analyze and interpret data.
c. Design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, Manufacturability and sustainability.
d. Function on multidisciplinary teams
e. Identify, formulate, and solve Civil Engineering problems in accordance with the relevant standard codes of practice.
f. Understand the role of Civil Engineers and ethical responsibility.
g. Communicate effectively through verbal, written, and graphical modes.
h. Perform on the basis of broad education necessary to understand the impact of engineering Solutions in a global, economic, environmental, and societal context.
i. Recognize the need for, and an ability to engage in life-long learning.
j. Incorporate specific contemporary issues into the identification, formulation, and solution of specific civil engineering problems.
k. Use the techniques, skills, and modern civil engineering tools necessary for engineering practice

FIRST SEMESTER

M19CT1010		L	T	P	C	Hrs.
Duration: 16weeks	**BUILDING PLANNING AND DESIGN**	3	1	0	4	5

Prerequisite: Building Planning and Construction

COURSE OBJECTIVES: Student will be able to learn

- To understand the byelaws and municipality act
- To get the knowledge of soil characteristics for deciding the depth of foundations
- To know the seismic affects to implement the design criteria
- To practice the designs of different structural elements

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

- To implement the byelaws and municipality act for planning of the buildings
- To decide the type of foundation to be provided by knowing the bearing capacity of the soil and its characteristics
- To be able to implement the design criteria required for earthquake prone zones
- To design of different structural elements

UNIT-I	**12HOURS**
Architecture: Land Acquisition Act 1894 (short titles, extent & definitions ONLY).Municipality act 1911 (short titles, extent & definitions only, Power of committee for making byelaws, for punishment, to sanction)Architectural Planning and Layout: Principles of planning a building, Factors affecting,selection of site for building, Sun & the building	
UNIT-II	**12HOURS**
SOIL: Soil formation, particle size analysis, Indian Standard Soil Classification, time-settlement curve,Proctor test, compaction of sand, factors affecting compaction, field compaction methods, calculation of Bearing Capacity of soil by Standard Penetration Test, soil investigation report, types of shear failures, effect of water table on B.C., Settlement cases, calculation of B.C. by Plate Load Test.Examples on determining area of foundation.	
UNIT-III	**12HOURS**
Structure: Earthquake: Hazardous affects on structures & Ground, General guidelines for earthquake resistance buildings. Liquefaction, factors affecting liquefaction &prevention, Various Loading Conditions and Analysis of Multistoreyed Complex (Kani's Method for vertical loads and Portal Method for Lateral loads)	
UNIT-IV	**12HOURS**
Structural Design of simply supported and cantilever reinforced concrete beams, columns, slabs, Foundations and Stairs.Structural Drawings with reference to seismic effects.	

REFERENCE BOOKS

1. Soil Mechanics and Foundation Engg – Dr K R Arora – Standard Publishers.
2. Building planning designing and scheduling – Gurcharan Singh
3. Construction equipment and its planning and application Dr. Mahesh Verma.

4. Construction Planning equipment and Methods by RL Peurify Tata McGraw Hill.
5. IS- 1888 (1978): Plate Load Test
6. IS – 6403 (1981): Bearing capacity of shallow Foundation

Mapping of Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 010	CO1		3								2	1	3			2
	CO2	3		3	2				2	3		3	3	3		3
	CO3	3			3	2	1			2	1		3	1	2	3
	CO4	3		3									3	2	3	3

M19CT1020	CONSTRUCTION METHODS AND EQUIPMENT	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: Building Construction

COURSE OBJECTIVES: Student will be able to learn

- To study different methods of excavations and equipments used for excavation
- 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 equipments used

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

- implement methods of excavations and equipments for the excavations
- To decide the provision of scaffolding and formwork to be used for high rise structures
- To implement construction and erection techniques for bridges
- 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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 020	CO1	3	3										3			2
	CO2	3		3						2			3			2
	CO3	3								3			3			1
	CO4	3		3						3			3			2

