ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2022 Rank Band : 201-250

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE

Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.

काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत

కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము

(An Autonomous Institute under Kakatiya University, Warangal)

(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)

website: www.kitsw.ac.in | E-mail: principal@kitsw.ac.in | : +91 9392055211, +91 7382564888

DEPARTMENT OF CIVIL ENGINEERING

PG - M.TECH. - STRUCTURAL ENGINEERING & CONSTRUCTION

RULES & REGULATIONS FOR POSTGRADUATE PROGRAMME
M.TECH. 2-YEAR DEGREE PROGRAMME (PRR-20)

SYLLABI (I to IV Semesters)

ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2022 Rank Band : 201-250

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DEPARTMENT OF CIVIL ENGINEERING

• PG - M.Tech. •

STRUCTURAL ENGINEERING & CONSTRUCTION

Rules & Regulations for postgraduate Programme
M.Tech. 2-Year Degree Programme (PRR-20)

Syllabi (I Semester to IV Semester)

VISION OF THE INSTITUTE

- *To make our students technologically superior and ethically strong by providing quality education with the help of our dedicated faculty and staff and thus improve the quality of human life*

MISSION OF THE INSTITUTE

- *To provide latest technical knowledge, analytical and practical skills, managerial competence and interactive abilities to students, so that their employability is enhanced*
- *To provide a strong human resource base for catering to the changing needs of the Industry and Commerce*
- *To inculcate a sense of brotherhood and national integrity*

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) PG - M.Tech. (STRUCTURAL ENGINEERING & CONSTRUCTION)	
At the time of graduation, the post graduates of SE&C will be able to …	
PEO1 ***(Research and Innovation)***	*demonstrate an epistemic state of exploring the research-based innovation in structural and construction engineering*
PEO2 ***(Technical expertise and Successful career)***	*generate best possible outcomes through potent technical expertise and decisions, making them accountable in the construction industry*
PEO3 ***(Soft skills and Lifelong learning)***	*develop self-efficacy, meta cognition and entrepreneurship, thus laying foundation for lifelong learning in the domain of sustainable construction industry.*

1. NBA POs for M. Tech ***(STRUCTURAL ENGINEERING & CONSTRUCTION)***

PROGRAM OUTCOMES (POs)

PO1	*An ability to independently carry out research/investigation and development work to solve practical problems.*
PO2	*An ability to write and present an effective technical report/ document.*
PO3	*Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.*

2. M.Tech ***(STRUCTURAL ENGINEERING & CONSTRUCTION)***

PROGRAM SPECIFIC OUTCOMES (PSOs)

At the time of graduation, the post graduates of SE&C will be able to …	
PSO1	*apply knowledge of structural and construction engineering for technology transfer from research to innovation.*
PSO2	*evaluate construction projects with a deeper conceptual coherence and integrity.*

DEPARTMENT OF CIVIL ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL - 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION FOR TWO YEAR POSTGRADUATE PROGRAMME
M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

PRR-20

SEMESTER-I

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE -TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
				L	T	P		ATLP	CRP	CP	PPT					
1	PC	P20SC101	Limit Analysis of Reinforced Concrete Structures	3	-	-	3	8	8	8	6	10	20	60	40	100
2	PC	P20SC102	Construction Management	3	-	-	3	8	8	8	6	10	20	60	40	100
3	PE	P20SC103	Professional Elective-I/ MOOC-I	3	-	-	3	8	8	8	6	10	20	60	40	100
4	PE	P20SC104	Professional Elective-II/ MOOC-II	3	-	-	3	8	8	8	6	10	20	60	40	100
5	PC	P20SC105	Structural Engineering Laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
6	PC	P20SC106	Construction Planning and Scheduling Laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
7	MC	P20MC107	Research Methodology & IPR	2	-	-	2	8	8	8	6	10	20	60	40	100
8	AC	P20AC108	Audit Course-I	2	-	-	1	8	8	8	6	10	20	60	40	100
			Total:	16	-	8	19							480	320	800

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Elective-1	Elective-2	Audit Course-1
P20SC103A: Matrix Analysis of Structures	P20SC104A: Behavior of Concrete	P20AC108A: English for Research Paper Writing
P20SC103B: Design of Concrete Bridges	P20SC104B: Construction Project Administration	P20AC108B: Sanskrit for Technical Knowledge
P20SC103C: Precast Concrete Technology	P20SC104C: Building Services	P20AC108C: Constitution of India
P20SC103D: MOOCs	P20SC104D: MOOCs	P20AC108D: Pedagogy Studies

Additional Learning: Students are advised to do MOOCs to bridge the gap in the curriculum as suggested in the DAC. The credits will be provided in the grade sheet.

Total Contact Periods/Week: 24 **Total Credits: 19**

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M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

PRR-20

SEMESTER-II

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE - TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
				L	T	P		ATLP	CRP	CP	PPT					
1	PC	P20SC201	Dynamics of Structures	3	-	-	3	8	8	8	6	10	20	60	40	100
2	PC	P20SC202	Construction Techniques & Equipment	3	-	-	3	8	8	8	6	10	20	60	40	100
3	PE	P20SC203	Professional Elective-III/ MOOC-III	3	-	-	3	8	8	8	6	10	20	60	40	100
4	PE	P20SC204	Professional Elective-IV/ MOOC-IV	3	-	-	3	8	8	8	6	10	20	60	40	100
5	PC	P20SC205	Structural Engineering Software Applications Laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
6	PC	P20SC206	Infrastructure Design and Drawing laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
7	PROJ	P20SC207	Mini Project with Seminar	-	-	4	2	-	-	-	-	-	-	100	-	100
8	AC	P20AC208	Audit Course-II	2	-	-	1	8	8	8	6	10	20	60	40	100
			Total:	14	-	12	19							520	280	800

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Elective- 3	Elective- 4	Audit Course - 2
P20SC203A: Earthquake Resistant Design of RCC Structures	P20SC204A: Quality and Safety Management	P20AC208A: Stress Management by Yoga
P20SC203B: Design of Special Structures	P20SC204B: Sustainable Construction Engineering	P20AC208B: Value Education
P20SC203C: Repair, Rehabilitation and Retrofitting of structures	P20SC204C: Urban Infrastructure Planning and Management	P20AC208C: Personality Development through Life Enlightenment Skills
P20SC203D: MOOCs	P20SC204D: MOOCs	P20AC208D: Disaster Management

Total Contact Periods/Week: 26 **Total Credits: 19**

Note: The students shall undergo mandatory Industrial training/ Internship for at least 6 to 8 weeks during summer vacation at Industry/R&D organization. Internship evaluation will be done during the III semester.

Additional Learning: Students are advised to do MOOCs to bridge the gap in the curriculum as suggested in the DAC. The credits will be provided in the grade sheet.

DEPARTMENT OF CIVIL ENGINEERING

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL - 15

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SCHEME OF INSTRUCTION & EVALUATION FOR TWO YEAR POSTGRADUATE PROGRAMME

M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

PRR-20

SEMESTER-III

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE - TA							ESE	Total Marks
				L	T	P		I²RE				Minor	MSE	Total		
								ATLP	CRP	CP	PPT					
1	PE	P20SC301	Professional Elective-V/ MOOC-V	3	-	-	3	8	8	8	6	10	20	60	40	100
2	OE	P20OE302	Open Elective-I/ MOOC-VI	3	-	-	3	8	8	8	6	10	20	60	40	100
3	PROJ	P20SC303	Dissertation Phase - I/Industrial Project *(to be continued in IV – Semester also as Dissertation Phase – II)*	-	-	18	9	-	-	-	-	-	-	100	-	100
4	PROJ	P20SC304	Internship Evaluation	-	-	2	-	-	-	-	-	-	-	100	-	100
			Total:	6	-	20	15							320	80	400

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Elective- 5	Open Elective
P20SC301A: AI & ML applications in Construction Engineering	P20OE302A: Business Analytics
P20SC301B: Theory of Elasticity	P20OE302B: Industrial Safety
P20SC301C: Finite Element Method	P20OE302C: Operations Research
P20DS301D:MOOCs	P20OE302D: Cost Management of Engineering Projects
	P20OE302E: Composite Materials
	P20OE302F: Waste to Energy
	P20OE302G: Renewable Energy Sources
	P20OE302H: MOOCs

Total Contact Periods/Week: 26 **Total Credits: 15**

Additional Learning: Students are advised to do MOOCs to bridge the gap in the curriculum as suggested in the DAC. The credits will be provided in the grade sheet.

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KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL - 15
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M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

PRR-20

SEMESTER-IV

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE - TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
				L	T	P		ATLP	CRP	CP	PPT					
1	PROJ	P20SC401	Dissertation Phase - II	-	-	30	15	-	-	-	-	-	-	60	40	100
			Total:	-	-	30	15							60	40	100

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Total Contact Periods/Week: 30 **Total Credits: 15**

COURSE CREDIT STRUCTURE COURSE WEIGHTAGE

Semester	PRR-20 Curriculum	As per Model Curriculum
I	19	18
II	19	18
III	15	16
IV	15	16
Total:	68	68

Courses	% Weightage of Courses
Professional Theory	42.85 % (9/21)
Professional Lab	38.1 % (8/21)
Other	19.05 % (4/21)
Total:	100 % (21/21)

SEMESTER vs COURSE CATEGORY WEIGHTAGE

Number of Courses / Number of Credits (*Course Category wise*)

Semester	MC	PC	PE	OE	PROJ	AC	TOTAL
I	1/2	4/10	2/6	-	-	1/1	8/19
II	-	4/10	2/6	-	1/2	1/1	8/19
III	-	-	1/3	1/3	2/9	-	4/15
IV	-	-	-	-	1/15	-	1/15
Total	1/2	8/20	5/15	1/3	4/26	2/2	21/68
% Weightage of Course Category	2.94 % (2/68)	29.41 % (20/68)	22.05 % (15/68)	4.41 % (3/68)	38.23 % (26/68)	2.94 % (2/68)	100 % (68/68)

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RULES AND REGULATIONS FOR POSTGRADUATE PROGRAMME - M.TECH 2-YEAR DEGREE PROGRAMME (PRR-20)
CHOICE BASED CREDIT SYSTEM (CBCS)
(Applicable from the academic year 2020-21)

1. INTRODUCTION

1.1 Kakatiya Institute of Technology & Science, Warangal (KITSW) is UGC autonomous institute under Kakatiya University (KU) Warangal. The institute offers 2 year (4 semesters) Master of Technology (M.Tech) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year 2020-21.

1.2 The provisions contained in these regulations given the conditions for imparting course of instructions, conducting examinations and evaluation of students performance leading to M.Tech. 2 -year degree programme to be offered by the Kakatiya Institute of Technology & Science, Warangal and awarded by Kakatiya University, Warangal.

1.3 These regulations shall be called the ***Kakatiya Institute of Technology & Science, Warangal (KITSW) regulations for the award of M.Tech. 2-year degree programme*** *by Kakatiya University, Warangal.*

1.4 They shall come into effect from the date of getting approval from the Academic Council of the Kakatiya Institute of Technology & Science, Warangal

1.5 They shall be applicable for all students enrolling for M.Tech. 2-year degree programme at the Kakatiya Institute of Technology & Science, Warangal from the academic year 2020-21.

2. DEFINITIONS

2.1 ***"M.Tech."*** means Master of Technology, an Post Graduate Degree awarded from the Kakatiya University, Warangal

2.2 ***"University"*** means Kakatiya University, Warangal

2.3 ***"Institute"*** means Kakatiya Institute of Technology & Science, Warangal

2.4 ***"UGC"*** means University Grants Commission, New Delhi

2.5 ***"AICTE"*** means All India Council for Technical Education, New Delhi

2.6 ***"MHRD"*** means Ministry of Human Resource & Development, Govt. of India, New Delhi

2.7 ***"TSCHE"*** means Telangana State Council for Higher Education, Govt. of Telangana,Hyderabad

2.8 ***"GB"*** means Governing Body of the Institute

2.9 ***"AC"*** means Administrative Committee of the Institute

2.10 ***"FC"*** means Finance Committee of the Institute

2.11 ***"Academic Council"*** means Academic Council of the Institute

2.12 ***"Principal"*** means Principal of the Institute

2.13 ***"Dean"*** means Dean of specific affairs of the Institute

2.14 ***"HoD"*** means Head of the Department of specific programme offered by the Institute

2.15 ***"BoS"*** means Board of Studies in the engineering of a specific programme offered by the Institute

2.16 ***"CoE"*** means Controller of Examinations of the Institute.

3. POST GRADUATE PROGRAMMES IN ENGINEERING

3.1 The Institute shall offer the following Post Graduate (M.Tech.)Programmes in engineering under CBCS:

1. **Structural & Construction Engineering (offered by the Dept. of Civil Engineering)**
2. **Design Engineering (offered by the Dept. of Mechanical Engineering)**
3. **Digital Communication (offered by the Dept. of Electronics & Communication Engineering)**
4. **Software Engineering (offered by the Dept. of Computer Science & Engineering)**
5. **VLSI & Embedded Systems (offered by the Dept. of Electronics & Instrumentation Engineering)**
6. **Power Electronics (offered by the Dept. of Electrical & Electronics Engineering)**
7. **Data Science (offered by the Dept. of Information Technology)**
8. **Communication Engineering & Signal Processing (offered by the Dept. of Electronics & Communication Engineering)**

3.2 The provisions of these regulations shall also be applicable to any new postgraduate programmes that are introduced from time to time with approval from appropriate bodies such as MHRD / AICTE / UGC, etc.

4. ADMISSION

4.1

Course	Specialization	Eligibility		
		Qualifying degree	GATE/ GPAT Exam	PGECET Exam
M.Tech.	Structural Engg. & Construction	B.E. / B.Tech. / AMIE in Civil Engineering / Construction Engineering or equivalent. They should have qualified at GATE/PGECET	CE	CE
M.Tech.	Design Engineering	B.E. / B.Tech./ AMIE in Mechanical Engineering / Production Engineering / Industrial Engineering/ Aeronautical Engineering, / Marine Engineering or equivalent. They should have qualified at GATE /PGECET	ME	ME
M.Tech.	Digital Communication	B. E. / B.Tech. / AMIE in ECE, AMIE (Electronics & Telecommunication Engg. / B.E. / B.Tech. in Electrical or Electrical & Electronics Engg., EIE and Bio-medical Engg. or equivalent. They should have qualified at GATE / PGECET	EC / IN	ECE
M.Tech.	Software Engineering	B.E. / B.Tech. / AMIE in any branch of Engg. / Tech. (or) equivalent Master"s Degree in Physics, Statistics, Mathematics, Applied Mathematics, Applied Statistics, Applied Physics, Geophysics, M.Sc. (Computer Science), M.Sc. (Information Systems) (Computer Applications & Electronics) and MCA or equivalent. They should have qualified at GATE / PGECET	CS	CS
M.Tech.	VLSI & Embedded System	B.E. / B.Tech. / AMIE in ECE, EIE, EEE, CSE, IT (or) equivalent. They should have qualified at GATE / PGECET	CS / EC / IN / EE	EC
M.Tech.	Power Electronics	B.E. / B.Tech. / AMIE in Electrical & Electronics Engg. /Electrical Engg. or equivalent	EE	EE
M.Tech.	Data Science	B.E. / B.Tech. / AMIE in any branch of Engg. / Tech. (or) equivalent Master"s Degree in Physics, Statistics,	CS	CS

		Mathematics, Applied Mathematics, Applied Statistics, Applied Physics, Geophysics, M.Sc. (Computer Science), M.Sc. (Information Systems) (Computer Applications & Electronics) and MCA or equivalent. They should have qualified at GATE / PGECET		
M.Tech.	Communication Engineering & Signal Processing	B. E. / B.Tech. / AMIE in ECE, AMIE (Electronics & Telecommunication Engg. / B.E. / B.Tech. in Electrical or Electrical & Electronics Engg., EIE and Bio-medical Engg. or equivalent. They should have qualified at GATE / PGECET	EC / IN	ECE

4.2 The Admissions shall be made in accordance with the guidelines issued by TSCHE.

4.3 **For GATE candidates**

The candidates should have passed B.E./B.Tech./AMIE in any branch of Engg./ Tech. (or) equivalent Master"s Degree in Physics, Statistics, Mathematics or Applied Mathematics, Applied Statistics, Applied Physics, Geophysics, M.Sc. (Comp. Sc.), M.Sc. (Information Systems) (Computer Applications and Electronics) and MCA or equivalent. They should have qualified at the GATE and possess a valid GATE score. The seats will be assigned purely onthe basis of merit of GATE.

For Sponsored seats

The candidates should have passed BE/B.Tech./AMIE in any branch of Engg./ Tech. (or) equivalent Master"s Degree in Physics, Statistics, Mathematics or Applied Mathematics, Applied Statistics, Applied Physics, Geophysics, M.Sc. (Comp. Sc.), M.Sc. (Information Systems) (Computer Applications and Electronics) and MCA or equivalent.

The criterion for selection of sponsored candidates shall be by their merit at the entrance examination to be conducted by the PGECET

Admission shall made into sponsored category only with the candidates who are qualified either GATE/ PGECET or as decided by the admission committee.

1. His/ Her application shall be duly recommended by the sponsoring agency for admission to the course and forwarded to the Convener, PGECET
2. He/ She must be permanent employee with the sponsoring agency for at least two years, after obtaining the qualifying degree.
3. The sponsoring agency must be a Government establishment or a public-sector undertaking, or a reputed private engineering college
4. The sponsoring agency shall certify that the candidates will be granted leave for pursuing the M.E./ M.Tech. Regular course of study.
5. The candidates who are working Research Projects approved by the competent authority are also required to fulfill the above conditions before they are sponsored for admission

5. ACADEMIC SESSION

5.1 Each academic session is divided into two semesters (odd and even), each of 15 weeks including two Mid Semester Examinations (MSE).

a) **Odd Semester**: From 3rd week of June to Second week of October. However, academic session of the first semester will be decided based on counseling schedule declared by the TSCHE.

b) **Even Semester**: From November/December to March/April of academic year.

5.2 The Institute shall announce the schedule for all the academic activities well before the commencement of the academic year and take all the necessary steps to follow them scrupulously.

5.3 The academic activities in a semester normally include registration, course work, Continuous Internal Evaluation (CIE), End Semester Examination (ESE) and declaration of results.

6. REGISTRATION

6.1 All the students are required to register in person at the beginning of each academic year on the dates specified in the academic calendar (almanac).

6.2 The sole responsibility for registration rests with the student concerned.

6.3 Registration of students will be centrally organized by the Academic section.

6.4 The Registration procedure involves:

a) Filling of the prescribed registration form
b) Payment of fees and clearance of outstanding dues (if any)
c) Signing undertakings (undertaking for regular attendance, discipline and against ragging) along with the parents

6.5 If for any compelling reasons like illness, etc., a student is unable to register on the announced day of registration, he/she can register within 12 working days from the beginning of the academic year on payment of an additional late fee as prescribed by the Institute.

6.6 **No late registration shall be permitted after 12th working day** from the scheduled date of commencement of class work for that academic year.

6.7 Only those students will be permitted to register who have

a) cleared all institute and hostel dues of previous semesters
b) paid all required prescribed fees for the current academic year
c) not been debarred / detained from registering for a specified period on disciplinary or any other grounds
d) cleared the minimum academic requirement as detailed in Regulation No. 15

7. CURRICULUM

7.1 Assignment based Teaching Learning Process (ATLP)

7.2 I²RE (Innovation, Incubation, Research and Entrepreneurship) based Learning activity

7.3 Importance to the Course Projects

7.4 The Model curriculum/ Course structure as suggested by AICTE, New Delhi; Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, New Delhi is followed for all PG programmes.

7.5 The duration of the programme leading to M.Tech degree will be 4 semesters (2 academic years)

7.6 The curricula for 2-year M.Tech degree programme as proposed by the department and recommended by the BoS shall have the approval of the Academic Council.

7.7 As suggested by AICTE, the courses offered for PG programme are broadly classified as: Program Core courses; Program Elective courses ; Labs based on Core courses; Lab based onElective courses; Research Methodology and IPR (Mandatory); Audit courses; Open Elective;Mini Project with Seminar; Dissertation-1 / Industrial Project; Dissertation-2

7.8 The courses offered would have a ***Lecture–Tutorial–Practical (L-T-P)*** component to indicate contact hours. Separate laboratory (practical) course may exist (0-0-P) in certain casesas decided.

7.9 The academic programmes of the Institute follow the credit system.

7.10 Each course shall have credits(C), which reflects its weightage. The number of credits of a course in a semester shall ordinarily be calculated as under:

Number of credits of a course, C = L +(T + P) /2

- where ***L, T, P*** represent the No. of Lecture, Tutorial and Practical hours / week
- The fraction to be rounded off to next integer value

7.11 **Course Code:** Each course offered in the Postgraduate (M.Tech.) curriculum at this institute shall be listed by using a total of 8 digits, as follows:

Ex: **P20SC101**

a) The first letter, to represent the Post Graduate Programme
Ex. P for Postgraduate Course
b) The next two numericals, to represent the year in which the syllabus is proposed / revised.

Ex. 20 for the year 2020 from which syllabus is applicable for the batches admitted from academic year 2020-21

c) The next two letters, to represent the concerned department offering that course.
Ex. SC for Structural & Construction Engineering

d) The last three numerical, to represent the course number and semester in which it is being offered.
Ex. XYZ; X - Semester number ; YZ – Course number
101 represents course number 01 offered in first semester

In general, a **course code "P20SC101"** represents a **Postgraduate Course number-01 for the batches admitted from the year 2020 in Structural & Construction Engineering in first semester.**

7.12 The syllabus of each course in the M.Tech. curriculum shall be divided into four (4) units.

8. ATTENDANCE

8.1 All the students are normally required to have 100% attendance in aggregate. However, condonation for shortage of attendance upto 25% may be granted by the Principal based on recommendation of HoD concerned.