M19CT1030		L	T	P	C	Hrs.
Duration: 16weeks	**ADVANCED DESIGN OF PRESTRESSED AND PRECAST STRUCTURES**	3	1	0	4	5

Prerequisite: Design of Prestressed Concrete Structures

COURSE OBJECTIVES: Student will be able to learn

- To impart the knowledge about behaviour, analysis and design of pre-stressed concrete members
- To develop an understanding of the design of continuous beams and simple portal frames.
- To study the design of anchorage zones, composite beams, analysis and design of continuous beam
- To study the shear and Torsional resistance of prestressed members

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

- Develop skills in the analysis and design of pre-stressed concrete beams, columns and slabs
- Design anchorage zones and composite pre-stressed concrete members.
- Understand the concepts and techniques of precast construction and Select or design precast elements
- Is able to understand the shear and Torsional resistance of prestressed members

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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 030	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		

M19CT1040	CONCRETE CONSTRUCTION TECHNOLOGY	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

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 concreting operations and equipments used
- To know different special concrete operations to be carried out
- 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:

- To decide the dosage of chemical admixtures to be used and mix design procedure
- To implement the concreting operations and equipments to be used
- To decide different special concrete operations to be carried out for specific requirements
- 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 work for 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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 040	CO1		3	3	2	1						2	3			2
	CO2		3	3						2			3			2
	CO3	3	3	3						3			3			1
	CO4	3	3	3						3			3			2

M19CT1051		L	T	P	C	Hrs.
Duration: 16weeks	**PAVEMENT DESIGN ,CONSTRUCTION AND MANAGEMENT**	3	1	0	4	5

Prerequisite: Transportation Engineering

COURSE OBJECTIVES: Student will be able to learn

- To know the different types of pavements and their functions
- 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
- To design of rigid pavements as per Indian Roads Congress standards and AASHTO standards
- 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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 051	CO1	3	3	3		1	1						3			3
	CO2	3	3	3	3	2	3			3			3	3	3	
	CO3	3	3	2	3	2	3			3			3	3	3	
	CO4	3	3	3	2			2					3	3		

M19CT1052		L	T	P	C	Hrs.
Duration: 16weeks	**BRIDGE ENGINEERING**	3	1	0	4	5

Prerequisite: Design of RCC and PSC structures

COURSE OBJECTIVES: Student will be able to learn

- Construction of substructures such as pile foundations and pile concreting under various soil conditions
- Caisson construction and sinking methods
- Construction of superstructure in reinforced and prestressed concrete
- Construction of box girder deck slab construction and segmental construction

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

- Conceptualise the Construction of substructures such as pile foundations and pile concreting under various soil conditions

- Design and implement Caisson construction and sinking methods
- Implement the methods of superstructure in reinforced and prestressed concrete construction
- 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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19CT1052	CO1	3	3		2			2	1	3		1	3	2	3	1
	CO2	3		3			2	1	2	2			3	2	2	2
	CO3	3	3		3			2	2	1			3		1	1

	CO4	3		3	2							3			2

M19CT1061		L	T	P	C	Hrs.
Duration: 16weeks	**SPECIAL CONCRETES**	3	1	0	4	5

Prerequisite: Concrete Technology

COURSE OBJECTIVES: Student will be able to learn

- Components of modern concrete and developments in the process and constituent materials
- High density concrete and ferrocement, their proportions and design
- Fibre reinforced concrete, materials, mix proportioning and distribution
- High performance concrete, their constituents and mix proportioning

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

- Implement the modern concrete and developments in the process of constructions
- Design High density concrete and ferrocement and their applications in the construction industry
- Design Fibre reinforced concrete for special applications to increase the tensile strength characteristics of concrete
- Design High performance concrete, their constituents and mix proportioning

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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 061	CO1		3	3						2		2	2		2	
	CO2		3	3	3	1		2		2	1	2	3	2	3	1
	CO3	3	3	3	3	1		2		2	1	2	3	2	3	1
	CO4	3	3	3	3	1		2		2	1	2	3	2		

- Implement the modern concrete and developments in the process of constructions
- Design High density concrete and ferrocement and their applications in the construction industry
- Design Fibre reinforced concrete for special applications to increase the tensile strength characteristics of concrete
- Design High performance concrete, their constituents and mix proportioning

M19CT1062		L	T	P	C	Hrs.
Duration: 16weeks	**Environmental engineering and management**	3	1	0	4	5

Prerequisite: Environmental Engineering

COURSE OBJECTIVES: Student will be able to learn

- Concepts of environmental impact assessment
- Unique pollution problems and public participation
- Measurement of environmental impact and organisation
- Environmental management, principles and strategies

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
- Organise systematically to implement the methodologies for assessment

- Apply the principles and strategies for environmental management

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 Po's and Co's

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	PSO1	PSO 2	PSO 3	PSO 4
M19 CT1 062	CO1			3			2	2	1	1			3			1
	CO2	3		3		2	1		3	2		2	3	2		2
	CO3	3		3	3	2	1			3			3	2		2
	CO4	3		3	3	3		2	3				3			3

M19CT1070		L	T	P	C	Hrs.
Duration: 16weeks	**CONSTRUCTION MATERIALS LAB**	0	0	4	4	3

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 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
- Identify the proportion of the mix design
- 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2	PSO3	PSO4
M19CT1070	CO1		3	2	3		2	2	1	1			3	2	3	1
	CO2	3	2	3	3	2	1		3	2		2	3	1	3	2
	CO3	3	3	3	3	2	1			3			3	2	3	2
	CO4	3	2	3	3	3		2	3				3	2	3	3

M19CT2010		L	T	P	C	Hrs.
Duration: 16weeks	**CONSTRUCTION COSTING AND FINANCIAL MANAGEMENT**	3	1	0	4	5

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
- Time value for money and discounted cash flow
- Accounting information and application in construction industry

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

- Implement financial management and supply-demand mechanism
- 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.

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2	CO1	3	3	3		1	2	3	2			2		3		
	CO2	3	3	3		2	3					1	2	3	1	

010	CO3	3	3	3	2		3		1					3	2	
	CO4	3	3	3		3		1				3			2	

M19CT2020		L	T	P	C	Hrs.
Duration: 16weeks	**COMPOSITE MATERIALS**	3	1	0	4	5

Prerequisite: Building Materials

COURSE OBJECTIVES: Student will be able to learn

- Theoretical concept of composite materials
- Behaviour, load bearing mechanism and designs
- Flexible and rigid connections and seismic behaviour of composite structures
- Behaviour of box girder bridges and design concepts

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

- implement the concept of composite materials
- Behaviour, load bearing mechanism and designs
- Flexible and rigid connections and seismic behaviour of composite structures
- Behaviour of box girder bridges and 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 Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 020	CO1	3	3	3	2	1				1			3			2
	CO2	3	3	3		2				2		2	3	2	1	2
	CO3	3	3	3	2	3				3	3	1	3			2
	CO4	3	3	3		2				3		2	3		2	2

M19CT2030		L	T	P	C	Hrs.
Duration: 16weeks	**BUILDING SERVICES**	3	1	0	4	5

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
- General requirements of fire resisting building
- Electrical services in buildings

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
- Provisions to make fire resisting buildings
- Design of Electrical services in buildings

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 DumbwaitersUses 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

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
8. Krieder, J. F., Handbook of Heating Ventilation and Air Conditioning, Taylor & Francis, 2005
9. Barrie Rigby, Design of Electrical Services for Buildings, 4th Edition, Routledge, 2013
10. W. E. Steward, T. A. Stubbs, Modern Wiring Practice Design and Installation; 14 edition, Newnes,2009

- Design the required services for different types of buildings
- Implementation and design of the lifts, their locations and sizes
- Provisions to make fire resisting buildings
- Design of Electrical services in buildings