8.2 The condonation for shortage of attendance upto 25% (as mentioned in Regulation No. 8.1) shall be taken up only when the student takes prior permission for his absence stating fully the genuine reasons along with supporting documents to the HoD concerned.

8.3 Students not having the mandatory requirement of minimum 75% of attendance in aggregate shall be detained and shall not be permitted to appear for the MSE-II & ESE of that semester

8.4 All such students who are detained have to repeat the entire semester when it is offered, by following the due registration procedure.

8.5 Attendance of all courses shall be entered before the end of each working day by the faculty concerned through the College Management System (CMS) portal of the institute website. Students are advised to monitor the status of their attendance through this CMS portal.

9. CONDUCT AND DISCIPLINE

9.1 All students shall be required to conduct themselves in a manner befitting the reputation of the institution, within and outside the premises of the Institute; and are expected to complete their studies without any break.

9.2 As per the order of Hon"ble Supreme Court of India, ragging in any form is strictly banned. Involvement of a student in ragging will be considered as a gross indiscipline and may lead to his / her expulsion from the Institute.

9.3 Detailed rules regarding the conduct and discipline (code of conduct) are given in Appendix-1

10. EVALUATION PROCEDURE

10.1 The evaluation of students in every course of 2-year M.Tech. programme (4 semesters) is a continuous process and is based on their performance in different examinations as mentioned below:

a) Sessional, involving **Continuous Internal Evaluation (CIE)** conducted all through the semester which includes **Teachers Assessment (TA)** through assignments, course research papers, course patents, course presentation (with PPT), Minor and **Mid-Semester Examinations (MSE)**

b) Terminal often designated as **End Semester Examination (ESE)** which includes written examination for theory courses and practical/ dissertation courses.

10.2 A student"s performance in a course (subject) shall be judged by taking into account the result of Continuous Internal Evaluation (CIE) and End Semester Examination (ESE) together.

10.3 Continuous Internal Evaluation (CIE) and End Semester Examination (ESE) shall have 60:40 weightage i.e. CIE carrying 60% weightage and ESE carrying 40% weightage.

10.4 **Continuous Internal Evaluation (CIE) for Theory Course:**

10.4.1 Continuous Internal Evaluation (CIE) throughout the semester shall consist of Innovation Incubation Research and Entrepreneurship-Teachers Assessment (I^2RE - TA) and Mid Semester Examination (MSE).

10.4.2 The distribution given to each component of CIE for a theory course is given below:

S.No.	Particulars	Weightage
1.	Innovation Incubation Research and Entrepreneurship-Teachers Assessment (I^2RE -TA)	30%
2.	Minor Examination (**M-I & M-II**)	10%
3.	Mid Semester Examination (MSE) **(MSE-I & MSE-II)**	20%
	Total Weightage	**60%**

10.4.3 **Teachers Assessment (TA)**:

a) There shall be two Assignments, Special Assignments consisting of two CRPs & two CPs and one Course Presentation for each course at regular intervals of time
b) Assignment-I shall be based on Unit-I & Unit-II syllabi and to be submitted before MSE-I, Assignment-II shall be based on Unit-III & Unit-IV syllabi and to be submitted before MSE-II and average of Assignment-I and Assignment-II marks shall be taken under TA
c) Each special assignment (CRP-I, CP-I, CRP-II and CP-II) has to submit two page summary report.
d) Course Presentation can be on CRP-I/ CP-I/ CRP-II/ CP-II/ Course Project/Business Idea.

10.4.4 **Minor Examination**:

a) There shall be two minor examinations (M-I and M-II) of one hour duration each.
b) Minor-I shall be based on Unit-I syllabus, Minor-II shall be based on Unit-III syllabus.
c) Average of Minor-I and Minor-II marks shall be taken under TA.

10.4.5 **Mid Semester Examination (MSE)**:

a) There shall be two mid semester examinations (MSE-I and MSE-II) of two hour duration each.
b) It is mandatory for the student to take both MSEs
c) MSE evaluation shall be done as given below:

MSE marks awarded = (70% of the best of MSE-I & MSE-II marks) + (30% of the other MSE marks)

Ex: A student secured following marks
MSE-I marks : 10 out of 20
MSE-II marks : 20 out of 20
MSE marks awarded = (70% of 20) + (30% of 10) = 14 + 3 =17

10.4.5 The marks obtained by the students in MSE must be submitted to the Controller of Examination (CoE) by the teachers within 1 week from the date of conduct of the examination.

10.4.6 The dates for MSE and ESE will be declared by the CoE in consultation with the Dean, Academic Affairs.

10.5 End Semester Examination (ESE) for Theory Course:

There shall be an End Semester Examination (ESE) at the end of each semester for three hour duration for each course.

10.6 Continuous Internal Evaluation (CIE) for Practical (Laboratory) Course:

10.6.1 Continuous Internal Evaluation (CIE) for practical course shall carry 60% weightage.

10.6.2 The Continuous Internal Evaluation (CIE) throughout the semester shall consist of the following:

Assessment	Weightage
Regular Experimentation / Job work	15%
Regular submission of record	15%
Quiz / Skill test / Viva-voce at the end of semester	15%
Viva-voce at the end of semester	15%
Total Weightage	**60%**

10.7 End Semester Examination (ESE) for Practical (Laboratory) Course:

10.7.1 There shall be an ESE at the end of each semester for three hour duration for each practical course.

10.7.2 The ESE for practical course shall carry 40% weightage.

10.7.3 The marks distribution at ESE shall be as follows:

Assessment	Weightage
Procedure/Experimentation/Tabulation/Result. as applicable	30%
Viva-voce at the end of semester	10%
Total Weightage	**40%**

The weightage to different components under CIE carrying 60% weightage and ESE carrying 40% weightage is as below:

PRR - 20 (Continuous Internal Evaluation)				Marks	Minimum marks
MSE – 1		20 Marks	*(70% of the best of MSE-I & MSE-II marks) + (30% of the other MSE marks)*	20 Marks	07/20
MSE – 2		20 Marks			
Minor – 1		10 Marks	*Average of M-I & M-II marks*	10 Marks	04/10
Minor – 2		10 Marks			
Assignment – 1		8 Marks	*Average of A-I & A-II marks*	08 Marks	10/30
Assignment – 2		8 Marks			
Special Assignments	CRP-1	04 Marks	*Two page summary Report on course research paper - I*	04 Marks	
	CRP-II	04 Marks	*Two page summary Report on course research paper - II*	04 Marks	
	CP-I	04 Marks	*Two page summary Report on course patent - I*	04 Marks	
	CP-II	04 Marks	*Two page summary Report on course patent - II*	04 Marks	
CRP or CP Presentation		06 Marks	*PPT Presentation and viva voce (CRP or CP)*	06 Marks	
PRR-20 End Semester Examination (ESE)				40	14/40
			Total	**100 Marks**	**35/100**

10.8 Continuous Internal Evaluation (CIE) for Mini Project with Seminar:

(i) The *Post Graduate Mini Project Evaluation Committee (PGMPEC)* shall be constituted with HoD as a Chairman, M.Tech. Coordinator as a Convener and three to five other faculty members representing various specializations in that particular programme as members.

(ii) Student has to take up independent mini project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.

(iii) *PGMPEC* shall allot a faculty supervisor to each student for guiding on

(a) Selection of topic

(b) Literature survey and work to be carried out

(c) Preparing a report in proper format

(d) Right conduct of research and academic activity to promote academic integrity

(e) Use of anti-plagiarism software to detect plagiarism in the report and submission of Mini project report within acceptable plagiarism levels

(f) Effective mini project oral presentation before the PGMPEC

There shall be only Continuous Internal Evaluation (CIE) for seminar

(iv) The CIE for mini project is as follows:

Assessment	Weightage
Mini project Supervisor Assessment	20%
PGMPEC Assessment: ***(i)*** *Registration presentation* ***(10%)*** ***(ii)*** *Working model / process / software package / system developed* ***(20%)*** ***(iii)*** *Mini project report* ***(20%)*** ***(iv)*** *Mini project paper* ***(10%)*** ***(v)*** *Mini project video pitch* ***(10%)*** ***(vi)*** *Final presentation (with PPT) and viva-voce* ***(10%)***	80 %
Total Weightage:	**100%**

Note: It is mandatory for the student to

(i) appear for final presentation (with PPT) and viva-voce to qualify for course evaluation

(ii) write mini project paper in given journal format

(ii) create a good video pitch to present mini project

(a) **Mini Project Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals/Technical Magazines on the topics of potential interest

(b) **Working Model**: Each student is required to develop a working model/ process/ software package /system on the chosen work and demonstrate before the *PGMPEC* as per the dates specified by *PGMPEC*

(c) **Mini Project Report:** Each student is required to submit a well-documented mini project report as per the format specified by *PGMPEC*

(d) **Anti-Plagiarism Check:** The mini project report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(e) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *PGMPEC* as per the schedule notified by the department

(f) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her mini project. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his / her business idea / plan (*if any*) and social impact

(v) The student has to register for the Mini project as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce
(b) he/she fails to submit the report in prescribed format
(c) he/she fails to fulfill the requirements of Mini project evaluation as per specified guidelines

(vi) (a) The CoE shall send a list of students registered for supplementary to the HoD concerned
(b) The *PGMPEC*, duly constituted by the HoD, shall conduct Mini project evaluation and send the award list to the CoE within the stipulated time

10.9 Evaluation for Dissertation / Industrial Project:

Dissertation work shall be normally conducted in two stages: Dissertation *Phase-I* in third semester and Dissertation *Phase-II* in fourth semester.

Dissertation *Phase-I*:

(i) The Department *Post Graduate Review Committee (DPGRC)* shall be constituted with HoD as a Chairman, M.Tech. Coordinator as a Convener and three to five other faculty members representing various specializations in that particular programme as members.

(ii) (a) Student shall take up independent Dissertation Phase-I on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their programme of study, which would supplement and complement the program assigned to each student

(or)

(b) Student shall take up industrial project (in any industry) relevant to the courses offered in their programme of study, which would supplement and complement the program assigned to each student

(iii) DPGRC shall allot a faculty supervisor to each student for guiding on
(a) selection of topic
(b) literature survey and 50% work to be carried out during phase-I
(c) preparing a report in proper format and
(d) effective Dissertation Phase-I oral presentation before the DPGRC
(e) right conduct of research and academic activity to promote academic integrity
(f) use of anti-plagiarism software to detect plagiarism in the report and submission of Mini project report within acceptable plagiarism levels

(iv) In case of students with industrial projects, internal guide shall be there to track the progress from time to time

(v) There shall be only Continuous Internal Evaluation (CIE) for Dissertation Phase-I

(vi) CIE for the Dissertation Phase-I in third semester is as follows:

Assessment	Weightage
Dissertation Phase-I Supervisor Assessment	50%
DPGRC Assessment: ***(i)*** *Registration Presentation* ***(10%)*** ***(ii)*** *Progress Report on Phase-I* ***(10%)*** ***(iii)*** *Video pitch on Phase-I* ***(10%)*** ***(iv)*** *Progress Presentation -I and viva voce* ***(20%)***	50%
Total Weightage:	100%

Note: It is mandatory for the student to
(i) appear for progress presentation-I and viva voce to qualify for course evaluation
(ii) create a good video pitch on dissertation phase-I

(a) **Dissertation Topic:** The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals/Technical Magazines on the topics of potential interest

(b) **Working Model:** Each student is required to develop a working model/ process/software package/system, on the chosen work and demonstrate before the DPGRC as per the dates specified by DPGRC at the end of dissertation phase-II

(c) **Progress Report:** Each student is required to submit a well-documented progress report on dissertation phase-I as per format specified by DPGRC

(vii) The student has to register for the Dissertation Phase-I as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce

(b) he/she fails to submit the report in prescribed format

(c) he/she fails to fulfill the requirements of Dissertation Phase-I evaluation as per specified guidelines

(viii) (a) The CoE shall send a list of students registered for supplementary to the HoD concerned

(b) The DPGRC, duly constituted by the HoD, shall conduct Dissertation Phase-I evaluation and send the award list to the CoE within the stipulated time

Dissertation *Phase-II*:

(i) Student has to continue the Dissertation work in 4th semester as Dissertation Phase-II

(ii) There shall be Continuous Internal Evaluation (CIE) for 60 marks and End Semester Examination for 40 marks.

(iii) The evaluation for Dissertation Phase-II is as follows:

Assessment	Weightage
Dissertation Supervisor Assessment (10%) *DPGRC* Assessment: *(i) Progress presentation -II (10%)* *(ii) Progress presentation -III (10%)* *(iii) Working model/process/software package/system developed (10%)* *(iv) Dissertation Video pitch (10%)* *(v) Dissertation Paper (10%)*	**60%**
End Semester Examination: *(i) Dissertation Report (20%)* *(ii) Oral presentation (with PPT) and viva-voce (20%)*	**40%**
Total Weightage:	**100%**

Note: It is mandatory for the student to

(i) appear for oral presentation (with PPT) and viva-voce to qualify for course evaluation

(ii) write dissertation paper in given journal format

(iii) create a good video pitch on dissertation phase-I & II

(a) **Working Model:** Each student is required to develop a working model/ process/system on the chosen work and demonstrate before the DPGRC as per the dates specified by DPGRC at the end of dissertation phase-II

(b) **Dissertation Report:** Each student is required to submit a well-documented dissertation report as per the format specified by DPGRC

(c) **Anti-Plagiarism Check:** The dissertation report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(d) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the DPGRC as per the schedule notified by the department

(e) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her dissertation Phase-I & II. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his / her business idea / plan (if any) and social impact

(iv) Dissertation Synopsis Presentation (DSP):

(a) Students, with the consent of supervisor, shall apply to the DPGRC for conduct of dissertation synopsis presentation (DSP). This shall normally happen when the

supervisor feels that the student has done significant work to qualify for M.Tech. dissertation.

(b) Those students who clear DSP shall only be allowed to submit the dissertation report for end semester examination

(v) Dissertation Report:

After clearing DSP, student shall be required to submit two bound copies of dissertation report, one for the department and other for the Dissertation Supervisor. The Dissertation report shall be evaluated by the DPGRC and external examination shall be conducted on a pre-notified date.

10.10 Evaluation for Internship:

(i) The students shall undergo 6-8 weeks internship during summer/winter vacation at industry/R&D organization / Academic Institutes like IITs & NITs.

(ii) The students preferably shall undergo internship at one organization only. In case of any difficulty, the stipulated period of internship shall be completed at different organizations with minimum of two weeks internship at every stage.

(iii) The internship evaluation shall be done in the III semester of study and hence the students shall complete the prescribed period of internship before start of III semester (from end of I semester to commencement of III semester).

(iv) The internship evaluation shall be done by *Department Post Graduate Evaluation Committee (DPGRC).*

(v) There shall be only Continuous Internal Evaluation (CIE) for Internship Evaluation

(vi) CIE for the Internship in third semester is as follows:

Assessment	Weightage
Internship Supervisor"s Evaluation: *a) Completion of Internship Assignment (**10%**)* *b) Quality of work in completing the Internship Assignment (**10%**)* *c) Attendance, punctuality and work hours (**10%**)*	***30%***
DPGRC Assessment: ***a)** Duration (8 /6 weeks) **(15% / 10%)*** ***b)** Internship Report **(35%)*** ***c)** Oral Presentation (with PPT) and viva voce **(20%)***	***70%***
Total Weightage:	***100%***

Note: It is mandatory for the student to
(i) appear for oral presentation (with PPT) and viva voce to qualify for course evaluation

(a) Internship Report: Each student is required to submit a well-documented internship report as per format specified by DPGRC
(b) Anti-Plagiarism Check: The internship report should clear plagiarism check as per the Anti-Plagiarism policy of the institute
(c) Presentation: Each student should prepare PPT with informative slides and make an effective oral presentation before the DPGRC as per the schedule notified by the department

10.11 **Evaluation of MOOCs:**

a) **SWAYAM-MOOCs:** Massive Open Online Courses (MOOCs) are such online courses which are developed as per the pedagogy and made available on the SWAYAM (Study Web of Active-learning by Young and Aspiring Minds) platform of *Government of India*

b) **SWAYAM** shall notify to all Institutions, on 1st June, 1st November every year, the list of online learning courses going to be offered in the forth coming semester.

c) The student shall be allowed to register for MOOCs courses for the designated Professional electives and Open electives mentioned in the curriculum.

d) The student shall select a relevant MOOCs course carrying 3 credits.

e) The Institutional MOOCs coordinator with the help of departmental MOOCs coordinator shall guide the students throughout the course.

10.11.1 **Evaluation and Certification of MOOCs:**

a) The Principal Investigator (PI) shall be a subject matter expert (SME) belonging to a reputed educational institution, called Host Institution

b) The host Institution and PI shall be responsible for evaluating the registered students for MOOCs course

c) After conduct of examination and completion of the evaluation, the PI through host institution shall award Marks/Grade as per the evaluation scheme announced.

10.11.2 **Credit Mobility of MOOCs:**

a) Institution shall allow the credit mobility for the courses earned through MOOCs.

b) A certificate regarding successful completion of the MOOCs courses shall be issued through host Institution and sent to the parent institution.

c) The parent institution shall give equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform in the credit plan of the programme.

10.11.3 In case the student is unable to complete the MOOCs course, he/she shall be allowed to select one of courses listed under respective PE/OE offered at institute/department concerned and appear for supplementary examination. In such case, the student is deemed to have passed the course, if he/she scores minimum 35% of maximum marks allotted to the course in the registered supplementary ESE only (i.e. 35 marks out of 60 in ESE).

11. MINIMUM REQUIREMENT FOR PASSING A COURSE

11.1 **Theory Course**: A student is deemed to have passed in a theory course, if he / she secures

a) 35 percent of marks assigned to End Semester Examination (ESE) **and**

b) 35 percent of marks assigned to the Mid Semester Examination (MSE) & End Semester Examination (ESE) of the course taken together **and**

c) 35 percent of marks assigned to Teacher"s Assessment (TA), Mid Semester Examination (MSE) and End Semester Examination (ESE) of the course taken together.

11.2 The marks assigned to MSE will be considered as per the Regulation no. 10.4.4

11.3 **Laboratory Course**: A student is deemed to have passed in a laboratory course, if he / she secures

a) 35 percent of marks assigned to End Semester Examination (ESE) and

b) 35 percent of marks assigned to the Teachers Assessment (TA) and End Semester Examination (ESE) of the laboratory course taken together.

12. GRADING SYSTEM

12.1 At the end of the semester a student is awarded a letter grade in each of his / her courses taking into account the total marks secured (X) in that course

where, X = Marks secured in CIE + Marks secured in ESE

12.2 For arriving at a grade obtained by a student in a particular course (subject), initially numeric marks obtained by the student out of 100 are to be determined. Once a numeric mark is obtained, the same is to be converted to a letter grade following the guidelines given in 12.3 below.

12.3 The Institute shall follow absolute grading system. The grades will be awarded to each course as under:

Grade	Total Marks Secured (X)
S	$X \geq 90$
A	$80 \leq X < 90$
B	$70 \leq X < 80$
C	$60 \leq X < 70$
D	$45 \leq X < 60$
P	$35 \leq X < 45$
F	$X < 35$

12.4 The typical grades and their numerical equivalents on 10-point scale (called Grade Points) are as follows:

Performance	Letter Grade	Grade Points (Gi)
Superior	S	10
Excellent	A	9
Very Good	B	8
Good	C	7
Average	D	6
Pass	P	4
Fail	F	0

12.5 **F-Grade** is a Fail Grade. The course in which the student has earned F-Grade will be termed as backlog course.

12.6 In addition, there shall be a transitional **M-Grade.** M-Grade for "Debarred" due to indiscipline / malpractice during examination.

12.7 A Semester Grade Point Average (SGPA) will be computed for each semester. The SGPA will be calculated as follows:

$$SGPA = \sum_{i=1}^{n} C_i G_i \Big/ \sum_{i=1}^{n} C_i$$

where „n" is the no. of courses (subjects) offered (excluding mandatory non-credit courses) for the semester „C_i" is the credits allotted to a particular course, „Gi" is the grade-points carried by the letter corresponding to the grade awarded to the student for the course as illustrated in 12.4.

12.8 The SGPA would indicate the performance of the student in the semester to which it refers. SGPA will be rounded off to the second place of decimal and recorded as such.

12.9 Starting from the second semester, at the end of each semester, a Cumulative Grade Point Average (CGPA) will be computed for every student as follows:

$$CGPA = \sum_{i=1}^{m} C_i G_i \Big/ \sum_{i=1}^{m} C_i$$

where „m" is the total number of courses (subjects) the student has been offered from the first semester onwards upto and including the present semester, „C_i and „G_i" are as explained in 12.7.

12.10 The CGPA would indicate the cumulative performance of the student from the first semester up to the end of the semester to which it refers. CGPA will be rounded off to the second
place of decimal and recorded as such.

12.11 SGPA and CGPA are calculated in consideration of only credits cleared, i.e. F-Grade credits are not included for calculation.

13. SUPPLEMENTARY EXAMINATIONS

13.1 A student who obtained the F-Grade in a course (theory or practical) can appear in a subsequent End Semester Examination (ESE) in the same course as supplementary candidate.

13.2 However the marks secured in Continuous Internal Evaluation (CIE) by the student in that course during the semester study shall remain unaltered.

13.3 The students those who have passed in the supplementary examination will be awarded grade with '*' marked on the courses passed in the supplementary.

13.4 **Makeup Examination for IV semester courses:**
Makeup Examination for the students having backlog courses at IV semester of 2nd year M.Tech. programme shall be conducted immediately after the release of IV semester regular examinations result.

14. REVALUATION

a) Revaluation is allowed for only theory courses.

b) If the award of the revaluator varies from the original award by less than 20% of maximum marks prescribed for the course, best of the two awards thus available shall be taken as final.

c) If the award of the revaluator varies from the original award by more than 20% of the maximum marks prescribed for the course, the answer script will be examined by the second revaluator. If the award of the both revaluators is more than 20% of the maximum marks, then average of the two awards thus available shall be taken as final. Otherwise, best of the original award and the second revaluator award shall be taken as final.

15. CONDITIONS FOR PROMOTION

15.1 A student shall have to satisfy the attendance requirements for the semester (as per the Regulation No. 8) for promotion to the next higher semester.

16. IMPROVEMENT EXAMINATION

16.1 Students who wish to improve their SGPA / CGPA are permitted for SGPA / CGPA improvement only for theory courses. The student may opt to re-appear all the courses of a semester at the immediately succeeding End Semester Examination (ESE) for improving his / her grades. However, the students should clear all the courses of a particular semester in which he / she intends to take an improvement examination.

16.2 Further, when once the student appears for the improvement examination he / she shall forego the grades secured in the earlier End Semester Examination (ESE) in the whole set of courses prescribed for that semester. However, the marks secured in Continuous Internal Evaluation (CIE) by the student in those courses during the semester study shall remain unaltered.

16.3 Students those who have re-appeared for improvement will be awarded grade with '$' marked on the courses appeared for improvement examination. '$' will state the grade improvement. Such improved grades will not be counted for the award of Prizes, Medals and Rank.

16.4 However, the students who register for improvement examinations and wish to drop from appearing the examinations, by written application to the CoE, before commencement of examinations, shall be permitted to retain their earlier grades.

17. GRADUATION REQUIREMENT

17.1 A student shall be declared to be eligible for award of the M.Tech. degree, if he / she has registered and completed all the courses with a minimum P-grade scored in every course and secured a total of stipulated 68 credits.

17.2 Normally a student should complete all the requirements consecutively in 4 semesters (2 academic years) for the award of M.Tech. degree. However, the students who fail to fulfill all the requirements for the award of M.Tech. degree within a period of 8 consecutive semesters (4 academic years from the registration in 1st semester) shall forfeit his / her enrolment to the program.

17.4 a) **CGPA to Percentage conversion**: As per UGC and AICTE guidelines, the CGPA will be converted to percentage of marks as below:
Percentage of marks = (CGPA – 0.75) x 10
Ex: If CGPA is 6.75, the equivalent Percentage of marks = (6.75-0.75) x 10 = 60%

b) CGPA to Class conversion:

S. No.	Division	Eligibility Criteria
1	First Division with Distinction	a) Student should secure CGPA ≥ 7.75 b) Student should pass all the courses along with the batch of students admitted with him / her within 4 consecutive semesters c) Student who appeared for improvement examination upto 3rd semester will also be considered d) Student who have cleared any course in supplementary examination shall not be awarded Distinction
2	First Division	a) Student should secure CGPA, which is 6.75 ≤ CGPA < 7.75 within the time frame of the programme i.e. 8 semesters b) Student who have cleared any course in supplementary examination and secured CGPA > 6.75
3	Second Division	Student should secure CGPA, which is 5.75 ≤ CGPA < 6.75 within the time frame of the programme i.e. 8semesters
4.	Pass Division	Student should secure CGPA, which is 4.25 ≤ CGPA < 5.75 within the time frame of the programme i.e. 8 semesters
5.	Fail	Student with CGPA < 4.25 will not be eligible for award of degree

17.5 The University will award degrees to the students who are evaluated and recommended bythe Institute.

18. MALPRACTICE IN EXAMINATION

18.1 Malpractice in examination is an illegal activity and is prohibited.

18.2 Mobile phones are strictly prohibited in the examination hall.

18.3 Exchange of question paper and material like pen, pencil, sharpener, eraser, scale, calculator, etc., during examination is strictly prohibited.

18.4 Malpractice in examination is viewed very seriously. Malpractice includes oral communication between candidates, possessing forbidden material, mobile phones (switched off/on) etc.

18.5 Any malpractice or engaging in any improper conduct and violation of the examination code by the student during examinations is liable for the punishment as given below:

S. No	Nature of Malpractice	S. No	Punishment
1.	Taking help from others, consulting and or helping other examinees during the examination period inside the examination hall or outside it, with or without their consent or helping other candidates to receive help from anyone else	a)	Cancelling the examination of the paper in which he / she indulged in malpractices
2	If the examinee attempts to disclose his / her identity to the valuer by writing his / her Hall-Ticket Number at a place other than the place prescribed for it or any coded message including his / her name or addressing the valuer in any manner in the answer book		Cancelling the examination of the paper in which he / she indulged in malpractices

3.	Candidate is found in possession of forbidden material; relevant or not relevant but not used	b)	Cancellation of the result of (i) all examinations taken including current examination in that session (or) (ii) current examination and proposed examinations to be taken during that session (or) (iii) current examination
4.	Destroying the material found in his / her possession or acting in any other manner with a view to destroying evidence	c)	Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his/her admission to or continuation in any course of the Institute for a period of one year. The student will be eligible to appear for the next corresponding semester / year examination in the succeeding academic year
5.	Smuggling main answer book / additional answer book / question paper / matter in to or out of the examination hall & Conspiring to interchange Hall Ticket Numbers		-do-
6.	Candidate is found in possession of forbidden material, relevant or not relevant but used		-do-
7.	In case of (i) impersonation, (ii) misbehavior with the invigilators/any person related to examination work, (iii) insertion of written sheets in different hand writing in the main/additional answer book, and (iv) creation of disturbance in and around the examination hall during or before the examination	d)	Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his/her admission in to or continuation in any course of the Institute for a period of two years. Further, the candidate shall not be allowed to appear for any examination during the period of punishment
8.	If a candidate is found guilty of malpractice in the improvement examination (after completion of course)	e)	Punishment will be awarded subject to the above rules and further, he/she will not be permitted to appear for further improvement examination

19. ROLL NUMBER ALLOTMENT

The Roll Number given to the student shall have a total 8 digits as follows:

Ex: **M20SC123**

a) The first letter, to represent M.Tech. degree programme.
   Ex: M for M.Tech. programme
b) The next two numerical, to represent the year in which the student admitted into I -semester.
   Ex: 20 for 2020
c) The next two letters, to represent the M.Tech specialization to which the student belongs.
   Ex: SC for Structural & Construction Engineering
d) The last three numerical, to represent the three digit roll number of the student.
   In general, a student with roll number "**M20SC123**" represents an **M.**Tech. Student of **S**tructural **&** **C**onstruction Engineering **(SC)** admitted in the year 2020 bearing a roll number of **123.**

20. AMENDMENTS

Notwithstanding anything contained in this manual, the Academic Council of the Institute reserves the right to modify / amend the curricula, requirements and rules & regulations pertaining to its undergraduate programmes, without any further notice.

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DEPARTMENT OF CIVIL ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION OF
M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

PRR-20

SEMESTER-I

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE –TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
				L	T	P		ATLP	CRP	CP	PPT					
1	PC	P20SC101	Limit Analysis of Reinforced Concrete Structures	3	-	-	3	8	8	8	6	10	20	60	40	100
2	PC	P20SC102	Construction Management	3	-	-	3	8	8	8	6	10	20	60	40	100
3	PE	P20SC103	Professional Elective-I/ MOOC-I	3	-	-	3	8	8	8	6	10	20	60	40	100
4	PE	P20SC104	Professional Elective-II/ MOOC-II	3	-	-	3	8	8	8	6	10	20	60	40	100
5	PC	P20SC105	Structural Engineering Laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
6	PC	P20SC106	Construction Planning and Scheduling Laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
7	MC	P20MC107	Research Methodology & IPR	2	-	-	2	8	8	8	6	10	20	60	40	100
8	AC	P20AC108	Audit Course-I	2	-	-	1	8	8	8	6	10	20	60	40	100
			Total:	16	-	8	19							480	320	800

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Elective-1	Elective-2	Audit Course-1
P20SC103A: Matrix Analysis of Structures	P20SC104A: Behaviour of Concrete	P20AC108A: English for Research Paper Writing
P20SC103B: Design of Concrete Bridges	P20SC104B: Construction Project Administration	P20AC108B: Sanskrit for Technical Knowledge
P20SC103C: Precast Concrete Technology	P20SC104C: Building Services	P20AC108C: Constitution of India
P20SC103D: MOOCs	P20SC104D: MOOCs	P20AC108D: Pedagogy Studies

Total Contact Periods/Week: 24 **Total Credits: 19**

P20SC101 : LIMIT ANALYSIS OF REINFORCED CONCRETE STRUCTURES

Class: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on...
LO1: concepts of limit state design in flexure and moment curvature relationships for RC beams
LO2: behaviour of columns under combined loading
LO3: analysis of beams in shear and torsion
LO4: concept of serviceability and analysis of slabs by yield line theory

UNIT-I (9)

Limit State Design: Behaviour of the materials, design philosophies of working stress, ultimate load method and limit state method, application of limit state collapse in flexure

Moment-Curvature: Deformation and ductility of members in flexure, moment-curvature relationships, curvature of a member, theoretical moment-curvature determination

UNIT-II (9)

Behaviour of Columns: Types of columns, load carrying capacity of columns, construction of interaction curves for uniaxial bending and bi-axial bending of rectangular and circular columns

Design of Columns: Design considerations, design of uniaxial, bi-axial, long, slender for rectangular and circular columns

UNIT-III(9)

Shear: Behaviour of RC elements in shear, principal mechanism of shear resistance, beam and arch action, mode of shear failure, shear failure mechanisms, shear strength of beam with and without shear reinforcement

Torsion: Behaviour of RC elements in torsion, types of torsion, behaviour plain concrete beams under torsion, skew bending and space truss analogy for RC members, combined bending and torsion, combined shear and torsion, design of beams in combined shear, bending and torsion as per is code

UNIT-IV (9)

Serviceability: Limit state of serviceability, short term deflections, long term deflections, total deflections, cracks in RC members, calculation of crack width

Yield Line Theory: Yield line theory of slabs, behaviour of slabs up to failure, yield criteria, methods of analysis using virtual and equilibrium method, design of slabs

Text Books:

[1] S.Unnikrishna Pillai and Devdas Menon, *Reinforced Concrete Design*, 3rd ed. New Delhi:McGraw Hill Education, 2017. (*Chapters 1, 2, 4, 6, 7, 10 and 13)*

[2] R. Park and T. Paulay, *Reinforced Cement Concrete Structures*, 3rd ed. New Delhi: MISL-WILEY Series, Wiley India Pvt. Ltd., 2009.(*Chapter 6)*

Reference Books:

[1] B.C. Punmia, Er. Ashok Kumar Jain and Arun K. Jain, *R.C.C. Design (Reinforced concretestructures)*, 10th ed. New Delhi: Laxmi Publications Pvt. Ltd., 2014.

[2] P.C. Varghese, *Advanced Reinforced Concrete Design*, 2nd ed. Prentice Hall India LearningPvt. Ltd., 2010.

[3] C.K. Wang, C G Salmon et al., *Reinforced Concrete Design*, 8th ed. Oxford University Press,2017.

[4] BIS, IS 456: 2000, *Plain and Reinforced Concrete- Code of Practice*, 5th amendment, New Delhi:Bureau of Indian Standards, 2019.

[5] BIS, IS: 875 (part 1-5), *Code of practice for Design loads*, New Delhi: Bureau of Indian standards, 1987.

[6] BIS, SP: 16, *Design Aids for Reinforced Concrete to IS 456: 1978*, New Delhi: Bureau of Indianstandards, 1980.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: apply the concepts of limit state method in flexure and develop the moment curvature relationships for RC beams

CO2: analyze and design of compression members

CO3: design beams for shear and torsion

CO4: estimate the deflection, crack width in RC structures and yield line theory of slabs

Course Articulation Matrix (CAM): P20SC101 : LIMIT ANALYSIS OF REINFORCED CONCRETE STRUCTURES

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC101.1	1	1	1	1	1
CO2	P20SC101.2	1	1	1	1	1
CO3	P20SC101.3	1	1	1	1	1
CO4	P20SC101.4	1	1	1	1	1
P20SC101		1	1	1	1	1

P20SC102 : CONSTRUCTION MANAGEMENT

Class: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: elements of construction management and specifications of contracts
LO2: project scheduling and cost management
LO3: project control and equipment management
LO4: cost analysis of project, valuation of land and property

UNIT – I (9)

Elements of Construction Management: Stages of construction project, construction team and their functions, functions of construction management, project feasibility studies - technical, financial, economic and ecological analysis, steps in planning, principles of planning, stages of planning

Construction Contracts and Specifications: Considerations in contract, contract documents, types of contracts – lump-sum, cost-plus fixed fee, cost-plus bid fee, guaranteed maximum, negotiated, unit price, design build, turn-key, specifications, types of specifications

UNIT – II (9)

Project Planning and Scheduling: Methods of scheduling, network techniques, activity, event, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), time estimates, floats and slacks

Time and Cost Relationship: Direct and indirect cost of project, total project cost, optimization of project cost through contraction - cost slope and crashing of activities, basics of resource allocation, leveling and smoothing

UNIT – III (9)

Project Planning &Control: Changes in project plan, Rescheduling activities, changesin duration of an activity, methods of updating, data required for updating

Management of Construction Equipment: Need for mechanization, financial aspects of plants and machineries, factors affecting the selection of equipment, factors affecting thecost of owning and operating the construction equipment

UNIT – IV (9)

Construction Economics: Economic analysis of construction projects, economic studies – primary economic comparisons, break-even analysis, time-based studies – cash flow forecasting, investment appraisal, sensitivity analysis

Valuation Engineering: Cost and value, purpose of valuation, factors affecting the value of property, valuation classification, sinking fund, capitalized value, obsolescence,depreciation, valuation of land and property

Text Books:

[1] S. Seetharaman, *Construction Engineering and Management*, 5th ed.New Delhi:Umesh Publications, 2017. *(Chapters 2-10, 13, 14, 15,17,18,23 and 25)*

[2] B. L. Gupta, *Construction Management, machinery and accounts*,3rded.Standard Publishers2016. *(Chapters 1, 2, 3, 5-12 and 15)*

Reference Books:

[1] K. N. Jha, *Construction Project Management – Theory and Practice*, 3rded. Noida: PearsonIndia Publishers, 2016.

[2] L. S. Srinath, *PERT and CPM principles and applications*, East West Press, 2011.

[3] SubhajitSaraswati, *Construction Technology*, Oxford University Press, 2017.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: interpret the process of construction management and tendering
CO2: estimate the project duration and cost of a project
CO3: anticipate project completion and judge equipment for construction
CO4: estimate cash flow for a project and property value

Course Articulation Matrix (CAM): P20SC102 : CONSTRUCTION MANAGEMENT						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC102.1	1	1	1	1	1
CO2	P20SC102.2	1	1	1	1	1
CO3	P20SC102.3	1	1	1	1	1
CO4	P20SC102.4	1	1	1	1	1
P20SC102		1	1	1	1	1

P20SC103A MATRIX ANALYSIS OF STRUCTURES

Class: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on...
LO1: flexibility matrix method and its applications to beams
LO2: application of flexibility matrix method to frames and truss elements
LO3: stiffness matrix method and its applications to beams
LO4: application of stiffness matrix method to frames and truss elements`

UNIT – I (9)

Flexibility Matrix Method: Basics, Review of matrix algebra, Force method, basic concepts, internal forces, external loads and redundant, relation between internal forces and deformation, determination of static indeterminacy for different types of structures, development of flexibility matrix for beams

Flexibility Matrix Method for Beams: Determination of internal and external static indeterminacy for different types of structures, Analysis of continuous beams up to second degree of static indeterminacy, bending moment and shear force diagrams

UNIT – II (9)

Flexibility Matrix Method for Frames: Analysis of rectangular portal frames – second degree of static indeterminacy, bending moment and shear force diagrams

Flexibility Matrix Method for Trusses: Analysis of statically indeterminate plane trusses up to second degree of static indeterminacy, application of flexibility method to pin jointed members and stresses due to lack of fit

UNIT – III (9)

Stiffness Matrix Method: Basics, Stiffness matrix method, kinematic indeterminacy, determination of kinematic indeterminacy for different types of structures, development of stiffness matrix for beams

Stiffness Matrix Method for Beams: Determination of kinematic indeterminacy for different types of structures, analysis of continuous beams up to second degree of kinematic indeterminacy, bending moment and shear force diagrams

UNIT – IV (9)

Stiffness Matrix Method for Frames: Analysis of rectangular portal frames up to second degree of kinematic indeterminacy, bending moment and shear force diagrams

Stiffness Matrix Method for Trusses: Analysis of statically indeterminate plane trusses-up to second degree of kinematic indeterminacy, application of stiffness methodto pin jointed trusses

Text Books:

[1] G.S. Pandit and S.P. Gupta, *Structural Analysis - A Matrix Approach,* 2nded.New Delhi:McGraw Hill Education Pvt. Ltd., 2017. (*Chapters 1, 2, 4 - 6 and 7)*

[2] Weaver and Gere, *Matrix Analysis of Framed Structures*, 3rd ed. New Delhi: CBS Publishers &Distributors, 2012. (*Chapters 1- 4 and 6)*

Reference Books:

[1] Bhavikatti. S.S, *Matrix methods of Structural Analysis,* New Delhi: I K International Publishing House, 2011.

[2] C. Natarajan and P. Revathi, *Matrix methods of Structures Analysis,* New Delhi: PHI LearningPvt. Ltd., 2014.

[3] C.S. Reddy, *Basic Structural Analysis,*3rd ed. New Delhi: Tata McGraw Hill Education Pvt.Ltd., 2017.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: develop the flexibility matrix to analyze beams

CO2: estimate the forces in frames and trusses by flexibility matrix method

CO3: formulate stiffness matrix to analyse beams

CO4: evaluate the forces in frames and trusses using stiffness matrix method

Course Articulation Matrix (CAM): P20SC103A MATRIX ANALYSIS OF STRUCTURES						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC103A.1	-	1	1	1	1
CO2	P20SC103A.2	1	1	1	1	1
CO3	P20SC103A.3	-	1	1	1	1
CO4	P20SC103A.4	1	1	1	1	1
P20SC103A		1	1	1	1	1

P20SC103BDESIGN OF CONCRETE BRIDGES

Class:M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: loading and design considerations in bridges
LO2: RCC deck slab and T-Beam bridges
LO3: types of bridge bearings and bridge appurtenances
LO4: elements of bridge sub-structure

UNIT-I (9)

Bridge Loading: Types of bridges, materials for construction, codes of practice (railwayand highway bridges), design loads and IRC standard loading

Hydraulic Design: Planning and layout of bridges, hydraulic design, geological and geotechnical considerations

UNIT-II (9)

Deck Slab Bridge: Design of reinforced cement concrete road bridge as per IRC loading **T-Beam Bridge:** Analysis of beams, Courbon's method, Pigeaud's curve method for design of interior slab panel, design of t-beam bridge

UNIT-III (9)

Bearings: Types and functions of bearings, forces on bearings, bearing materials, designof elastomeric pad bearing

Bridge Appurtenances: Expansion joints, design of joint railings, drainage systems and lighting

UNIT-IV (9)

Sub-Structure: Loads acting on substructure, Design of pier and pier cap, stability analysis of abutments, retaining and wing walls

Bridge Foundations: Types of foundation, Design of shallow and deep foundations

Text Book:

[1] T.R. Jagdish and M.A. Jayaram, *Design of Bridge Structures*, 2nd ed. New Delhi: PHI Learning Pvt. Ltd., 2009.

Reference Books:

[1] N. Krishna Raju, *Design of Bridges,* 5thed. New Delhi: Oxford &IBH Publishing Co. Pvt. Ltd.,2019.

[2] D. Johnson Victor, *Essentials of Bridge Engineering*, 6th ed. New Delhi: IBH Publishing Co.Ltd., 2019.

[3] IRC 5: 2015 *Standard Specifications and Code of Practice for Road Bridges*, 8th revision, NewDelhi: The Indian Road Congress, 2015.

[4] IRC 6: 2014 *Standard Specifications and Code of Practice for Road Bridges*, 5th revision, NewDelhi: The Indian Road Congress, 2014.
[5] IRC 21: 2000 *Standard Specifications and Code of Practice for Road Bridges*, 3rd revision, NewDelhi: The Indian Road Congress, 2000.
[6] BIS, IS 456:2000, *Code of practice for Plain and reinforced concrete*, 5th revision,New Delhi: Bureau of Indian standards,2000.