Mapping of Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 030	CO1		3	3						3		2	3	2	3	
	CO2		3	3				1		3		2	3	2	3	3
	CO3		3	3	2	2				3	2	1	3			

	CO4		3	3						3		2	3	2	3	

M19CT2040	FOUNDATION DESIGN AND CONSTRUCTION	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: RCC Design of Structures

COURSE OBJECTIVES: Student will be able to learn

- Function and settlement determination of shallow foundations
- Function and classifications of piles and concepts of raft foundations
- Caisson type and stability of caissons
- Types of machine foundations and general requirements

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

- Design of shallow foundations and settlement determination
- Load evaluation of piles and ground modification of raft foundations
- Design and construction aspects of Caissons
- Field tests for the provision of machine foundations

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 Po's and Co's

- Design of shallow foundations and settlement determination
- Load evaluation of piles and ground modification of raft foundations
- Design and construction aspects of Caissons
- Field tests for the provision of machine foundations

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 040	CO1	3	3	3						3		2	3	2	3	2
	CO2	3	3	3		3				2			3	2	1	1
	CO3	3	3	3	2					3		2	3	2	3	
	CO4	3	3	3									3	1	2	

M19CT2051		L	T	P	C	Hrs.
Duration: 16weeks	**CONSTRUCTION PLANNING AND CONTROL**	3	1	0	4	5

Prerequisite: Building Planning and Construction, Concrete Technology

COURSE OBJECTIVES: Student will be able to learn

- 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

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

- 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

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**
Time: 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 Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 051	CO1	3	3	3		2				2		2		3		3
	CO2	3	3	3				2		2		2	3			1
	CO3	3	3	3	2							2		2	3	
	CO4	3	3	3							3	2	3	2		1

M19CT2052	MODERN CONSTRUCTION MATERIALS	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: Concrete Technology

COURSE OBJECTIVES: Student will be able to learn

- Properties and specifications of concrete making materials
- Different concreting techniques and types of concretes
- Use of waste industrial waste products
- Concept of painting and varnishing

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

- Implementing the specifications for concrete making materials
- Practical implementation of concreting techniques
- Practicing the waste industrial waste products
- Application of painting and varnishing

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 Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 052	CO1		3	3	2				3		3	2	3	2	3	2
	CO2		3	3			3		2				3	2		2
	CO3	3	3	3	2						3		3	2		1
	CO4	3	3	3									3			2

- Implementing the specifications for concrete making materials
- Practical implementation of concreting techniques
- Practicing the waste industrial waste products
- Application of painting and varnishing

M19CT2053	GREEN BUILDING TECHNOLOGY	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: Concrete Technology

COURSE OBJECTIVES: Student will be able to learn

- Life cycle impacts of materials and products and sustainable design concepts
- Building energy simulation and efficiency
- Indoor environmental quality management
- 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
- Simulate the building energy and design for efficiency
- To adopt indoor environmental quality management
- 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- Fans and 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 Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 053	CO1	3	3						3	3		3	3		2	3
	CO2	3		3		2			2	1	2	2	3	3	3	2
	CO3	3			2			2					2	2		1
	CO4	3		3					3	3		3	3		2	3

M19CT2061	DISASTER REDUCTION AND MANAGEMENT	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: Design of Earthquake resistant structures

COURSE OBJECTIVES: Student will be able to learn

- Concept of natural and manmade disasters and risks involved
- Phases of disasters and preparedness
- Disaster life cycle, planning and preparations
- Disaster management scenario in Indian context

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
- To design for preparedness to manage disasters
- Plan and prepare for Disaster life cycle
- Management of disasters with available resources in Indian scenario

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 non structural 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 equipments, safe use of equipments

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 Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 061	CO1	3	3						2		3		3			3
	CO2	3	3	3					2		3		3		1	
	CO3	3	3						2		3		3		2	
	CO4	3	3	3					2		3		3			3

M19CT2062	LOW COST CONSTRUCTION TECHNOLOGY	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: Building Construction