Course Learning Outcomes (Cos):

On completion of this course, Students will be able to…

CO1: describe loads and design specification for bridges
CO2: design RCC deck slab and T-Beam bridge
CO3: recommend types of bearing and appurtenances
CO4: evaluate the behavior of sub-structure elements

Course Articulation Matrix (CAM): P20SC103B DESIGN OF CONCRETE BRIDGES

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC103B.1**	1	-	1	1	-
CO2	**P20SC103B.2**	1	1	1	1	1
CO3	**P20SC103B.3**	1	1	1	1	-
CO4	**P20SC103B.4**	1	1	1	1	1
P20SC103B		**1**	**1**	**1**	**1**	**1**

P20SC103CPRECAST CONCRETE TECHNOLOGY

Class:M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40
End Semester Examination	60

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: materials used for precast concrete
LO2: behaviour of precast concrete structural components
LO3: production and erection methods of precast elements
LO4: applications of precast technology and its structural integrity

UNIT-I (9)

PrecastConcrete: Definitions, advantages and disadvantages, type standardisation and component standardisation, precast superstructure, structural stability, precast design concepts

Materials: Concrete - for precast production, for precast floor elements, young's modulus, shrinkage and creep, admixtures, reinforcements, structural steel etc., non-cementitious material

UNIT-II (9)

Frame Analysis: Types of precast concrete structures, simplified frame analysis, sub structuring method, strength and serviceability requirements, connection designs, stabilizing methods, standard design of beam, column and slab

Behaviour of Structural Components: Construction of roof and floor slabs, wall panels, columns, shear walls, joints and connections, classification of joints, joints for different structural connections, beam and column - connections types and classifications

UNIT-III (9)

Production: Production technology, Choice of production setup, manufacturing methods, stationary and mobile production, planning of production setup, storage of precast elements, dimensional tolerances, acceleration of concrete hardening

Hoisting: Hoisting technology, equipment for hoisting and erection, techniques for erection of members like beams, slabs, wall panels and columns, vacuum lifting pads

UNIT-IV (9)

Applications: Applications, designing and detailing of precast unit for factory structures, purlins, principal rafters, roof trusses, lattice girders, gable frames, single span, single storied simple frames, single storied buildings, slabs, beams and columns **Structural Integrity:** Progressive collapse, codal provisions, equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., importance of avoidance of progressive collapse

Text Books:

[1] Kim S. Elliott, *Precast Concrete Structures*,2nd ed. New York: CRC Press, 2017.

Reference Books:

[1] ICI Bulletin, *Handbook on Precast concrete Structures*, 1st ed. Chennai: Indian Concrete Institute, 2016.

[2] Kim S. Elliott and Colin K. Jolly, *Multi-Storey Precast Concrete Framed Structures*, 2nd ed. UK: Wiley Blackwell, 2013.

[3] Mokk, *Prefabricated Concrete for Industrial and Public Structures*, 8th ed. Budapest: Publishing House of the Hungarian Academy of Sciences, 1964.

[4] Koncz. T, *Manual of precast concrete construction, Vol. I, II and III*, 7th ed. GMBH: Bauverlag, 1971.

[5] CBRI, *Building materials and components*, 1st ed. India: CSIR Roorkee, 1990.

[6] Structural design manual, *Precast concrete connection details, Society for the studies in the use ofprecast concrete*, 1st ed.Netharland:Netherland Betor Verlag, 1978.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: identify materials used for precast concrete

CO2: analyze the structural elements of precast concrete

CO3: illustrate production and erection methods of precast elements

CO4: evaluate precast systems and structural integrity

Course Articulation Matrix(CAM): P20SC103C PRECAST CONCRETE TECHNOLOGY

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC103C.1**	1	1	1	1	1
CO2	**P20SC103C.2**	1	1	1	1	1
CO3	**P20SC103C.3**	1	1	1	1	1
CO4	**P20SC103C.4**	1	1	1	1	1
P20SC103C		**1**	**1**	**1**	**1**	**1**

P20SC104A BEHAVIOUR OF CONCRETE

Class: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: hydration process of cement and microstructure of concrete
LO2: the effects of concrete strength and durability
LO3: methods of mix design and review on special concretes
LO4: non-destructive testing methods of concrete and challenges towards sustainability

UNIT-I (9)

Hydration of Portland Cements: Mechanism of hydration, hydration of aluminates, hydration of silicates, aspects of setting and hardening, effect of cement characteristics on strength and heat of hydration

Microstructure of Concrete: Microstructure of concrete, structure of aggregate phase, structure of hardened cement paste, structure and property relationships in hydrated cement paste, transition zone in concrete and its influence on properties of concrete

UNIT-II (9)

Strength: Water/Cement ratio, strength - porosity relationship, influence of aggregates,compressive strength and factors affecting, behaviour of concrete under different stresses, bond strength

Durability of Concrete: Factors affecting durability, physical and chemical mechanisms, transport of fluids in concrete – permeability, diffusion, absorption, carbonation, acid attacks, principles of performance-based approach

UNIT-III (9)

Engineered Concrete Mix design: Significance and objectives, considerations and principles of concrete mix design, proportioning and procedures in mix design, mix design of concrete guidelines of BIS, ACI methods and British standards

Special Concretes: Concretes having reduced environmental impact, high performance concretes, fiber reinforced concrete, self-compacting concrete, geopolymer concrete, self-healing concrete, self-curing concrete

UNIT-IV (9)

Non Destructive Testing: Surface hardness methods, Pull-out tests, Stress wave propagation methods, Electromagnetic methods, Tomography of reinforced concrete, SEM analysis

Future Challenges: Future demand of concrete - advantages of concrete structures, environmental considerations, concrete durability and sustainability, technology for sustainable development

Text Books:

[1] Mehta P.K and Monteiro Paulo,*Concrete: Microstructure, Properties and Materials*, 4th ed. New Delhi: Tata McGraw Hill Education Pvt. Ltd., 2014.*(Chapters 2,3,5,6,7,9,11 and 14)*

[2] A.M.Neville, *Properties of concrete,* 5th ed., India: Pearson Education, Dorling KindersleyIndia Pvt. Ltd., 2013. *(Chapters 1, 6, 10, 12 and 14)*

Reference Books:

[1] M.L. Ghambir, *Concrete Technology*, 5th ed. New Delhi: Tata McGraw Hill Publishers, 2016.

[2] Santha Kumar A.R, *Concrete Technology*, 2nd ed., New Delhi: Oxford University Press, 2018.

[3] RILEM TC 230,*Performance-Based Specifications and Control of Concrete Durability-State of ArtReport*, 1st ed.Netherlands:Springer, 2016.

[4] BIS, IS: 10262: 2019, *Concrete Mix Proportioning Guidelines*, 2nd revision, New Delhi: Bureauof Indian Standards, 2019.

[5] ACI 211 Committee. *Guide for Selecting Proportions for No-Slump Concrete Vol. II, Reported* by ACI Committee 211: American Concrete Institute, 2002.

[6] B. S. 8110, *The Structural Use of Concrete,* British Standard Institution, 1997.

[7] BIS, IS 456: 2000, *Plain and Reinforced Concrete- Code of Practice*, 5th revision, New Delhi:Bureau of Indian Standards, 2019.

Course Learning Outcomes (Cos):

On completion of this course, students will be able to...

CO1: apprehend the chemistry of hydration in cement and concrete microstructure

CO2: estimate the strength and durability of concrete

CO3: develop concrete mixes and comprehend special concretes

CO4: evaluate concrete using NDT methods and assess sustainable challenges in concrete

Course Articulation Matrix(CAM): P20SC104A BEHAVIOUR OF CONCRETE						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC104A.1**	2	1	1	1	1
CO2	**P20SC104A.2**	2	1	1	2	1
CO3	**P20SC104A.3**	2	1	1	2	1
CO4	**P20SC104A.4**	1	1	1	1	1
P20SC104 A		**1.75**	**1**	**1**	**1.5**	**1**

P20SC104B CONSTRUCTION PROJECT ADMINISTRATION

Class: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Exam:	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: organization of a project and contracting for public projects
LO2: responsibilities of project representative
LO3: handling and documentation of a project
LO4: preconstruction operations and electronic project management

UNIT – I (9)

Project Delivery System: Project participants, construction administration, organizational structure of a construction project, professional and engineering definition of construction management

Design-Build Concept: Design–build contracts, definitions of individual construction responsibilities, scope of work in a construction management contract, responsibility for coordination of the trades, partnering concept, contracting for public works projects, construction administration task list

UNIT – II (9)

Responsibility and Authority: Role of resident project representatives, lines of authority on construction projects, authority and responsibility of the resident project representative

Resident Project Representative Office Responsibilities: Setting up a field office, familiarization with construction documents, equipping the field office, establishment of communications

UNIT – III (9)

Managing Project: Handling job-related information, staffing responsibilities, Field Cost Indexes (FCI), selection of trailer-type field offices, development of an inspection plan

Project Documentation: Records and reports, Project documentation as evidence in claims, files and records, construction reports, construction diary, daily reports, intermittent inspection, contractor submittals

UNIT – IV (9)

Preconstruction Operations: Description of approach, constructability analysis, issuance of bidding documents, pre-qualification of bidders, opening, acceptance and documentation of bids, development of quality control programme, filed office organization, preconstruction conference

Electronic Project Administration: Computer usage in project administration, web enabled project management applications, Building Information Modeling (BIM), synchronization of multiple devices

Text Books:

[1] Edward R. Fisk and Wayne D. Reynolds, *Construction Project Administration,* 10th ed. New York: Pearson,2016. *(Chapter 1-5 and 12)*

Reference Books:

[1] James E. Koch and Douglas D. Gransberg, Keith R. Molenaar,*Project Administration forDesign-BuildContracts,*USA:ASCE press, 2010.

[2] Kumar Neeraj Jha, *Construction Project Management,* 2nd ed.New Delhi: Pearson, 2015.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: create organization and propose contracts for a project
CO2: list responsibilities for project representatives
CO3: appraise aspects of handling a project and develop project documentation
CO4: execute preconstruction activities and adapt electronic project administration

Course Articulation Matrix (CAM): P20SC104B CONSTRUCTION PROJECT ADMINISTRATION

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC104B.1**	1	1	1	-	1
CO2	**P20SC104B.2**	1	1	1	-	1
CO3	**P20SC104B.3**	1	1	1	-	1
CO4	**P20SC104B.4**	1	1	1	-	1
P20SC104B		**1**	**1**	**1**	**-**	1

P20SC104C BUILDING SERVICES

lass: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Exam	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: building services and firefighting systems
LO2: building transport systems and water supply systems
LO3: electrical and air conditioning services
LO4: disposal and miscellaneous building services

UNIT –I (9)

Elements of Building Services: Basic needs for human comfort, comfort equation, type of services required to keep facility usable, control rules, general building requirements – NBC recommendations, role and administrative functions of supervisors, functional planning in building

Fire Fighting: Basic requirement of the works for fighting system, various components of the firefighting system, firefighting installations in high-rise buildings, commercial/industrial complexes, smoke, fire and heat detectors, checklist for firesafety

UNIT –II (9)

Lifts/Elevators, Escalators: Legal formalities for elevators, Various types of lifts, working mechanisms of lift and escalators, estimate the number of lifts required, Indian standard codes for planning & installations of elevator, inspection & maintenance of lifts

Water Supply System: Water supply and distribution system in high-rise building & other complexes, hot water and cold-water services, joints on water pipes, backflow protection, pumps and pumping mechanisms, do's &don'ts for water pipe networks

UNIT –III (9)

Electrical Services: Electricity distribution, Basics of single phase & three phase electrification, electrical network & appliances, earthling systems and bonding, power and lighting circuits, overload protection, Indian standard codes for electrical appliances, wiring operations - maintenance of network & appliances

Air-Conditioning and Heating: Air conditioning – principles and applications, centralised systems, air temperature profile, packaged air conditioning systems, heat emitters, combined heat and power, steam heating systems, timed control of heating systems, HVAC

UNIT –IV (9)

Disposal Services: Combined and separate drainage systems, rodding point system, sewer connection, drain laying and drainage ventilation, drainage design principles, bedding of drains, joints, subsoil drainage, cesspools and septic tanks, waste and refuseprocessing

Miscellaneous Services: Gas installation – connection of gas supply, burner types, security installations – intruder alarms, micro switch and magnetic read, acoustics, vibration and inertia detectors, land scaping &horticulture

Text Books:

[1] Fred Hall and Roger Greeno, *Building Services Handbook*, 9th ed. London:Taylor & Francis(U.K.) Ltd., 2017. *(Chapters 1,2 and 5-12)*

[2] E. F. Curd and C. A. Coward, *Introduction to building Services*, 2nd ed. Basingstoke: PalgraveMacMillan Press (U.K.)Ltd.,1996. *(Chapters 1-3 and 5-8)*

Reference Books:

[1] IVOR H. Seeley, *Building Technology*, 5th ed. Basingstoke: Palgrave MacMillan Press (U.K.)Ltd.,1995.

[2] R. Chudley, *Building Finishes, fittings and domestic service*, 2nd ed., Harlow: Pearson Education (U.K.) Ltd., Longman Scientific and Technical book, 1988

[3] David V. Cheddarton, *Building Services Engineering*, 6th ed. London: Taylor & Francis(U.K.) Ltd., 2004.

[4] National Building Code of India 2016.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: appraise building services and the firefighting requirements

CO2: recommend building transport and water supply systems

CO3: choose suitable electrical and air conditioning services for building

CO4: plan the disposal system and choose miscellaneous services

Course Articulation Matrix (CAM): P20SC104C BUILDING SERVICES						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC104C.1	1	1	1	1	1
CO2	P20SC104C.2	1	1	1	1	1
CO3	P20SC104C.3	1	1	1	-	1
CO4	P20SC104C.4	1	1	1	-	1
P20SC104C		1	1	1	1	1

P20SC105STRUCTURAL ENGINEERING LABORATORY

Class:M.Tech. I-Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
-	-	4	2

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: effect of water cement ratio, aggregate ratio, shape and sizeon strength of concrete
LO2: qualitative measure of concrete
LO3: moment-curvature, stress - strain behaviour of concrete
LO4: shear, temperature and bond in concrete

LIST OF EXPERIMENTS

1. Analyze the effect of water/cement ratio on strength of concrete.
2. Investigate the fine aggregate/coarse aggregate ratio on strength of concrete.
3. Explore the correlation between cube strength and cylinder strength.
4. Determine the concrete mix design using ACI method.
5. Investigate the Non-Destructive testing of concrete.
6. Explore the effect of pozzolanic materials on strength of concrete.
7. Analyze the Moment-curvature behaviour of under reinforced beams.
8. Analyze the Moment-curvature behaviour of over reinforced beams.
9. Examine the effect of pure shear on concrete.
10. Explore the effect of size on concrete.
11. Determine the effect of temperature on strength of concrete.
12. Assessment of bond strength between steel and concrete.

Laboratory manual:
[1] *Structural Engineering Laboratory Manual*, Prepared by faculty of Civil Engineering Department, KITSW.

Reference Books:

[1] Neville A.M, *Properties of Concrete*, 4th ed. Longman, United Kingdom: English Language,Book society,2015.
[2] M. S. Shetty, *Concrete Technology (Theory and Practice)*,7th ed. New Delhi: S. Chand Company, 2016.
[3] N. Krishna Raju, *Concrete Mix Design*, 5th ed. CBS Publishers and Distributors, 2018.

Course Learning Outcomes (COs):
On completion of this course, students will be able to ...
CO1: assess the effect of water cement ratio, aggregate ratio, shape and sizeon strength of concrete
CO2: evaluate the quality of concrete
CO3: develop the moment-curvature, stress-strain behavior of concrete
CO4: intervene the shear, temperature and bond in concrete

Course Articulation Matrix (CAM): P20SC105 STRUCTURAL ENGINEERING LABORATORY

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC105.1**	2	2	1	1	1
CO2	**P20SC105.2**	2	2	1	1	-
CO3	**P20SC105.3**	2	2	1	1	1
CO4	**P20SC105.4**	2	2	1	1	-
P20SC105		**2**	**2**	**1**	**1**	**1**

P20SC106 CONSTRUCTION PLANNING AND SCHEDULING LABORATORY

Class: M.Tech. I – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: creating project plan
LO2: time estimates and allocation of resources
LO3: critical path and baseline plan
LO4: updating projects and generating reports

LIST OF EXPERIMENTS

1. Using MS Projects/Primavera create and define a new Project Plan, configure aProject Calendar
2. Develop a Work Breakdown Structure (WBS)
3. Develop a Gantt Chart by adding tasks, durations and predecessors
4. Define dependencies and time estimates
5. Define resources and allocate them to activities
6. Critical Path Analysis
7. Perform Crashing, Tracking and Resource Smoothening & levelling
8. Perform Resource optimization
9. Project tracking and updating actuals
10. Generate tables and reports

Laboratory manual:

[1] *Construction Planning and Scheduling Laboratory Manual,* prepared by faculty of Civil Engineering Department, KITSW.

Reference Books:

[1] K. N. Jha, *Construction Project Management*, 3rd ed. Noida: Pearson India Publications, 2016.
[2] Carl Chatfield and Johnson, *Microsoft Project 2016 Step by Step*,USA: Microsoft Press, 2016.
[3] Dennis Lock, *Project Management in Construction*, 1st ed. USA: Gower Publications Ltd., 2004.

Course Learning Outcomes (COs):
On completion of this course, students will be able to ...
CO1: create a new project plan
CO2: interpret resources in the project
CO3: monitor the project progress
CO4: develop project progress reports for tracking and updating

Course Articulation Matrix (CAM): P20SC106CONSTRUCTION PLANNING AND SCHEDULING LABORATORY

CO		PO1	PO2	PO3	PSO1	PS02
CO1	**P20SC106.1**	1	2	1	-	1
CO2	**P20SC106.2**	1	2	1	-	1
CO3	**P20SC106.3**	1	2	1	-	1
CO4	**P20SC106.4**	1	2	1	-	1
P20SC106		**1**	**2**	**1**	**-**	**1**

P20MC107RESEARCH METHODOLOGY AND IPR

Class:M. Tech., I-Semester

Specialization(s):SE&C , DE, VE, PE, SE DS, DC & CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1: research methodology, approaches, principles of experimental design and research plan

LO2: sampling design, data collection, data representation and statistical analysis

LO3: layout of a research report, technical paper writing, oral presentation and intellectual property

LO4: patent rights and developments in IPR

UNIT-I (6)

Research Methodology: Meaning of research, objectives,motivation, types, approaches, research methods Vs methodology, scientific method, research process, criteria for good research, literature review, research ethics, plagiarism, problems encountered by researchers in India

Defining the Research Problem and Research Design: Selecting a research problem, Necessity and techniques in defining research problem, need for research design, features of good design, different research designs, basic principles of experimental design, developing a research plan

UNIT – II (6)

Sampling Design: Census and sample survey, implications, steps, criteria of selecting a sampling procedure, characteristics of a good sample design, types of sample designs, complex random sampling designs

Data Collection & Data Analysis: Collection of primary and secondary data, observation method, interview method, collection of data through questionnaires, schedules, data organization, methods of data grouping, diagrammatic and graphic representation of data, regression modeling, direct and interaction effects, ANOVA, F- test, time series analysis, autocorrelation and autoregressive modeling

UNIT – III (6)

Interpretation and Report Writing: Interpretation technique, precaution in interpretation, significance, steps and layout of report writing, types of reports, oral presentation, mechanics of writing a research report, precautions, format of the research report, synopsis, dissertation, thesis, references/bibliography/webliography, technical paper writing/ journal/ report writing, making presentation, use of visual aids

Nature of Intellectual Property: Patents, designs, trade and copyright

Process of Patenting and Development: Technological research, innovation, patenting, development

UNIT – IV (6)

Patent Rights: Scope of patent rights, licensing and transfer of technology, patent information and databases, geographical indications

New Developments in IPR: Administration of patent system, new developments in IPR, IPR of biological systems, computer software etc., traditional knowledge case studies, IPR and IITs

Text Books:

[1] C.R Kothari and Gaurav Garg, *Research Methodology, Methods & Techniques,* 4th ed.New Age International Publishers, 2019.(*Chapters 1, 2, 3, 6, 7, 11, 14*)

[2] Deborah Ebouchoux, *Intellectual Property, The Law of Trademarks, Copyrights, Patents and Secrets,* 4th ed. Delmar, Cengage Learning, 2012.*(Chapter 1, 2, 3, 17, 18)*

[3] ***Anti-plagiarism policy of KITSW*** - A handout prepared by Dean, Research and Development, KITSW, Jan 2020.

[4] Frequently Asked Questions, Office of CGPDTM, INDIA 2020

[5] Patent Office Procedures: http://www.ipindia.nic.in/writereaddata/images/pdf/patent-office-procedures.pdf

References Books:

[1] Stuart Melville and Wayne Goddard, *Research methodology: An Introduction for Science &Engineering Students* 2nd ed. JUTA, 2007.

[2] Robert P. Merges, Peter S. Menell, Mark A. Lemley, *Intellectual Property in New TechnologicalAge - 1,* Clause 8, 2016.

[3] Dobera J Halbert, *Resisting Intellectual Property,* Taylor & Francis Ltd.,1sted.2005.

[4] Ranjit Kumar, *Research Methodology: A Step by Step Guide for beginners,* 3rd ed.New Delhi:Sage Publications India Pvt. Ltd, , 2011.

[5] T. Ramappa, *Intellectual Property Rights Under WTO,* 4th ed. S. Chand, 2008

[6] R. Ganesan, *Research Methodology for Engineers,* MJP Publishers, Chennai, 2011

[7] Patent application procedures: https://patentinindia.com/cost-patent-registration-india/

[8] http://www.ipindia.nic.in/history-of-indian-patent-system.htm

[9] Patent Law India: https://www.mondaq.com/india/patent/656402/patents-law-in-india--everything-you-must-know

[10] How to file patents: https://iptse.com/how-to-file-patents-understanding-the-patent-process-in-india/

[11] How Can I get a patent for my project:https://patentinindia.com/cost-patent-registration-india/

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: develop and formulate research problem using research methodology techniques

CO2: utilize techniques of data modeling and analysis to solve research problem

CO3: choose an appropriate methodology to write a technical report and present a research paper

CO4: judge patent rights and adapt new developments in IPR for their patent publications

Course Articulation Matrix (CAM): P20MC107 RESEARCH METHODOLOGY & IPR

CO		PO 1	PO 2	PO 3	PSO 1	PSO 2
CO1	P20MC107.1	2	2	1	-	-
CO2	P20MC107.2	2	2	1	-	-
CO3	P20MC107.3	2	2	1	-	-
CO4	P20MC107.4	2	2	-	-	-
P20MC107		2	2	1	-	-

P20AC108A ENGLISH FOR RESEARCH PAPER WRITING

Class: M.Tech. I-Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge in /on...
LO1: planning for quality research writing with improved level of readability
LO2: constituents and attributes of a research paper
LO3: specifications for research transcription and pedagogic skills for reporting research
LO4: guidelines for publishing research papers in quality journals

UNIT-I (6)

Skills for Research Writing: Planning and preparation, word order, breaking up long sentences, structuring paragraphs and sentences, being concise and removing redundancy

Improving Level of Readability: Avoiding ambiguity and vagueness,clarifying who did what, highlighting your findings, hedging and criticizing, paraphrasing and plagiarism

UNIT-II (6)

Constituents of a Research Paper: Abstract, Styles of abstract, keywords, characteristics of poor abstract, assessing quality of abstract, introduction- outline in introduction, assessing quality of introduction, review of literature, ways of referring to authors in literature

Attributes of a Research paper: Methodology, use of tenses and articles in methodology, results, results, styles of reporting results, discussion, styles of writing discussions, conclusions, impact of writing conclusions, assessing quality of conclusions, final check-do's and don'ts

UNIT-III (6)

Specifications for Research Transcription: Structuring phrasing and summarizing oftitle and abstract, structuring phrasing and summarizing of introduction, critical review of literature, limitations of previous work and demonstration of innovation in proposed research.