COURSE OBJECTIVES: Student will be able to learn

- Materials to be used in the low cost constructions
- Recycling of wastes in manufacturing materials used for housing
- Roof elements constructed used by low cost materials
- Laurie Baker's concept of low cost technology

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

- Adopting the low cost materials in the low cost constructions
- Use of recycled wastes in manufacturing materials used for housing
- Implementation for roof elements constructed used by low cost materials
- Low cost technology adopted by Laurie Baker

Laurie Baker's concept of low cost technology

UNIT-I	12HOURS

Improvement of mud , Stabilization, Non-erodible mud plaster , Terra-cotta skin to mud walls Improved Thatch Roof, Wardha Tumbler Tiles, Ferro-Cement, Fly ash-sand Lime Bricks, Clay Fly ash Burnt Bricks, Cement Bonded Fiber Roofing Sheets, Gypsum Based Ceiling Tiles, Precast Stone Blocks, Precast Hollow Concrete Blocks, Holo-Pan system

UNIT-II	12HOURS

Selection of Materials for Low Cost Housing, In Manufacturing of low cost building materials – Pollution prevention, Recycling of wastes in Manufacturing, Reducing Energy Consumption and use of Natural materials, Use of Local material, Foundation, Plinth, Walling, Concrete block walling

UNIT-III	12HOURS

Soil cement block technology, Doors and windows, Lintels and Chajjas, Roofing, Filler slabs, Jack arch roof/floor, Ferrocement channel/shell unit, Finishing Work, Case histories in India, Sustainable building technology for mass application

UNIT-IV	12HOURS

HUDCO Projects, project on Panchayat Raj, National Institute of Rural Development funded project: Access to Housing for the Rural Poor 2014, Laurie Baker Building Centre: Projects carried under low cost technology

REFERENCE BOOKS

1. Low-cost Concrete Houses"-1963. The Concrete Association of India, Cement House, 121, Queen's Road, Bombay.

2. "Papers on Housing" - 1969. Calcutta Metropolitan Planning Organization, Development and Planning (T S CP) Dept. Govt. of West Bengal, Calcutta.

3. "Low cost-Soil Cement Houses" 1966. The concrete Association of India, Bombay.

4. "Elementary Hand book of Concrete House Construction" - 1963 The Concrete Association of India, Bombay.
5. "Low cost Housing-designs for North Bengal-Siliguri Planning Organization, Development and Planning (T S CP) Dept., Govt. of West Bengal, Calcutta.
6. "Low cost Integral House" - S.K.Iyer, Architecture and Building Industry, May 1969, 87/88, New Market, Begam Bridge, Meerut, U.P.
7. "Precast Concrete Floors and Roofs" - 1958, The Concrete Association of India, Bombay.
8. "Building Digest 45" Sept., 1966, Central Building Research Institute, Roorkee, U.P., India.
9. "Building Digest-43" July, 1966, Central Building Research Institute, Roorkee, India.

Mapping of Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 062	CO1	3	3	3			2		2		3		3	2	1	2
	CO2	3							2		3		3	1	2	
	CO3	3		3	3				2		3		3			3
	CO4	3					2		2		3		3		2	

M19CT2063	SHORING, SCAFFOLDING AND FORMWORK	L	T	P	C	Hrs.
Duration: 16weeks		3	1	0	4	5

Prerequisite: Concrete Technology

COURSE OBJECTIVES: Student will be able to learn

- Understand the planning of formwork installations
- Materials to be used in the form
- Design the forms and shoring
- 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
- Decide the materials to be used in the form
- Design the forms and shoring
- 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 – Flying system 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 Po's and Co's

Course Code	POS/ COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2	PSO 3	PSO 4
M19 CT2 063	CO1	3	3								2		3	2	1	2
	CO2	3		3									3	1	2	
	CO3	3	3		3					2	2		3			
	CO4	3		3									3			