Pedagogic Skills for Reporting Research: Structuring and justifying the methodology, structuring, reporting, interpreting and summarizing results, structuring, comparing, interpreting and summarizing discussions, styles of writing discussions, structuring, differentiating and summarizing of conclusions

UNIT-IV (6)

Quality Assurance and Corroboration of Research: Indexing and harnessing useful phrases, adapting final check for readability, clarity in logical order of argumentation, checking for journal guidelines, consistency, accuracy, acknowledgements and spell- check

Text Books:

[1] Adrian Wallwork, *English for Writing Research Papers*, 2nd ed.New York: Dordrecht Heidelberg London, Springer books, 2016.

Reference Books:

[1] Goldbort R, *Writing for Science, London*, 2nded. Yale University Press, 2006.

[2] Day R, "How to Write and Publish a Scientific Paper", 8th ed, Cambridge University Press,2016.

[3] Adrian Wallwork,*English for Academic Research*, 2nd ed. New York: Grammar, Usage and Style, Springer Dordrecht Heidelberg London, Springer Books ,2012.

Course Learning Outcomes (Cos):

On completion of this course, the student will be able to...

CO1: *develop essential skills for research writing with improved level of readability*

CO2: *organize the constituents of research paper and derive conclusions with a final check of Do's and Don'ts*

CO3: *justify, interpret, compare and summarize results for proposed methodologies in research paper*

CO4: *adopt quality assurance methods like final check for readability, consistency and accuracy of a research paper*

Course Articulation Matrix (CAM): P20AC108AENGLISH FOR RESEARCH PAPER WRITING

CO Code		PO 1	PO2	PO3	PSO 1	PSO 2
CO1	P20AC108A .1	1	2	2	-	-
CO2	P20AC108A .2	1	2	2	-	-
CO3	P20AC108A .3	1	2	2	-	-
CO4	P20AC108A .4	1	2	2	-	-
P20AC108A		1	2	2	-	-

P20AC108B SANSKRIT FOR TECHNICAL KNOWLEDGE

Class: M.Tech. I – Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1:proficiency in illustrious sanskrit, the scientific language in the world

LO2: the depth of grammar in sanskrit

LO3: deeper insight into tenses used in sanskrit

LO4: concepts related to various technical fields

UNIT – I (6)

Introduction: Alphabets, vowels, consonants, mahesvarasutras, combined alphabets, verbs, basic words.

UNIT –II (6)

Study of Grammar I: Singular / dual / plural, nominative case, accusative case, instrumental case, dative case, ablative case, genitive case, locative case.

UNIT– III (6)

Study of Grammar II: Nouns and adjectives,indeclinable,present tense,past tense, future tense, order and request, prefixes, number word, combinations ablative case, genitive case, locative case and cases

UNIT - IV (6)

Technical ConceptsRelated to Various Fields: Technical concepts of mathematics, chemistry, electrical science, mechanics &mechanical science, metallurgy, aeronautics, marine science, measurement of time, astronomy, architecture, botany, agriculture, hygiene &health

Text Books:

[1] Dr.Vishwas, *Abhyaspustakam*, 1st ed. New Delhi: Samskrita-Bharti Publication, 2014.

[2] Suresh Soni, *India's Glorious Scientific Tradition*, 1st ed. NewDelhi: Ocean books (P) Ltd, 2008(Unit IV).

Reference Books:

[1] VempatiKutumbshastri, *Teach Yourself Sanskrit*, 1st ed. New Delhi: PrathamaDeekshaRashtriya Sanskrit Sansthanam, 2012.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: understand to read and write basic Sanskrit language

CO2: identify the usage of grammar in the ancient Indian language

CO3: make use of tenses in Sanskrit language

CO4: analyze the ancient Sanskrit literature on Science and Technology

Course Articulation Matrix (CAM): P20AC108B SANSKRIT FOR TECHNICAL KNOWLEDGE

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20AC108B.1	2	1	1	-	-
CO2	P20AC108B.2	2	1	1	-	-
CO3	P20AC108B.3	2	1	1	-	-
CO4	P20AC108B.4	2	1	1	-	-
P20AC108B		2	1	1	-	-

P20AC108C CONSTITUTION OF INDIA

Class: M. Tech. I – Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop students 'knowledge in/on...

LO1:state policy and parliamentary form of government, council of ministers

LO2: necessity of act of information technology and its powers, cyber security and its laws

LO3: consumer protection act, rights of consumer-deficiency in service

LO4: crimes against women, different legislations, process of investigation and right to information act

UNIT – I (6)

Constitutional Law: Constitution meaning and significance-constitutional history-status of fundamental rights-role of fundamental duties-implementation of the directive principles of the state policy-parliamentary form of government-president-prime minister-council of ministers-federal structure in constitution-relations between central and state-amendment of constitution –procedure and kinds of amendments

UNIT –II (6)

Law of Information Technology: Evolution-genesis and necessity of information technology act-features and various authorities under it act-their powers-impact of other related enactments-e-commerce laws in India-digital and electronic signatures in Indian laws-e-contracts and its validity in India-cyber tribunals-definition and necessity of cyber security-computer and cyber security-e-mail security-database security- operating system security-advance computers-network and mobile security techniques- sensitive personal data and information in cyber laws-cybercrimes-hacking-phishing – stalking-cyber terrorism

UNIT– III (6)

Corporate Law: Definition and essentials of valid contract - corporate incorporation and management-directors of company-company secretary-corporate governors-different system of corporate governors-corporate governance and social responsibility-emerging trends-corporate and social environment responsibility-competition law-objectives competition commission of India-consumer protection act-consumerism-rights of consumer-deficiency in service-unfair trade practices-e-contracts etc.

UNIT - IV (6)

Criminal Law: Definition of crime--crimes against women including cybercrimes-criminal justice systems-protection for women for atrocities-different legislations like constitution, Indian penal code, human rights, domestic violence, equality in rights, dowry prohibition, prevention of child marriage, prevention of sexual harassment against woman at work place, protection of children some sexual harassment – investigation – compliant - process of investigation – fir, panchanama, closure report, charge sheet etc., - procedure of search

Right to Information Act: Freedom of information - Indian constitution and right to information - legislating the right to information - salient features of the right to information act 2005 - public authority under RTI act - nature of RTI, exemptions and limitations - composition, powers and functions of the information commissions - rightto information and implementation issues

Text Books:

[1] M.P.Jain, Indian *Constitutional Law*, Vol.1, Wadhwa & Co, Nagpur, 2003
[2] Vakul Sharma, *Information Technology – Law and Practice*, 3rded.Universal Law Publishing,2011.
[3] Gower and Davies, *Principles of Modern Company Law*, 10th ed.Sweet and Maxwell Publishing,
[4] Ratan Lal and Dhiraj Lal: *Indian Penal Code*, 36th ed. Wadhwa & Co., 2000.
[5] O.P.Srivastava: *Principles of Criminal Law*, 6th ed. Eastern Book Company, 2016
[6] KM Shrivastava, *The Right to Information: A Global Perspective*, New Delhi:Lancer Publisher,2013.

Reference Books:

[1] H.M.Seervai, *Constitutional Law of India, Vol.3*,4th ed. N.M.Tripathi ,. 1997.
[2] G.C.V.Subba Rao, *Indian Constitutional Law*, Hyderabad : S.Gogia& Co.
[3] Dr.S.R.Myneni, *Information Technology Law (Cyber Laws)*, 1st ed., Hyderabad: Asia LawHouse 2018.
[4] J.M. Thomson: *Palmer's Company Law*, Vol.4, 21sted. Wildy& Sons Ltd.
[5] P.S.Achutan Pillai: *PSA Pillai'sCriminal Law*, Butterworth Co., 2000.
[6] K.D.Gour: *Criminal Law, Cases and Materials*, 9th ed. LexisNexis, 2019.
[7] Sairam Bhat, *Right to Informationand Good Governance*, National Law School of India University, 2016.
[8] Dheera Khandelwal and KK Khandelwal, A Commentary and Digest on the *Right to Information Act: 2005*, 2nd ed 2014

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: develop the knowledge in state policy and parliamentary form of government
CO2: make use of information technology act and cyber security
CO3: utilize the consumer protection act and rights consumer
CO4: perceive the legislations and understand the process of investigation and right to information act

Course Articulation Matrix (CAM): P20AC108CCONSTITUTION OF INDIA						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20AC108C.1	1	1	1	-	-
CO2	P20AC108C.2	1	1	1	-	-
CO3	P20AC108C.3	1	1	1	-	-

P20AC108DPEDAGOGY STUDIES

Class:M.Tech. I – Semester**Specialization(s):** SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1:terminology of pedagogy studies, role of curriculum, relation between teaching and learning

LO2: effectiveness of pedagogical practices and teaching strategies

LO3: student centered approaches of learning

LO4: factors supporting effective pedagogy, research gaps and future directions of potential areas

UNIT-I (6)

Methodology: Aims and rationale, Policy background, conceptual framework and terminology, theories of learning- behaviourism, constructivism, social constructivism, critical theory, difference between curriculum and syllabus, curriculum, importance of curriculum for students and teachers, role played by the curriculum

Teaching- Learning Process: Introduction, concept of pedagogy, principles of teaching,maxims of teaching, phases of learning, relationship between teaching and learning, factors of teaching and learning in classroom situation, difference between teaching andlearning

UNIT-II (6)

Overview of Pedagogical Practices in Developing Countries: Overview and aims, pedagogy approaches, pedagogy as practice, pedagogy as ideas, pedagogy and equity, curriculum, teacher education - initial teacher education, continuing professional development, training unqualified teachers,**e**ffectiveness of pedagogical practices, pedagogic theory and pedagogical strategies, teachers' attitudes and beliefs

Strategies of Teaching: Features, characteristics, advantages and limitations of lecture method, demonstration method, experimental method and discussion method

UNIT-III (6)

Student Centred Approaches: Features, characteristics, advantages and limitations of constructivist approach of learning, Discovery method of learning, Enquiry method, Project Based Learning (PBL), Activity Based Learning (ABL)

Practical Approaches: Features of experiential learning and Teacher's role, Peer tutoring, Field visits and process of organizing, E-learning tools, strengths and weaknesses

UNIT-IV (6)

Role of Teacher Education, School Curriculum, Guidance Materials in Supporting Effective Pedagogy: Professional development, alignment with classroom practices and follow-up support, peer support, support from the head teacher and the community,

curriculum and assessment, barriers to learning:limited resources and large class sizes **Research gaps and future directions:** Research design, contexts, pedagogy, teacher education, curriculum and assessment, dissemination and research impact

Textbooks:

[1] Dr. S. K. Bhatia, Dr. Sonia Jindal, *A Textbook of curriculum, pedagogy and evaluation*, 1st ed. New Delhi: Paragon International Publishers, 2016.

[2] Jo Westbrook, NaureenDurrani, Rhona Brown, David Orr, John Pryor, Janet Boddy, Francesca Salvi, *Pedagogy, Curriculum. Teaching Practices and Teacher Education in Developing Countries*, Education Rigorous Literature Review, Center for International Education, University of Sussex, December 2013.

Reference books:

[1] Ackers J, Hardman F, *Classroom interaction in Kenyan primary schools*, Compare, 31 (2): 245-261, 2001.

[2] Agrawal M, *Curricular reform in schools: The importance of evaluation*, Journal of Curriculum Studies, 36 (3): 361-379, 2004.

[3] Akyeampong K, *Teacher training in Ghana - does it count? Multi-site teacher education researchproject (MUSTER) country report 1*. London: DFID, 2003.

[4] Akyeampong K, Lussier K, Pryor J, Westbrook J, *Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?* International Journal EducationalDevelopment, 33 (3): 272–282, 2013.

[5] Alexander RJ, *Culture and pedagogy: International comparisons in primary education*. Oxfordand Boston: Blackwell, 2001.

[6] Chavan M, *Read India: A mass scale, rapid, 'learning to read' campaign*, 2003.

[7] www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to...

CO1: describe the significance of curriculum, relationship between teaching and learning

CO2: justify the effectiveness of pedagogical practicesof teaching and compare the lecture, demonstration, experimental and discussion methods of teaching strategies

CO3: analyse the role of student centered approaches in learning of a student and identify suitable approaches for the improvement

CO4: exemplify the role of professional development, curriculum, assessment for effective pedagogy and identify the research gaps in allied areas

Course Articulation Matrix (CAM): P20AC108D PEDAGOGY STUDIES

CO		PO 1	PO 2	PO 3	PSO 1	PSO 2
CO1	**P20AC108D.1**	-	1	-	-	-
CO2	**P20AC108D.2**	1	1	1	-	-
CO3	**P20AC108D.3**	1	1	1	-	-
CO4	**P20AC108D.4**	1	1	1	-	-
P20AC108D		1	1	1	-	-

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DEPARTMENT OF CIVIL ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION OF
M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

PRR-20

SEMESTER-II

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE - TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
				L	T	P		ATLP	CRP	CP	PPT					
1	PC	P20SC201	Dynamics of Structures	3	-	-	3	8	8	8	6	10	20	60	40	100
2	PC	P20SC202	Construction Techniques & Equipment	3	-	-	3	8	8	8	6	10	20	60	40	100
3	PE	P20SC203	Professional Elective-III/ MOOC-III	3	-	-	3	8	8	8	6	10	20	60	40	100
4	PE	P20SC204	Professional Elective-IV/ MOOC-IV	3	-	-	3	8	8	8	6	10	20	60	40	100
5	PC	P20SC205	Structural Engineering Software Applications Laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
6	PC	P20SC206	Infrastructure Design and Drawing laboratory	-	-	4	2	-	-	-	-	-	-	60	40	100
7	PROJ	P20SC207	Mini Project with Seminar	-	-	4	2	-	-	-	-	-	-	100	-	100
8	AC	P20AC208	Audit Course-II	2	-	-	1	8	8	8	6	10	20	60	40	100
			Total:	14	-	12	19							520	280	800

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Elective- 3

P20SC203A: Earthquake Resistant Design of RCC Structures
P20SC203B: Design of Special Structures
P20SC203C: Repair, Rehabilitation and Retrofitting of structures
P20SC203D: MOOCs

Elective- 4

P20SC204A: Quality and Safety Management
P20SC204B: Sustainable Construction Engineering
P20SC204C: Urban Infrastructure Planning and Management
P20SC204D: MOOCs

Audit Course - 2

P20AC208A: Stress Management by Yoga
P20AC208B: Value Education
P20AC208C: Personality Development through Life Enlightenment Skills
P20AC208D: Disaster Management

Total Contact Periods/Week: 26 **Total Credits: 19**

P20SC201DYNAMICS OF STRUCTURES

Class:M.Tech. II – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Exam	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: fundamentals of dynamic loading
LO2: dynamic and earthquake response of single degree of freedom system
LO3: multi degree of freedom system, free vibrations of structures
LO4: dynamic and earthquake analysis of linear systems

UNIT–I (9)

Concepts of Structural Dynamics: Fundamental objective of structural dynamics analysis, types of prescribed loadings,methods of discretization, formulation of the equations of motion

Single Degree-of-Freedom System: Equations of motion, analysis of free vibration, response to harmonic and periodic loadings, response to impulse loading, response to general dynamic loading: step by step method, generalized single degree freedom systems

UNIT–II (9)

Numerical Evaluation of Dynamic Response: Time stepping methods, central difference method, Newmark's method

Earthquake Response of SDOF Systems: Earthquake excitation, response quantities and history, response spectrum concept and characteristics, elastic design spectrum, comparison of design and response spectra

UNIT–III (9)

Multi Degree of Freedom System: Equations of motion, Static condensation, symmetric and unsymmetric plan systems: ground motion, in-elastic systems

Free Vibration of MDOF Systems: Natural vibration frequency and modes, free vibration response, computation of vibration properties, undamped free vibrations, analysis of vibration frequencies, free vibration analysis of systems with damping

Text Books:

[1] K. Chopra, *Dynamics of Structures: Theory & Applications to Earthquake Engineering*, 1st ed.New Jersey: Prentice Hall Inc., 1995.

Reference Books:

[1] Mario Paz, *Structural Dynamics - Theory & Computations*,2nd ed. New Delhi: CBS Publishers, 2001.

[2] R.W. Clough and J. Penzien, *Dynamics of Structures*, 3rd ed. Computers and Structures Inc.,2003.

[3] BIS, IS: 1893 (part-1)-2002, *Criteria for Earthquake Resistant-Design of structures*,New Delhi: Bureau of Indian Standards.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: appraise the concepts of dynamic loading

CO2: evaluate the dynamic and earthquake response of single degree of freedom system

CO3: solve multi degree of freedom system and free vibrations of structures

CO4: analyze dynamic and earthquake response of linear systems

Course Articulation Matrix (CAM): P20SC201DYNAMICS OF STRUCTURES						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC201.1	1	1	1	1	1
CO2	P20SC201.2	1	1	1	1	1
CO3	P20SC201.3	1	1	1	1	1
CO4	P20SC201.4	1	1	1	1	1
P20SC201		1	1	1	1	1

P20SC202 CONSTRUCTION TECHNIQUES & EQUIPMENTS

Class:M.Tech. II – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Exam	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: financing aspects, management and maintenance of construction equipment
LO2: earthmoving and drilling equipment
LO3: functions of cranes and concreting equipment
LO4: equipment valuation and application of artificial intelligence

UNIT-I (9)

Mechanization in Construction: Mechanization in construction industry, financing aspects of construction plants and equipment, factors effecting selection of constructionequipment

Operation and Maintenance: Operating the construction equipment, equipment management, maintenance characteristics performance

UNIT-II (9)

Drilling and Plant Equipments: Piles and pile driving equipments, drilling rock and the earth, air compressors and pumps

Earthmoving Equipments: Excavating and demolishing equipment - shovels, scrapers and bulldozers, compaction and stabilization equipments, trucks and hauling equipments, finishing equipments, blasting rock

UNIT-III (9)

Hoisting Equipment: Hoist winch, chains, and hooks, slings, various types of cranes- tower crane, mobile crane and derrick crane, safety in crane operation

Conveying Equipment: Various types of belts and conveyors, concreting equipment: concrete mixers, truck mixers, pneumatic concrete placers, vibrators and scaffolding

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: appraise the financing aspects, operation and maintenance of construction equipment

CO2: choose earthmoving and drilling equipment

CO3: select suitable hoisting and conveying equipment

CO4: evaluate value of equipment and adapt artificial intelligence in construction

Course Articulation Matrix (CAM): P20SC202 CONSTRUCTION TECHNIQUES & EQUIPMENTS

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC202.1**	1	1	1	-	1
CO2	**P20SC202.2**	1	1	1	-	1
CO3	**P20SC202.3**	1	1	1	-	1
CO4	**P20SC202.4**	1	1	1	1	1
P20SC202		1	1	1	1	1

P20SC203A EARTHQUAKE RESISTANT DESIGN OF RCC STRUCTURES

Class:M.Tech. II – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: basic concepts of earthquake and its quantification
LO2: principles of conceptual and earthquake resistant design
LO3: seismic evaluation of reinforced concrete and masonry buildings
LO4: seismic effect on structural and non-structural elements

UNIT-I (9)

Earthquake and Ground Motion: Earthquake phenomenon, causes of earthquakes, faults, plate seismic tectonics, wave terms associated with earthquakes, magnitude, intensity of an earthquake, scales, energy released

Earthquake Measuring Instruments: Seismoscope, Seismograph, Accelerograph, characteristics of strong ground motions, seismic zones of India

UNIT – II (9)

Conceptual Design: Functional planning, continuous load path, overall form, simplicity and symmetry, elongated shapes, stiffness and strength, horizontal and vertical tremors, twisting of building

Earthquake Resistant Design: Seismic design requirements, regular and irregular configurations, basic assumptions, design earthquake loads, load combinations, Equivalent lateral force method, Response spectrum method

UNIT –III (9)

Seismic Evaluation: Principles of earthquake resistant deign of reinforced concrete members, structural models for frame buildings, seismic methods of analysis, seismic design methods, IS code-based methods for seismic design, seismic evaluation and retrofitting, vertical irregularities, plan configuration problems

Masonry Buildings: Elastic properties of masonry assemblage, categories of masonry buildings, behavior of unreinforced and reinforced masonry walls, behavior of walls, box action and bands, behavior of infill walls, improving seismic behavior of masonry buildings, load combinations and permissible stresses, seismic design requirements

UNIT-IV (9)

Structural Walls: Strategies in the location of structural walls, sectional shape, variations in elevation, cantilever walls without openings, failure mechanism of non- structures

Non-Structural Elements: Effects of non-structural elements on structural system, analysis of non- structural elements, prevention of non-structural damage, isolation of non-structures

Text Book:

[1] S. K. Duggal, *Earthquake Resistant Design of structures,*2nd ed. Oxford University Press, 2013.

Reference Books:

[1] Pankaj Agawal and Manish Shrikhande, *Earthquake Resistant Design of structures,*2nd ed. Prentice Hall of India Pvt. Ltd., 2007.

[2] T.Paulay and M.J.N. Priestly, *Seismic Design of Reinforced Concrete and Masonry Building,*1st ed. John Wiley & Sons, 1992.

[3] Anand.S.Arya, *Masonry and Timber structures including earthquake Resistant Design,* 1st ed.Nem Chand &Bros, 1987.

[4] C.V.R. Murty, *Earthquake Tips - Learning Earthquake Design and construction,* National Information Centre of Earthquake Engineering, Indian Institute of Technology Kanpur, 2005.

[5] BIS, IS: 1893 (part-1)-2002,*Criteria for Earthquake Resistant-Design of structures,*New Delhi: Bureau of Indian Standards.

[6] BIS, IS 4326: 1993, *Earthquake Resistant Design and Construction of Building,* New Delhi: Bureau of Indian Standards.

[7] BIS, IS 13920: 2016, *Ductile detailing of concrete structures subjected to seismic force,* New Delhi: Bureau of Indian Standards.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: interpret the basic concepts and measure different earthquake parameters
CO2: adapt the principles of conceptual and earthquake resistant design
CO3: design of reinforced concrete and masonry buildings
CO4: predict the seismic effect on structural and non-structural elements

Course Articulation Matrix (CAM): P20SC203AEARTHQUAKE RESISTANT DESIGN OF RCC STRUCTURES						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC203A.1	1	1	1	1	1
CO2	P20SC203A.2	2	1	1	1	1
CO3	P20SC203A.3	1	1	1	1	1
CO4	P20SC203A.4	2	1	1	1	1
P20SC203A		1.5	1	1	1	1

P20SC203B DESIGN OF SPECIAL STRUCTURES

Class:M.Tech. II-Semester **Specialization:**Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: structural behavior of flat slabs and grid slabs
LO2: analysis of deep beams and shear walls
LO3: analysis of roof trusses and gantry girder
LO4: structural aspects on bunkers and silos

UNIT – I (9)

Flat Slabs: Components, BIS codal recommendations, direct design and equivalent methods, design for flexure and shear

Grid Slabs: General features, Approximate method, Plate theory, BIS codal provisions, analysis and design

UNIT –II (9)

Deep Beams: Minimum thickness, steps for designing, design by BIS method

Shear Walls: Classification of walls, type of loads, design of rectangular and flanged shear walls

UNIT– III (9)

Roof Trusses: Types of trusses,components, types of loads, wind load consideration, analysis and design of roof trusses, portal and gable frames

Gantry Girder: Type of loads,Permissible stresses, types of girders, components, designof gantry girder

UNIT – IV (9)

Steel Bunkers: Types of bunkers, assumptions, Jansen's and Airy's theories, BIS codal provisions, design of square bunker

Silos: Types of loads, BIS codal provisions, design of cylindrical silo, side plates, ring girder

Text Books:

[1] P.C. Varghese, *Advanced Reinforced Concrete Design*, 2nd ed. Jodhpur: Prentice Hall of IndiaPvt. Ltd., 2005 *(Chapters 4, 6, 10-13, and 19)*

[2] B. C. Punmia, Ashok Kr. Jain and Arun Kr. Jain, *ComprehensiveDesign of Steel Structure*, 2nded. New Delhi: Lakshmi Publishers, 2005. *(Chapters 9 and 16)*

Reference Books:

[1] Ramchandra and Virendra Gehlot, *Design of Steel Structures-II*, 9th ed. New Delhi: Scientific Publishers, 2015.

[2] B.C. Punmia, Ashok Kr. Jain and Arun Kr. Jain, *RCC Designs (Reinforced Concrete Design)*, 10th ed. New Delhi: Lakshmi Publishers, 2015.

[3] Ramaswamy. G. S, *Design and Construction of concrete shell roofs*, New Delhi: CBS Publishers,2005

[4] KrishnaRaju. N, *Design of Reinforced concrete Structures*, 3rd ed. New Delhi: CBS Publisher,2015.

[5] Arya Azmani, *Design of Steel Structures*, New Delhi: New Chand Publisher, 2011

[6] BIS, IS 456: 2000, *Code of practice for Plain and reinforced concrete*, New Delhi:Bureau of Indianstandards, 2000.

[7] BIS, IS 875 (part 1-5),*Code of practice for Design loads*, New Delhi: Bureau of Indian standards, 1987.

[8] BIS, SP: 16,*Design Aids for Reinforced Concrete to IS 456: 1978*,New Delhi: Bureau of Indianstandards, 1980.

[9] BIS, IS 800:2007, *General construction in steel -Code of practice*, 3rd ed. New Delhi: Bureau of Indian standards, 2007.

[10] BIS, SP: 6 (1-7),*Handbook for structural engineers*, New Delhi: Bureau of Indian standards,1980

[11] BIS, IS 9178: 2010, *Criteria for design of Steel Bins for storage of bulk materials*, New Delhi: Bureau of Indian standards, 2010.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: analyze, design of flat slabs and grid slabs.
CO2:design the segments of deep beams and shear walls.
CO3: develop the sections of roof truss and gantry girder
CO4: estimate the dimensions of steel bunkers and silos

Course Articulation Matrix(CAM):P20SC203B DESIGN OF SPECIAL STRUCTURES						
CO		PO 1	PO 2	PO 3	PSO1	PSO2
CO1	P20SC203B.1	1	-	1	1	1
CO2	P20SC203B.2	1	-	1	1	1
CO3	P20SC203B.3	1	1	1	1	1
CO4	P20SC203B.4	1	1	1	1	1
P20SC203B		1	1	1	1	1

P20SC203CREPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES

Class:M.Tech. II – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: failure and diagnose distress of structures
LO2: case studies of damage and reserve strength of structure
LO3: materials for repairing and their techniques
LO4: techniques of retrofitting and rehabilitation

UNIT-I (9)

Failure of Structures: Review of the construction theory, performance problems, responsibility and accountability, case studies - learning from failures, causes of distressin structural members, design and material deficiencies, over loading

Diagnosis and Assessment of Distress: Visual inspection, non-destructive tests, ultrasonic pulse velocity method, rebound hammer technique, penetration resistance, pull out tests, core sampling and testing, chemical tests, carbonation tests and chloride content, corrosion potential assessment - cover meter survey, half-cell potentiometer test, resistivity measurement

UNIT-II (9)

Case Studies: Studies of RCC buildings subjected to distress, identification and estimation of damage, structural integrity and soundness assessment, interpretation and evaluation of results

Evaluation: Evaluation of reserve strength of existing structures, active and passive repairs, selection of repair materials for concrete, essential parameters for repair materials, strength and durability aspects

UNIT-III (9)

Materials: Materials for repair, premixed cement concrete and mortars, polymer modified mortars and concrete, epoxy and epoxy systems, polyester resins, coatings

Repair Techniques: A suitable repair option for certain damage in a structure, repair stages, repair methods, guniting, shortcreting, polymer concrete system, reinforcement replacement, strengthening concrete by surface impregnation, polymer and epoxyoverlays

UNIT-IV (9)

Retrofitting: Resin/polymer modified slurry injection, plate bonding technique, ferro cement jacketing, RCC jacketing, propping and supporting, repair methods, fiber wrap technique, foundation rehabilitation methods, chemical and electrochemical method of repair

Rehabilitation: Strategies, Stress reduction technique, repair and strengthening of columns and beams, rehabilitation strategies, compressive strength of concrete, cracks/joints, masonry, foundation, base isolation

Text Book:

[1] CPWD, *Handbook on Repair and Rehabilitation of RCC buildings*, 1st ed. New Delhi: Govt. of India Press, 2002.

Reference Books:

[1] R.N. Raikar,*Learning from failures - Deficiencies in Design, Construction and Service,* 1st ed.New Bombay: R and D Centre (SDCPL), 1987.

[2] ACI 562-16, *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary,* US: ACI Committee, 2019.

[3] Santha Kumar A.R, *Concrete Technology,* 2nd ed. New Delhi: Oxford University Press, 2018.

[4] DovKaminetzky,*Design and Construction Failures,* 1st ed. New Delhi: Galgotia PublicationsPvt. Ltd., 2001.

[5] S. M. Johnson, *Deterioration, Maintenance and repair of structures,* 1st ed. New Delhi: Krieger Publishing Company, 1980.

[6] R. T. Allen and S. C. Edwards, *Repair of Concrete Structures,* 1st ed. UK: CRC Press, 1992.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: assess the causes for distress and estimate the deterioration of structures

CO2: evaluate distress in the structure

CO3: recommend materials for repairing and their techniques

CO4: formulate guidelines for repair techniques of deteriorated structures

Course Articulation Matrix (CAM): P20SC203C REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC203C.1**	1	-	1	1	-
CO2	**P20SC203C.2**	1	1	1	1	-
CO3	**P20SC203C.3**	1	-	1	1	1
CO4	**P20SC203C.4**	1	1	1	1	1
P20SC203C		**1**	**1**	**1**	**1**	**1**

P20SC204A QUALITY AND SAFETY MANAGEMENT

Class:M.Tech. II-Semester **Specialization:**Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Exam:	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: quality control methods and standards
LO2: quality assurance and management in construction industry
LO3: safety concepts and requirements applied to construction industry
LO4: risk management in construction industry

UNIT-I (9)

Construction Quality: Significance of quality- inspection, control, assurance, philosophies, management, periodical changes in quality system

Quality Standards: Quality standards, standards organizations,common standards used in building construction projects, principles of quality in construction projects, progress in quality of construction projects

UNIT-II (9)

Quality Assurance: Quality assurance in construction, International Organization for Standardization (ISO), ISO certification, ISO- 9000, ISO-14000, ISO-18000 Quality management system, Quality System Documentation, Quality audit – categories, process

Quality Management: Total quality management (TQM), quality tools, design tools-Six Sigma, Design of experiments (DOE), lean tool, quality in construction projects

UNIT-III (9)

Construction Safety: Evolution of safety, accident causation theories, foundation of major injury, health and safety act and regulations, cost of accidents, roles of safety personnel, causes of accidents, principles of safety

Safety Management System: Safety policy and organization, safety budget, safety organization, education and training, safety plan, safety manual, safety committee, incentive programs, accident reporting, investigation and record keeping, research results in safety management

UNIT- IV (9)

Risk in Construction: Risk identification process - analysis and evaluation process, risk management process, risk treatment strategies

Insurance in Construction Industry: Fundamental principles of insurance, project insurance, marine cum erection insurance, fire policy, professional indemnity policy, common examples of business and project risk, risks faced by Indian construction companies assessing international project

Text Books:

[1] Abdul RazzakRumane, *Quality Management in Construction Projects*, New York:CRC Press,2017.*(Chapter 1-4)*

[2] Kumar Neeraj Jha, *Construction Project Management*, 2nd ed.New Delhi: Pearson, 2015. *(Chapters14 and 15)*

Reference Books:

[1] Dr. S.Seetharaman *Construction Engineering and Management*, 5th ed. New Delhi: Umeshpublications, 2019.

[2] Tim Howarthand David Greenwood, *Construction Quality Management:Principles and Practice*, Routledge, NY, 2017.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: apply quality standards and philosophies
CO2: recommend quality assurance aspects and standards in construction industry
CO3: interpret hazards in construction and adapt safety measures
CO4: identify risk and suggest suitable mitigation strategy

Course Articulation Matrix (CAM): P20SC204A QUALITY AND SAFETY MANAGEMENT

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC204A.1	1	1	1	-	1
CO2	P20SC204A.2	1	1	1	1	1
CO3	P20SC204A.3	1	1	1	1	1
CO4	P20SC204A.4	1	1	1	1	1
P20SC204A		1	1	1	1	1

Sustainability Concepts: Definitions of sustainability, pillars of sustainability, circle of sustainability, need for sustainability, engineering principles of sustainability, systems approach to sustainability

Green Buildings: Green buildings, sustainable buildings, climate change, global warming, national, international policies and their regulations of sustainability

UNIT-II (9)

Sustainable Building Materials: Sustainable building materials, qualities, use, examples, natural building materials, locally available and locally manufactured materials, bio materials, salvaged and recycled materials, nontoxic materials: low VOC paints, coating and adhesives

Selection of Sustainable Materials: Issues in selecting green materials, pragmatic view of green materials, priorities in selection process, life cycle assessment of building materials, sustainable concrete production

UNIT-III (9)

Energy and Carbon Reduction: Building energy issues,high performance building design strategy, goal setting for high performance, passive design strategy – shape, orientation, and massing, lighting, ventilation, passive cooling, composite beam and panel, furnicular shells, filler slabs, reinforced concrete masonry, vaulted roofs, ferro- cement walls

Applications in Built Environment: Concepts of green buildings, climate responsive building, Indoor Environmental Quality (IEQ), issues, factors, acoustics transmission, lighting quality, thermal comfort conditions, odours, volatile organic compounds, humidity, integrated IEQ

UNIT-IV (9)

Indian Green Building Rating Systems and Codes: Approach to sustainability,Green building rating systems: IGBC and GRIHA rating tools for building assessment, Codes and regulations for green building

The Future of Sustainable Buildings: Business case of high-performance green buildings,design and construction strategies, reinventing the construction industry, challenges and opportunities

Text Books:

[1] Charles J Kibert,*Sustainable Construction Green Building Design and Delivery*, 3rd ed.Canada: John Wiley & Sons, 2014. *(Chapters 6-9,12,13and15)*

[2] Steve Goodhew, *Sustainable Construction Processes*, London:John Wiley & Sonspublisher,2016. *(Chapters 1-9)*

Reference Books:

[1] Gajanan M. Sabnis, *Green Building with concrete – sustainable design and construction*, London: CRC Press, 2016.

[2] Gursharan Singh Kainth, *Climate Change, Sustainable Development and India*, LAP Lambert Academic Publishing, 2011.

[3] *Sustainable Building - Design Manual Part I and II*, The Energy and Resources Institute, TERI,2004.
[4] Linda Reeder, *Guide to Green Building Rating Systems: Understanding LEED, Green Globes*, John Wiley & Sons publisher, 2010.
[5] Margaret Robertson *Sustainability Principles and Practice*, 2nd ed.Routledge publisher, 2014.
[6] Traci Rose Rider, Stacy Glass, Jessica McNaughton, *Understanding Green Building Materials* W.W. Norton and Company, 2011.

Course Learning Outcomes (COs):
On completion of this course, students will be able to ...

CO1: infer the significance of sustainability in construction engineering
CO2: appraise and select sustainable building materials
CO3: interpret the energy and carbon reduction strategies
CO4: design and construct sustainable building

Course Articulation Matrix (CAM): P20SC204B SUSTAINABLE CONSTRUCTION ENGINEERING

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC204B.1	1	1	1	1	1
CO2	P20SC204B.2	1	1	1	1	1
CO3	P20SC204B.3	1	1	1	1	1
CO4	P20SC204B.4	1	1	1	1	1
P20SC204B		1	1	1	1	1

P20SC204C URBAN INFRASTRUCTURE PLANNING AND MANAGEMENT

Class: M.Tech. II –Semester **Specialization:** Structural Engineering & Constructior

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: urban infrastructure development and system performance
LO2:socio-economic and environmental implications
LO3: urban planning and designing for sustainability
LO4: urban infrastructure performance towards sustainability

UNIT-I (9)

Urban Infrastructure: Infrastructure,evaluating infrastructure projects, cities and civilization, framework for project evaluation – identification, analysis of alternatives, assessing and comparing alternatives, implementation, evaluation
System Performance: Performance of infrastructure-based systems, system cost – total, average, marginal and incremental, resource requirement, lifecycle cost, profitability, breakeven volume, return on investment, service capacity, safety, security and risk, case studies

UNIT-II (9)

Public Perspectives and Concerns: General overview – differences between public and private perspectives, benefit-cost analysis – brainstorming, monetary values of cost andbenefit analysisand decision-making adjustments
Socio-Economic and Environmental Aspects: Economic – measures related to regional and national economy, environment – ecosystem, pollution, wetlands, wild life habitat, renewable resourcesand climate change, social – positive and negative issues, framework for assessing social impacts, case studies

UNIT-III (9)

Urban Eco-Design for Buildings: Territorial facilities – eco-design approach, Essential notions, decision about space, eco-design for transportation, land use and spatial planning and their systematic analysis **Sustainable Urban Planning:** Concepts and components of ecology and ecosystem, types of pollution: causes, effects and control; role of planner for location of treatment plants and industries, abatement measures of noise, air and land pollution, concept of eco-city, decay causes and remedies; urban renewal missions, role of urban planners in disaster management, concept of smart city

UNIT-IV (9)

Infrastructure Rating Systems and Codes: Approach to sustainability, Codes and regulations for green building, Indian building assessment tools
Challenges and Opportunities: Green buildings for competitive business models, design and construction strategies, reinventing the construction industry, challenges and opportunities

Text Books:

[1] Carl D. Martland,*Toward more Sustainable Infrastructure: Project Evaluation for Planners andEngineers*, London:John Wiley & Sons, 2011. *(Chapters 1-5)*

[2] Pratap Rao, *Urban Planning Theory and Practices*, CBS Publishers, 2014. *(Chapters 1-3,5,6and8-12)*

Reference Books:

[1] Margaret Roberts,*Town Planning techniques*,Hutchinson Educational Publication, 2012.

[2] Rehana Tariq, *Sustainable Urbanization and urban Development*,New Delhi: New AcademicPublishers, 2008.

[3] N.V. Modak and V.N. Ambdekar, *Town and Country Planning and Housing*, Orient Longman Limited.

[4] Gajanan M. Sabnis, *Green Building with concrete – sustainable design and construction*, London: CRC Press, 2016

[5] Gursharan Singh Kainth, *Climate Change, Sustainable Development and India*, LAP LambertAcademic Publishing, 2011.

[6] *Sustainable Building - Design Manual Part I and II*, The Energy and Resources Institute, TERI, 2004.

[7] Linda Reeder, *Guide to Green Building Rating Systems: Understanding LEED, Green Globes*, John Wiley & Sons publisher, 2010.

[8] Margaret Robertson *Sustainability Principles and Practice*, 2nd ed. Routledge publisher, 2014.

[9] Traci Rose Rider, Stacy Glass, Jessica McNaughton, *Understanding Green Building Materials* W.W. Norton and Company, 2011.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: articulate the urban planning for circular ecosystem

CO2: appraise the sustainable aspects and cost implications in urban infrastructure planning

CO3: integrate eco-design for urban planning

CO4: validate rating for urban infrastructure

Course Articulation Matrix (CAM): P20SC204C URBAN INFRASTRUCTURE PLANNING AND MANAGEMENT

CO		PO 1	PO 2	PO 3	PSO1	PSO2
CO1	**P20SC204C.1**	1	1	1	1	1
CO2	**P20SC204C.2**	1	1	1	1	1
CO3	**P20SC204C.3**	1	1	1	1	1
CO4	**P20SC204C.4**	1	1	1	1	1
P20SC204C		1	1	1	1	1

P20SC205 STRUCTURAL ENGINEERING SOFTWARE APPLICATIONS LABORATORY

Class: M.Tech. II-Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
-	-	4	2

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: type of loadings in buildings
LO2: STAAD-PRO in using design of RCC, steel structures
LO3: design of RC beams, columns, slabs, footings and retaining walls using Matlab
LO4:design of steel beams, columns and connections using Matlab

LIST OF EXPERIMENTS

1. Analysis and design of RCC multi-storey building using STAADPRO for verticalloads (dead, live load etc.).
2. Analysis and design of RCC multi-storey building using STAADPRO for verticaland horizontal loads (wind load, seismic loads etc.).
3. Analysis and design of steel structure using STAADPRO for various loads (dead,live, wind load).
4. Analysis and design of roof truss using STAADPRO.
5. Analysis of structure for rolling loads using STAADPRO.
6. Analysis of water tank using finite element meshing in STAADPRO.
7. Developing design charts for RC beams using Matlab/spread sheets.
8. Developing design charts for columns and footings using Matlab/spread sheets.
9. Developing design charts for retaining walls using Matlab/spread sheets.
10. Developing design charts for steel beams using Matlab/spread sheets.
11. Developing design charts for steel columns using Matlab/spread sheets.
12. Developing design charts for bolted / welded connections using Matlab/spreadsheets.

Laboratory Manual:

[1] *Structural Engineering Software Applications Laboratory Manual,* prepared by faculty of Civil Engineering Department, KITSW.

Reference Books:

[1] Krishnamurthy D, *Structural Design and Drawing -Vol. II and III,* 2nd ed.CBS Publishers,2010.

[2] BIS, IS800:2007, *General Constructions in Steel,*3rded. New Delhi: Bureau of Indian Standards, 2007.

[3] BIS, IS 456:2000, *Plain and Reinforced Concrete-Code of Practice,* New Delhi: Bureau of Indian Standards, 2000.

[4] BIS,SP34, *Handbook on Concrete Reinforcement and Detailing,* New Delhi: Bureau of Indian Standards.
[5] C.S. Krishnamurthy and S. Rajeev, *Computer Aided Design*, 2nd ed. Alpha science International, 2005.
[6] Boyd C. Panbou, *Computer applications in Construction*, 1st ed. Tata McGraw-Hill Co. Ltd.,1994.
[7] Bansal, Goel Sharma, MATLAB *and its Applications in Engineering*, 2nd ed. New Delhi: Pearson Publications.
[8] Bentley Staad V8i – Select series.