M19CT2070		L	T	P	C	Hrs.
Duration: 16weeks	**CONSTRUCTION SOFTWARE LAB**	0	0	4	4	3

Prerequisite: AUTOCAD,STAAD PRO and ETABS

COURSE OBJECTIVES: Student will be able to learn

- Importing and exporting data
- Project management modules
- Linking the project management and Contract manager modules
- Transferring the data to Primavera Contractor users

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

- To plan the building and scheduling for multistoreyed building
- To plan and schedule the road projects
- To prepare resource sheet and assign the level of resources
- Plot the variance graphs for the assigned Projects

PRIMAVERA :

Basics and application of Primavera software referring the Primavera Manual
And solving the problems as following:

1. Planning and Scheduling of Multi storeyed 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
M19CT 2070	CO1	3	3	3	3	3						3	3	2	1	2
	CO2	3	3	3	3	3						3	3	2	1	
	CO3	3	3	3	2				2	2		1	3	2	1	2
	CO4	3	3	3	2							1	3	2	1	

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

M19CT3010	ROADS AND BUILDING STRUCTURES	L	T	P	C	Hrs.
Duration:16week		3	1	0	4	5

COURSE OBJECTIVE: Student will be able to learn

- About traffic characteristics and control over the vehicles.
- The importance of highway geometric design and drainage systems.
- Understand the building planning and Bye-Laws.
- Different aspects of building construction.

COURSE OUTCOME: After successful completion of this course thestudent will be able to:

- Describe about traffic characteristics and control over the vehicles.
- Provide conceptual details of highway geometric design and drainage systems
- Describe building planning and Bye-Laws.
- Provide different aspects of building construction.

UNIT-I	12HOURS

Traffic Characteristics: Objectives and scope of traffic engineering. Components of road traffic: the vehicle, driver and road. Road user characteristics: human and vehicular characteristics.
Traffic Regulation and Control: Driver, vehicle, traffic flow and general regulations and control. Traffic Control Devices: traffic signs, markings, islands and signals.

UNIT-II	12HOURS

Elements of Highway Geometric Design: Design controls and criteria. Cross Section Elements: Pavement surface characteristics, width considerations for various components of cross section elements, right of way.
Highway Drainage: Objects and requirements of highway drainage. Surface drainage systems – analysis and design. Sub-surface drainage systems types and design.

UNIT-III	12HOURS

Building Planning: Introduction, Types of Buildings Based on Occupancy, Types of Residential Buildings, Basic Concepts of Building Elements,Methods of Construction,Cost-effective Building Techniques in Construction,Construction Management Techniques, Site Selection for Residential Buildings, Influence of Climate on Building Planning, Orientation of Building , Principles of Building Planning , Building bye-Laws , Planning of Residential Buildings, Building Services .

UNIT-IV	12HOURS

Building Construction: Foundations, Shallow and Deep Foundations, Stone Masonry, Brick Masonry,Partitions,Lintels, Stairs, Doors, Windows And Ventilators,Floors And Flooring , Roofs, Pointing And Plastering , Painting, Varnishing And Distempering, Etc. Acoustics, Fire Protection in Buildings.

REFERENCE

1. Khanna, S.K., Justo, C.E.G., and Veeraragavan, A., 'Highway Engineering', Nem Chand and Bros, Roorkee - 2014.
2. Kadiyali, L.R., `Traffic Engineering and Transport Planning', Khanna Publishers, Delhi – 2007.
3. Relevant IRC Publications.
4. "Building Drawing", Shah M.H and Kale C.M, Tata McGraw Hill Publishing co. Ltd., New Delhi.
5. "Building Construction", Gurucharan Singh, Standard Publishers &distributors, New Delhi.
6. National Building Code, BIS, New Delhi.

Mapping of Po's and Co's

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
M19CT3010	CO1		3								2	1	3			2
	CO2	3		3	2				2	3		3	3	3		3
	CO3	3			3	2	1			2	1		3	1	2	3
	CO4	3		3									3	2	3	3

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