Course Learning Outcomes (COs):
On completion of this course, students will be able to...
CO1: analyse the structures for both vertical and horizontal loads in buildings using STAADPRO
CO2: design RCC and steel structures using STAADPRO
CO3: develop working drawings of RC beams, columns, slabs, footings and retaining walls through programming
CO4: generate charts for design of steel beams, columns and connections through programming

Course Articulation Matrix (CAM): P20SC205 STRUCTURAL ENGINEERING SOFTWARE APPLICATIONS LABORATORY

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC205.1**	1	2	1	1	1
CO2	**P20SC205.2**	1	2	1	1	1
CO3	**P20SC205.3**	1	2	1	-	1
CO4	**P20SC205.4**	1	2	1	-	1
P20SC205		**1**	**2**	**1**	**1**	**1**

P20SC206 INFRASTRUCTURE DESIGN AND DRAWING LABORATORY

Class: M.Tech. II-Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
-	-	4	2

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on...

LO1:RCC sub structure elements

LO2: RCC super structure elements

LO3: steel structural elements

LO4: industrial structural elements

LIST OF EXPERIMENTS

Design and draft working drawings of following RCC Structures:

1. Rectangular Column and Footing.
2. Combined footing with two columns.
3. One-way, two-way Slab and beam system.
4. Cantilever Retaining wall.
5. T-beam bridge deck.
6. Underground Rectangular Water Tank.
7. Elevated circular water Tank.

Design and draft working drawings of following Steel Structures

1. Foundation, column base and Built-up column.
2. Simple Steel Roof Trusses.
3. Eave Strut of Industrial building.
4. Plate Girder (welded).
5. Beam and Column Connection and detailing.
6. Gantry girder.
7. Steel water Tank.

Laboratory Manual:

[1] *Infrastructure Design and Drawing Laboratory Manual,* prepared by faculty of Civil EngineeringDepartment, KITSW.

Reference Books:

[1] Krishnamurthy D, *Structural Design and Drawing - Vol. II and III,* CBS Publishers, 2010.

[2] BIS, IS800:2007, *General Constructions in Steel,* 3rdrevision, New Delhi: Bureau of Indian Standards, 2007.

[3] BIS,IS 456:2000, *Plain and Reinforced Concrete-Code of Practice,* New Delhi: Bureau of Indian Standards, 2000.

[4] BIS, SP34 *Handbook on Concrete Reinforcement and Detailing,* New Delhi: Bureau of Indian Standards

[5] BIS, IS 875 Part 1, 2 and 3: 2003, *Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, Code of Practice-Dead Load*, New Delhi: Bureau of Indian standards, 2003.

[6] BIS, IS 3370 Part 1& Part 2: 2009, *Indian Standard Concrete Structures for Storage of Liquids-Code of Practice-General Requirements, Code of Practice,* New Delhi: Bureau of Indiar standards, 2009.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: interpret drawings of RCC sub structure elements

CO2: develop drawings of RCC super structures

CO3: create drawings of steel structures

CO4: analyze drawings of Industrial structural elements

Course Articulation Matrix (CAM): P20SC206 INFRASTRUCTURE DESIGN AND DRAWING LABORATORY

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC206.1**	1	2	1	-	1
CO2	**P20SC206.2**	1	2	1	-	1
CO3	**P20SC206.3**	1	2	1	-	1
CO4	**P20SC206.4**	1	2	1	-	1
P20SC206		**1**	**2**	**1**	-	**1**

P20SC207MINI PROJECT WITH SEMINAR

Class:M.Tech.II - Semester **Specialization:** Structural Engineering & Construction

TeachingScheme:

L	T	P	C
-	-	4	2

ExaminationScheme:

Continuous Internal Evaluation	100
End Semester Examination	---

Course LearningObjectives (LOs):
This course will develop students' knowledge on /in...
LO1: implementing a project independently by applying knowledge to practice
LO2: literature review and well-documented report writing
LO3: creating PPTs and effective technical presentation skills
LO4: writing technical paper in scientific journal style & format and creating video pitch

Continuous Internal Evaluation (CIE) for Mini Project with Seminar:

1) The *Post Graduate Mini Project Evaluation Committee (PGMPEC)*shall be constituted with HoD as a Chairman, M.Tech. Coordinator as a Convener and three to five other faculty members representing various specializations in thatparticular programme as members.
2) Student has to take up independent mini project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.
3) *PGMPEC* shall allot a faculty supervisor to each student for guiding on
   (a) Selection of topic
   (b) Literature survey and work to be carried out
   (c) Preparing a report in proper format
   (d) Right conduct of research and academic activity to promote academic integrity
   (e) Use of anti-plagiarism software to detect plagiarism in the report andsubmission of Mini project report within acceptable plagiarism levels
   (f) Effective mini project oral presentation before the PGMPEC There shall be only Continuous Internal Evaluation (CIE) forseminar
4) The CIE for mini project is as follows:

Assessment	Weightage
Mini project Supervisor Assessment	**20%**
PGMPEC Assessment: ***(i)*** *Registration presentation* ***(10%)*** ***(ii)*** *Working model / process / software package / system developed* ***(20%)*** ***(iii)*** *Mini project report* ***(20%)*** ***(iv)*** *Mini project paper* ***(10%)*** ***(v)*** *Mini project video pitch* ***(10%)*** ***(vi)*** *Final presentation (with PPT) and viva-voce* ***(10%)***	**80 %**
Total Weightage:	**100%**

Note: It is mandatory for the student to

(i) appear for final presentation (with PPT) and viva-voce to qualify forcourse evaluation

(ii) write mini project paper in given journal format

(ii) create a good video pitch to present mini project

a) **Mini Project Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals/Technical Magazines on the topics of potential interest

b) **Working Model**: Each student is requested to develop a working model/ process/ software package /system on the chosen work and demonstrate before the *PGMPEC*as per the dates specified by *PGMPEC*

c) **Mini Project Report:** Each student is required to submit a well-documentedmini project report as per the format specified by*PGMPEC*

d) **Anti-Plagiarism Check:** The mini project report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

e) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the *PGMPEC*as per the schedule notified by thedepartment

f) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her mini project. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his / her business idea / plan (*if any*) and social impact

5) The student has to register for the Mini project as supplementary examination inthe following cases:

i) he/she is absent for oral presentation and viva-voce

ii) he/she fails to submit the report in prescribed format

iii) he/she fails to fulfill the requirements of Mini project evaluation as perspecified guidelines

6) (a) The CoE shall send a list of students registered for supplementary to theHoD concerned

(b) Thc PGMPEC, duly constitutcd by thc HoD, shall conduct Mini projectevaluation and send the award list to the CoE within the stipulated time

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: apply knowledge to practice to design and conduct experiments and utilize modern tools for developing working models / process / system leading to innovation and entrepreneurship

CO2: demonstrate the competencies to perform literature survey, identify gaps, analyze the problem and prepare a well-documented Mini project report

CO3: make an effective oral presentation through informative PPTs, showing knowledge on the subject and sensitivity towards social impact of the Mini project

CO4: write a "Mini project paper" in scientific journal style and format from the prepared Mini

Course Articulation Matrix (CAM): P20SC207MINI PROJECT WITH SEMINAR

CO		PO 1	PO 2	PO 3	PSO 1	PSO 2
CO1	**P20SC207.1**	2	-	2	2	2
CO2	**P20SC207.2**	2	-	2	2	2
CO3	**P20SC207.3**	-	2	-	1	1
CO4	**P20SC207.4**	-	2	-	1	1
P20SC207		**2**	**2**	**2**	**1.5**	**1.5**

P20AC208A STRESS MANAGEMENT BY YOGA

Class: M.Tech. II – Semester **Specialization(s):** SE&C, DE, VE, PE, SE, DS, DC & CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on

LO1: awareness about different types of stress
LO2: yoga in the management of stress
LO3: positive health and overall wellbeing
LO4: prevention of stress related health problems by yoga practice

UNIT – I (6)

Stress: Definition of Stress, Types of stress - acute and chronic, stressors, definition of yoga from various sources, types of yoga – karma yoga, gnana yoga, bhakti yoga and raja yoga, concept of bhagavadgita, yoga versus exercise, basics of physiology and psychology, brain and its parts– Central Nervous System (CNS), Peripheral Nervous System (PNS), Hypothalamic Pituitary Adrenal (HPA) axis, sympathetic and parasympathetic nervous systems, fight and flight mechanism, relationship between stress and yoga

UNIT –II (6)

Ashtanga Yoga: Do's and don'ts in life, yamas – ahimsa, satya, asteya, bramhacharya and aparigraha, niyama – shaucha, santosha, tapa, svadhyaya, ishvarapranidhana, asana, pranayama, pratyahara, dharana, dhyana, samadhi

UNIT– III (6)

Asana and Stress: Definition of asana from patanjali, origin of various names of asanas, various yoga poses and their benefits for mind and body, sequence of performing asanas - standing, sitting, lying down on stomach, lying down on back and inverted postures, activation of annamaya kosha, effect on various chakras, systems and glands thereby controlling the stress levels through the practice of asanas.

UNIT - IV (6)

Pranayama: Anulom and vilom pranayama, nadishudhi pranayama, kapalabhati pranayama, bhramari pranayama, nadanusandhana pranayama

Meditation Techniques: Om meditation, cyclic meditation, Instant Relaxation Technique (IRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique(DR

Text Books:

[1] *Yogic Asanas for Group Training - Part-I*, Nagpur: Janardhan Swami Yogabhyasi Mandal.
[2] Swami Vivekananda, *Rajayoga or Conquering the Internal Nature*, Kolkata: Advaita Ashrama (PublicationDepartment).

Reference Books:

[1] Nagendra H.R and Nagaratna R, *Yoga Perspective in Stress Management*, Bangalore : Swami Vivekananda Yoga Prakashan.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: differentiate yoga and exercise

CO2: explain eight steps of Ashtanga yoga

CO3: describe different yogasanas, and their benefits for mind and body

CO4: discuss the benefits of pranayama and meditation as an effective tool for stress management

Course Articulation Matrix (CAM): P20AC208A STRESS MANAGEMENT BY YOGA						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20AC208A.1	1	1	-	-	-
CO2	P20AC208A.2	1	1	-	-	-
CO3	P20AC208A.3	1	1	-	-	-
CO4	P20AC208A.4	1	1	-	-	-
P20AC208A		1	1	-		-

P20AC208B: VALUE EDUCATION

Class: M.Tech. II – Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge on /in...

LO1: value of education and self-development
LO2: importance of cultivation of values
LO3: personality and behavior development
LO4: character and competence

UNIT – I (6)

Values and self-development: Social values and individual attitudes, work ethics,Indian vision of humanism, moral and non-moral valuation, standards and principles, value judgments

UNIT – II (6)

Importance of cultivation of values: Sense of duty, devotion, self-reliance, confidence, concentration, truthfulness, cleanliness, honesty, humanity, discipline, power of faith, national unity, patriotism, love for nature

UNIT – III (6)

Personality and Behavior Development: Soul and scientific attitude, Positive thinking, integrity, discipline and punctuality, love and kindness, avoid fault thinking, free from anger, dignity of labor

Universal brotherhood and religious tolerance: True friendship, Love for truth, happiness vs suffering, aware of self-destructive habits, association and cooperation, doing best for saving nature

UNIT – IV (6)

Character and Competence: Holy books vs blind faith, self-management and good health, science of reincarnation, equality, non-violence, humility, role of women, all religions and same message, mind your mind, self-control, honesty, studying effectively

Text Book:

[1] S. K. Chakroborty, *Values and Ethics for organizations: Theory and practice*, New Delhi: Oxford University Press, 2000.

Reference Books:

[1] D. N. Grose, *A text book of Value Education*, New Delhi: Dominant Publishers and Distributors, 2005.

[2] Yogesh Kumar Singh and Ruchika Nath, *Value Education*, New Delhi: A. P. H. Publishing Corporation, 2005.

[3] S. P. Ruhela, *Human Values and Education*, New Delhi: Sterling Publishers Pvt. Ltd.,1986.
[4] V. Narayan Karan Reddy, *Man, Education and Values*, New Delhi: B. R. Publishing Corporation, 1979.
[5] Bharatwaj Tilak Raj, *Education of Human Values*, 2nd ed.New Delhi: MittalPublications, 2001.

Course Learning Outcomes (COs):
On completion of this course, students will be able to...
CO1: illustrate social & moral values and inculcate Indian vision of humanism
CO2: develop sense of duty, national unity and love for nature
CO3: utilize positive thinking and develop universal brotherhood
CO4: build character & competence through holy books

Course Articulation Matrix (CAM):P20AC208B: VALUE EDUCATION

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20AC208B.1**	-	1	-	-	-
CO2	**P20AC208B.2**	-	2	-	-	-
CO3	**P20AC208B.3**	-	1	-	-	-
CO4	**P20AC208B.4**	-	2	-	-	-
P20AC208B		-	1.5	-	-	-

P20AC208CPERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENT SKILLS

Class:M.Tech. II-Semester **Specialization(s):** SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme: **Examination Scheme:**

L	T	P	C			
2	-	-	1		Continuous Internal Evaluation	60
					End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge on/in...
LO1: holistic development of personality
LO2:accomplishmentof day to day responsibilities and to achieve the highest goal
LO3:basic knowledge to maintain a stable mind, pleasing personality and determination
LO4:personality building towards becoming a role model

UNIT – I (6)

Holistic Development of Personality: Neetisatakam - verses-19, 20, 21, 22(wisdom), verses-29, 31, 32 (pride& heroism), verses-26, 28, 63, 65(virtue), verses-52, 53, 59(don'ts), verses-71, 73, 75, 78(do's)

UNIT – II (6)

Approach to Day to DayWork and Duties: Shrimad bhagwadgeeta - chapter2-verses 41, 47, 48 chapter3-verses 13, 21, 27, 35, shrimadbhagwadgeeta - chapter6-verses 5, 13, 17, 23, 35, chapter18-verses 45, 46, 48

UNIT – III (6)

Statements of Basic Knowledge: Shrimad bhagwadgeeta- chapter2-verses 56, 62, 68 chapter12-verses 13, 14, 15, 16, 17, 18

UNIT – IV (6)

Personality of Role Model: Shrimad bhagwadgeeta - chapter2-verses 17, chapter3-verses 36,37,42 chapter4-verses 18,38,39, chapter18-verses 37,38,63

Text Book:

[1] Swami Swarupananda, *Shrimad Bhagavad Geeta*, Advaita Ashram(Publication Department), Kolkata:Printed in Sharada Press, Car Street, Mangalore.

Reference Books:

[1] Prof. SatyavrataSiddhantalankar, *Bhagavad Geeta* , New Delhi: Oriented Publishing.
[2] P.Gopinath,*Bhartrihari's Three Satakam (Niti-sringar-vairagya)*, New Delhi: Rashtriya Sanskrit Sansthanam.
[3] Maharaja Bhadrihari, *Nithishatakam Translated by P.Jwala Dutta Sharma*, Dharm Diwakar Press, Moradabad, 1909, First Edition.
[4] world.com/section_personality_development.html.

Course Learning Outcomes (COs):

On completion of this course, students will be able to…

CO1: build a holistic personality

CO2: develop himself to accomplish his responsibilities and achieve his highest goal in life

CO3: perceive basic knowledge to maintain stable mind, pleasing personality and determination

CO4: originate himself to become a role model thus leading mankind to peace and prosperity

Course Articulation Matrix (CAM): P20AC208CPERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTEMENT SKILLS						
CO		**PO1**	**PO2**	**PO3**	**PSO1**	**PSO2**
CO1	**P20AC208C.1**	2	1	1	-	-
CO2	**P20AC208C.2**	2	1	1	-	-
CO3	**P20AC208C.3**	2	1	1	-	-
CO4	**P20AC208C.4**	2	1	1	-	-
P20AC208C		2	**1**	**1**	**-**	-

P20AC208D DISASTER MANAGEMENT

Class: M.Tech. II – Semester **Specialization(s):** SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
2	-	-	1

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on...
LO1: disaster management cycle and relation between disaster & development
LO2: risk / vulnerability assessment and reduction strategies
LO3: management strategies, approaches, frameworks and governance
LO4: disaster mitigation aspects and recovery strategies

UNIT – I (6)

Introduction to Disaster: Concepts of hazard, vulnerability & risks, natural and manmade disasters- earthquake, cyclone, floods , volcanoes; famine, displaced populations, industrial & transport accidents, slow and rapid onset disasters - famine, draught , epidemics , air crash, tidal waves & tsunami

Mitigation and Management techniques of Disaster: Basic principles of disasters management, disaster management cycle, political, social, economic impacts of disasters, gender and social issues during disasters, principles of psychosocial issues and recovery during emergency situations, impact of disaster on development, different stake holders in disaster relief, refugee operations during disasters, human resettlement and rehabilitation issues during and after disasters, intersectoral coordination during disasters, models in disasters

UNIT –II (6)

Disaster Risk and Vulnerability: Introduction to disaster risk and vulnerability, risk analysis techniques, process of risk assessment, analytical systems for risk assessment, natural hazard/ risk assessment, understanding climate risk, mapping of risk assessment, decision making for risk reduction, problems in risk assessment, strategies for risk reduction, community-based risk reduction, observation and perception of vulnerability, vulnerability identification, vulnerability types and dimensions, vulnerability and social and economic factors

Preparedness and Response: Disaster preparedness significance & measures, institutional mechanism for disaster preparedness, disaster preparedness policy & programmes, concept and significance of disaster preparedness plan, community-based disaster preparedness plan, prediction, early warnings and safety measures of
disaster,resource mobilization, post disaster reliefs & logistics management, emergency support functions and coordination mechanism

UNIT– III (6)

Disaster Management and Governance: Institutional arrangements, disaster management strategies & approaches, Community Based Disaster Preparedness (CBDP) - components, teams, preparedness, linkages with development programmes

Disaster Response in India: Legal framework, National disaster management Act, 2005, Institutions for disaster management – NDMA, NIDM, Role of government agencies, NCMC committee, crisis management group, need, media, community resilience, social & economic problems, funding mechanism

UNIT - IV (6)

Disaster Risk Mitigation: Background, strengthening, sendai framework and strengthening disaster risk governance, responsibility matrix

Disaster Recovery: Scope, approach, recovery process, steps involved in recovery process, early, mid& long-term recovery, reconstruction, coordination–central, state, & private sectors and voluntary organizations, rehabilitation–economical and psychological

Text Books:

[1] Manual on *Natural Disaster Management in India*, M C Gupta, NIDM, New Delhi, 2016*(Chapters 1- 5,7,9 &10).*

[2] N. G. Dhawan, A. S. Khan, *Disaster Management and Preparedness*, 1st ed. New Delhi: CBSPublication, 2014. *(Chapters 1,2,3,4,6,7,8 &10).*

Reference Books:

[1] Ashok Kumar and Vipul Anekant, *Challenges to internal security of India*, Tata McGrawhill,2020.

[2] Larry R. Collins, *Disaster management and Preparedness*, CRC Press, 2004.

[3] Tony Moore and Raj Lanka, *Hand book of Disaster and Emergency Management*, 3rd ed.Elsevier, 2006.

[4] R. K. Dave, *Disaster Management in India: Challenges and Strategies*, Prowess Publishing, 2018.

[5] M. M. Sulphey, *Disaster Management*, 1st ed.Prentice Hall of India, 2016.

[6] M. Pandey, *Disaster Management*, 1st ed. Wiley India, 2014.

[7] R. B. Singh, *Natural Hazards and Disaster Management: Vulnerability and Mitigation*, Noida:Rawat Publications, 2006.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1:categorize disasters, analyse the phases of disaster management cycle and relation between disaster & development

CO2: perform risk / vulnerability assessment and devise response & preparedness strategies for risk / vulnerability reduction

CO3: identify the role of government and private agencies involved in disaster assistance

CO4: analyse the mitigation measures and recovery strategies to inculcate a culture of resilience

Course Articulation Matrix (CAM): P20AC208D DISASTER MANAGEMENT

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20AC208D.1**	2	1	1	-	-
CO2	**P20AC208D.2**	2	1	1	-	--
CO3	**P20AC208D.3**	1	1	-	-	
CO4	**P20AC208D.4**	2	1	-	1	1
P20AC208D		**1.75**	**1**	**1**	1	1

PRR-20

DEPARTMENT OF CIVIL ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)
SCHEME OF INSTRUCTION & EVALUATION FOR TWO YEAR POSTGRADUATE PROGRAMME
M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

SEMESTER-III

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
				L	T	P		CIE - TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
								ATLP	CRP	CP	PPT					
1	PE	P20SC301	Professional Elective-V/ MOOC-V	3	-	-	3	8	8	8	6	10	20	60	40	100
2	OE	P20OE302	Open Elective-I/ MOOC-VI	3	-	-	3	8	8	8	6	10	20	60	40	100
3	PROJ	P20SC303	**Dissertation Phase – I/Industrial Project** *(to be continued in IV – Semester also as Disseriation Phase – II)*	-	-	18	9	-	-	-	-	-	-	100	-	100
4	PROJ	P20SC304	**Internship Evaluation**	-	-	2	-	-	-	-	-	-	-	100	-	100
			Total:	6	-	20	15							320	80	400

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Elective- 5

P20SC301A: AI & ML applications in Construction Engineering
P20SC301B: Theory of Elasticity
P20SC301C: Finite Element Method
P20DS301D:MOOCs

Open Elective

P20OE302A: Business Analytics
P20OE302B: Industrial Safety
P20OE302C: Operations Research
P20OE302D: Cost Management of Engineering Projects
P20OE302E: Composite Materials
P20OE302F: Waste to Energy
P20OE302G: Renewable Energy Sources
P20OE302H: MOOCs

Total Contact Periods/Week: 26 **Total Credits: 15**

P20SC301A AI & ML Applications in Civil Engineering

Class: M.Tech. III-Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge in/on...

LO1: machine learning
LO2:concepts of machine learning (ML) and large-scale data analytics tools in solving civil engineering problems
LO3: decision problem analysis and training dataset preparation
LO4: Understanding on the Evolutionary algorithms and their applications in civil engineering

UNIT-I (9)

Introduction to ML: History of ML, necessities, ML in modern civil engineering, real- world application examples
Supervised Learning: Probably Approximately Correct (PAC) Learning, classification and regression using linear and nonlinear models, logistic regression, gradient descent

UNIT-II (9)

Bayesian Learning: Bayes theorem, concept learning, Bayesian networks, parametric methods, model selection procedures, risk minimization, multilayer perceptronandsupport vector machines
Unsupervised Learning: Dimensionality reduction, clustering, Expectation-maximization (EM) algorithm

UNIT-III (9)

Decision Trees: Univariate trees, multivariate trees, graphical models and their temporal extensions, exact and approximate inference methods, parameter estimation **Probability**: Probability, Bernoulli distribution, binomial, multinominal distribution

UNIT-IV (9)

Introduction to AI-based Technologies: Overview of the foundational principles that

drive AI-based technologies, Basics of optimization, objective functions, constraints, principles of optimality, single and multi-objective optimization, pareto optimality

Introduction to Nature Inspired Optimization Techniques: Genetic algorithms, ant colony optimization, particle swarm optimization, comparison with classical methods, hands on using standard test functions and practical projects

Text Books:

[1] Alpaydin, Ethem, *Introduction to machine learning*, MIT press, London: Second Edition, 2010.(*Chapters 1, 2, 3, 4, 6, 7, 9, 10, 11, 16)*

[2] Engelbrecht, Andries P., *Computational intelligence: an introduction*, John Wiley & Sons, 2007.(*Chapters: 1, 8, 9, 16, 17*)

Reference Books:

[1] Tom M. Mitchell, *Machine Learning*, New Delhi: McGrawHill Education (India) PrivateLimited, 2013.

[2] Stephen Marsland, *Machine Learning: An Algorithmic Perspective*, CRC Press, 2015.

[3] BishopC., *Pattern Recognition and Machine Learning*, Berlin: Springer Verlag.

[4] Smola, Alex, and S. V. N. Vishwanathan, *Introduction to machine learning*, Cambridge University Press, First edition, 2008.

[5] Yuen, Ka-Veng, *Bayesian methods for structural dynamics and civil engineering*, John Wiley & Sons, 2010.

[6] Yu X, Gen M, *Introduction to evolutionary algorithms*, Springer Science & Business Media,2010 Jun 10.

[7] Bansal, Jagdish Chand, Pramod Kumar Singh, and Nikhil R. Pal, eds. *Evolutionary and swarm intelligence algorithms*, Springer2019.

[8] Yang XS, *Nature-inspired metaheuristic algorithms*, Luniver press, 2010.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: apply the concept of optimization technique and solving complex problem

CO2: evaluate the critical Civil Engineering problems by using the concepts of machine learning (ML) and large-scale data analytics tools.

CO3: implement decision-making process for decision problem analysis and identifying the best alternative solution

CO4: employ the concept of meta-heuristic algorithms in solving real-world problems

Course Articulation Matrix (CAM): P20SC301AAI & ML Applications in Civil Engineering

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC301A.1**	1	1	1	1	1
CO2	**P20SC301A.2**	1	1	1	1	1
CO3	**P20SC301A.3**	1	1	1	1	1
CO4	**P20SC301A.4**	1	1	1	1	1
P20SC301A		1	1	1	1	1

P20SC301B THEORY OF ELASTICITY

Class:M.Tech. III – Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: concepts and principles of stress, strain behaviour of continuum
LO2: stress analysis problems in 2D based on compatibility conditions, equilibrium equations
LO3: concept of Airy's stress functions for 2-D plane stress and plane strain problems in cylindrical coordinate systems
LO4: torsion of non-circular bars

UNIT-I (9)

Fundamentals: Notation of stress, components of stress and strain, generalized Hooke's law, stress and strain in three dimensions, stress components on an oblique plane, surface traction, transformation of stress components under change of co-ordinate system

Stress and Strain Tensors: Analysis of stress and strain in three dimensions,principal stresses and principal planes, stress invariants, mean and deviator stress, strain energy per unit volume, octahedral shear stress, strain of a line element, principal strains, volume strain

UNIT-II (9)

Two Dimensional Problems in Rectangular Coordinates: Plane stress and plane strainsituations, equilibrium equations, compatibility equations, St.Venant's principle, uniqueness of solution, stress components in terms of Airy's stress functions

Applications of 2D Problems in Rectangular Coordinates: Applications to cantilever,simply supported and fixed beams with sample loading

UNIT-III (9)

Two Dimensional Problems in Polar Coordinates: Equilibrium equations, stress strain components, compatibility equation, applications usingAiry's stress functions in polar co-ordinates for stress distributions symmetric about an axis

Applications of Two-Dimensional Problems in Polar Coordinates: Effect of hole on stress distribution in a plate in tension, stresses due to load at a point on a semi-infinite straight boundary, stresses in a circular disc under diametrical loading

UNIT-IV (9)

Torsion: Torsion of various shapes of bars, stress function method of solution applied to circular and elliptical bars, Prandtl's membrane analogy

Torsion Problems in Elasticity: Solution of torsion of rectangular bars by Raleigh Ritzmethod and Finite difference method

Text Book:

[1] Timoshenko and Goodier, *Theory of Elasticity*, 3rd ed. New Delhi: McGraw Hill, 2017.

Reference Books:

[1] Sadhu singh, *Theory of Elasticity*, 4th ed. 12th reprint New Delhi: Khanna Publishers, 2018.
[2] Martin H. sadd, *Elasticity- Theory, Applications, Numeris*, 4th ed. Elsevier Sciencepublisher,2020.
[3] L.S.Srinadh, *Advanced Mechanics of Solids*, 3rd ed. New Delhi: TMH Publishing Company Ltd.
[4] C.T. Wang, *Applied Elasticity*, McGrawHill Inc.,US published in 1953, digitalized on 21stNov 2007.

Course Learning Outcomes (COs):
On completion of this course, students will be able to...

CO1: evaluate the stress, strain invariants of continuum in Cartesian coordinate system
CO2: analyze plane stress and plane strain problems in 2D
CO3: constitute plane stress and plane strain problem in polar coordinate system
CO4: predict the torsion equation of an elliptical cross section bar by analogous method

Course Articulation Matrix (CAM): P20SC301B THEORY OF ELASTICITY

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20SC301B.1**	1	-	1	1	-
CO2	**P20SC301B.2**	1	-	1	1	-
CO3	**P20SC301B.3**	1	-	1	1	-
CO4	**P20SC301B.4**	1	1	1	1	1
P20SC301B		1	1	1	1	1

P20SC301C FINITE ELEMENT METHOD

Class: M.Tech. II-Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Exam	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on...
LO1: *principles of finite element method*
LO2: *general and isoperimetric elements*
LO3: *formulation of stiffness matrix for trusses, beams and frames*
LO4: *stiffness matrices for two dimensional and axi-symmetric elements*

UNIT – I (9)

Concepts of Finite Element Method: History, introduction, basic concepts, need for study, advantages, disadvantages, basic equations of elasticity – plane stress, plane strain and axi-symmetric problems, steps in finite element method
Finite Element Formulation: Virtual work and variational principle, Galerkin's Method, Finite Element Method: displacement approach, stiffness matrix and boundaryconditions, assembly of global stiffness matrix

UNIT – II (9)

General Elements: Basic element shapes, properties - natural coordinates, triangular elements, rectangular elements, Lagrange and serendipity elements
Isoperimetric Elements: Isoperimetric formulation,development of stiffness matrix, application to bar element, plane quadrilateral element, numerical integration: one-andtwo-dimensional elements using gauss - quadrature and Jacobian methods

UNIT – III (9)

Trusses and Beams: Formulation of stiffness matrices for truss and beam members, assembly of elements and solution techniques for static loads
Plane frames: Formulation of stiffness matrix for plane frame, assembly of elements and solution techniques for static loads

UNIT – IV (9)

Two Dimensional Elements: Formulation and evaluation of stiffness matrix for various 2D elements-constant strain triangle, linear strain triangle, rectangular elements
Axi-symmetric Elements: Axi-symmetric element, applications of axi-symmetric elements, finite element formulation of axi-symmetric element

Text Books:

[1] P. Seshu, *Finite Element Analysis*, 10thed. New Delhi: PHI Learning Pvt. Ltd.,2012. (*Chapters1-6*)

[2] R. Tirupati, Chandupatla and D. Ashok Belegundu, *Finite Elements Methods in Engineering*, 2nd ed. New Delhi: Pearson Education Publications, 1997. (*Chapters 1, 3, and 5-7*)

Reference Books:

[1] Singeresu S.Rao, *The Finite Element Methods in Engineering*, 4th ed. Elsevier Publication,2009.

[2] O. C. Zienkiewicz, R. L. Taylor, *The Finite Element Method*, 5thed. New Delhi: Butterworth and Heinemann publishers, 2000.

[3] C. S. Krishna Murthy, *Finite Element analysis– Theory and Programming*,2nded. New Delhi:Tata McGraw Hill, 2001.

[4] S. S. Bhavikatti, *Finite element analysis*, New Age International Publishers, 2005.

[5] D. Robert Cook,S. David Malkus and E. Michael Plesha, *Concepts and Applications of FiniteElement Analysis*, 4th ed. John Wiley and Sons, 2007.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: appraise importance of formation of elements in finite element method

CO2: develop stiffness matrices for isoperimetric elements

CO3: analyze trusses, beams and frames by developing stiffness matrices

CO4: formulate stiffness matrices for two dimensional solids and axi-symmetric members

Course Articulation Matrix (CAM): P20SC301C FINITE ELEMENT METHOD						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20SC301C.1	1	-	1	1	-
CO2	P20SC301C.2	1	1	1	1	1
CO3	P20SC301C.3	1	1	1	1	-
CO4	P20SC301C.4	1	1	1	1	1
P20SC301C		1	1	1	1	1

P20OE302ABUSINESS ANALYTICS

Class:M.Tech. III – Semester **Specialization(s):** SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop student's knowledge in/on

LO1: fundamental concepts of business analytics and descriptive analytics
LO2: data collection and data visualization methods
LO3: text analysis and simulation methods in business analytics
LO4: social media, web and health care analytics

UNIT-I (9)

Introduction to Business Analytics: Introduction to business analytics, why analytics, business analytics: the science of data-driven decision making, business context, technology data science, descriptive analytics, predictive analytics, prescriptive analytics descriptive, predictive and prescriptive analytics techniques, big data analytics, web and social media analytics, machine learning algorithms, framework for data-driven decision making, analytics capability building, roadmap for analytics capability building, challenges in data-driven decision making and future

Descriptive Analytics: Introduction to descriptive analytics, data types and scale, structured and unstructured data, cross-sectional, time series and panel data, types of data measurement scales, population and sample, measures of central tendency, percentile, decile and quartile, measures of variation

UNIT-II (9)

Data Collection: Iintroduction, the value of data, data collection preliminaries, data collection methods, data types, problem formulation preliminaries,challenges in data collection, data collation,validation and presentation, data collection in the retailing industry

Data Visualization: Introduction, motivating example, methods of data visualization, software and data visualization

UNIT-III (9)

Text Analytics: Introduction, motivating text analysis, methods of text analysis, natural language processing

Simulation: Introduction, motivating examples, simulation modeling method and casestudies

UNIT-IV (9)

Applications of Business Analytics: Introduction, what is social media and web analytics, display advertising in real time, a/b experiments for measuring value of digital media and handling e-retailing challenges, strategies for mobile devices, the future of social media analytics

Health Care Analytics: Introduction, methods of health care analytics

Textbooks:

[1] U Dinesh Kumar, *Business Analytics: The Science of Data-Driven Decision Making*, 1st ed. 2017 *(Units-I)*

[2] BhimasankamPochiraju,Sridhar S, *Essentials of Business Analytics: A Textbook*,1st ed.Springer Nature Switzerland, 2019. *(Units-II, III, IV)*

Reference Books:

[1] R N Prasad, Seema Acharya, *Fundamentals of Business analytics: Big Data*, 2nd ed. WileyPublications, 2017.

[2] Foster Provest, Tom Fawcett,*Data Science for Business*, 1st ed. USA: O'Reilly, 2013.

Course Learning Outcomes (COs):

On completion of this course, the students will be able to...

CO1: describe the concepts of business analytics and descriptive analytics

CO2: apply the data collection and data visualization methods in business analytics

CO3: categorize text analysis and simulation methods in business analytics

CO4: apply social media & web analytics and health care analytics in real world problems

Course Articulation Matrix (CAM): P20OE302A BUSINESS ANALYTICS

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20OE302A.1	-	-	-	-	-
CO2	P20OE302A.2	1	1	-	-	-
CO3	P20OE302A.3	1	1	-	-	-
CO4	P20OE302A.4	2	2	-	-	-
P20OE302A		1.33	1.33	-	-	-

P20OE302B INDUSTRIAL SAFETY

Class: M. Tech. III - Semester **Specialization(s):** SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on...

LO1: need for safety in industries

LO2: fundamentals of maintenance engineering

LO3: causes for wear& corrosion and method of lubrication

LO4: faults tracing in equipments and importance of preventative maintaince

UNIT –I (9)

Industrial Safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 - for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, safety color codes, fire prevention and firefighting, equipment and methods

UNIT –II (9)

Fundamentals of Maintenance Engineering: Definition and aim of maintenance engineering, primary and secondary functions and responsibility of maintenance department, types of maintenance, types and applications of tools used for maintenance, maintenance cost & its relation with replacement economy, service life ofequipment

UNIT –III (9)

Prevention of Wear and Corrosion: Wear- types, causes, effects, wear reduction methods, lubricants - types and applications, lubrication methods, general sketch, working and applications- screw down grease cup, pressure grease gun, splash lubrication, gravity lubrication, wick feed lubrication, side feed lubrication, ring lubrication, definition, principle and factors affecting the corrosion, types of corrosion, corrosion prevention methods

UNIT –IV (9)

Fault Tracing and Preventative Maintaince: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment - machine tool, pump, air compressor, internal combustion engine, boiler, electrical motors, types of faults in machine tools and their general causes, periodic and preventative maintaince, advantages of preventative maintaince, repair cycle importance

Textbook:

[1] John Ridley and John Channing, *Safety at work*, 6th ed. UK: Elsevier Butterworth-Heinemann, 2003. *(Unit 1& Unit 2) chapter (2,3,5,6,7,8).*

[2] Amit Gupta, *Industrial Safety and environment*, New Delhi: Laxmi Publications (P) LTD, 2006., 1973., *(Unit3 & Unit 4) chapters (10,11,12,13,14,15,16,17).*

Reference Books:

[1] R. Keith Mobley Editor, Lindley R. Higgins Darrin J. Wikoff, *Maintenance Engineering Handbook*, 7th ed. New York: Mc Graw Hill International, 2008.

[2] Mohammed Ben-Daya,UdayKumar, Prabhakar Murthy D.N, *Introduction to MaintenanceEngineering*, New Delhi: Wiley India Pvt. Ltd., 2016.

Course Learning Outcomes(COs):

Upon completion of this course, students will be able to...

CO1: summarize the principles of industrial safety and maintenance

CO2: describe the functions of maintenance department and list the types of maintenance & tools used for maintenance

CO3: identify the causes for wear, tear& corrosion and suitable lubrication method for a given application

CO4: describe the significance of decision-tree and apply it for problems in equipment to detect and classify the faults and need of preventative maintenance

Course Articulation Matrix (CAM) P20OE302B INDUSTRIAL SAFERTY

CO		PO1	PO2	PO3	PS01	PSO2
CO1	**P20OE302B.1**	1	1	1	1	1
CO2	**P20OE302B.2**	1	1	1	1	1
CO3	**P20OE30B.3**	1	1	1	1	1
CO4	**P20OE302B.4**	1	1	1	1	1
P20OE302B		**1**	**1**	**1**	**1**	**1**

P20OE302 COPERATIONS RESEARCH

Class: M. Tech. III - Semester **Specialization(s):** SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students 'knowledge in/on
LO1: linear programming problems
LO2: nonlinear optimization problem
LO3: sequencing, scheduling and network model
LO4: decision making theory and queuing models

UNIT – I (9)

Linear Programming Problem (LPP): Mathematical formulation of LPP, solution of linear programming problems-simplex method, artificial variable technique, duality in LPP and Dual Simplex method, sensitivity analysis

UNIT –II (9)

Non-Linear Programming Problem (NLPP): Classification of NLPP, unconstrained optimization techniques- iterative methods - random search methods, steepest decent method, conjugate gradient method, Fibonacci method and golden section method

Constrained Optimization Techniques-- Lagrange 's method and Kuhn-Tuckermethod

UNIT– III (9)

Sequencing and Scheduling: Sequencing and scheduling of n jobs one, two and three machine problems, scheduling of n jobs through k machines problem

Project Network: Network construction-CPM and PERT, resource analysis in network problems

UNIT - IV (9)

Decision Analysis and Game Theory: Introduction, decisions under uncertainty-laplace criterion, max-min criterion, savage criterion and Hurwitz criterion, game theory-introduction, two person zero sum games and the maximin-minimax principle, mixed strategy games- graphical method and linear programming method, dominance property

Queuing Theory-Elements and operating characteristics of a queuing system, Poisson queuing systems, study of single server queuing model with infinite capacity

Text Books:

[1] Kantiswarup, P.K.Gupta, Man Mohan, *Operations Research,*16th ed.New Delhi:S. Chand &Sons, 2013. *(Chapters: 2, 4, 5, 6, 12, 16, 17, 21, 25, 27)*

[2] S.S. Rao,*Optimization Techniques,* 3rd ed. New Delhi: New Age International,2013. *(Chapters: 6)*

Reference Books:

[1] H.A. Taha, *Operations Research an Introduction,*6th ed.Prentice Hall of India, 2006.

[2] N.D Vohra, *Quantitative Techniques in Management*, 3rd ed. TMH, 2010.

Course Learning Outcomes (COs):

On completion of this course, students will be able to ...

CO1: model engineering real time problems and solve them using various LPP techniques

CO2:optimize the engineering problems using NLPP methods

CO3: apply the tools and techniques to solve sequencing and scheduling problems and project network models

CO4: analyze conflicting situations using game theory and solve various queuing model parameters

Course Articulation Matrix (CAM): P20OE302C: OPERATIONS RESEARCH

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20OE302C.1**	2	1	1	-	-
CO2	**P20OE302C.2**	2	1	1	-	-
CO3	**P20OE302C.3**	2	1	1	1	1
CO4	**P20OE302C.4**	2	1	1	-	-
P20OE302C		2	1	1	1	1

P20OE302D COST MANAGEMENT OF ENGINEERING PROJECTS

Class: M.Tech. III-Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge on /in...
LO1: cost concepts, objectives of costing system, project management
LO2: standard costing, cost control and reduction
LO3: cost behavior, profit planning and types of budgets
LO4: quantitative techniques for cost management

UNIT-I (9)

Overview of Cost Accounting: Cost concepts in decision making, objectives of a costing system, different costs of projects - relevant cost, differential cost, incremental cost, opportunity cost, activity-based costing

Project: Meaning, Types of projects, benefits of project management, project life cycle

UNIT-II (9)

Standard Costing: Meaning,advantages and limitations, standard costing in manufacturing and process industries, standard costing and standardized costing, standard cost and estimated cost

Cost Control and Reduction: Cost control meaning, distinction between cost control and cost reduction, advantages and disadvantages of cost control and cost reduction, cost control techniques, essential for success of cost controls and cost reduction programme, areas of cost reduction, tools and techniques of cost reduction

UNIT-III (9)

Cost Behavior and Profit Planning: Marginal cost, absorption cost, break-even analysis, Cost-Volume-Profit (CVP) analysis, Profit-Volume (PV) ratio, Sales ratio, margin of safety.

Budgets: Budgetary control, flexible budget, performance-based budgets, zero based budgets

UNIT-IV (9)

Quantitative Techniques for Cost Management: Linear Programming Problems (LPP includes graphic method and simplex method), transportation problems, assignment problems

Text Books:

[1] S.P. Jain, K.L.Narang, *Advanced Cost Accounting*, New Delhi: Kalyani Publishers, 2014 *(Chapter 7, 10 ,11 13, 14, 16 &27)*

[2] N.D. Vohra, *Quantitative Techniques in Management*, 3rd ed. New Delhi: Tata McGraw HillBook Co. Ltd. 2007 *(Chapter 2,3, 5 and 6)*

Reference Books:

[1] Ashish K. Bhattacharya, *Principles & Practices of Cost Accounting*, 3rd ed. New Delhi: Prentice Hall India Learning Private Limited, 2004.

[2] Harold Kerzner, *Project Management: A systems approach to Planning, Scheduling and Controlling*, 10th ed.New Delhi: John Wiley & Sons Inc., 2009.

[3] V K Kapoor, *Operations Research*, New Delhi: Sultan Chand & Sons, 2013.

[4] Charles T. Horngren and George Foster, *Cost Accounting A Managerial Emphasis*, New Delhi:Prentice Hall of India, 1991.

Course Learning Outcomes (Cos):

Upon completion of this course, the student will be able to...

CO1:interpret overview of cost accounting and project management

CO2: distinguish standard costing in manufacturing and process industries, estimate cost control and reduction

CO3: estimate cost behavior, profit planning and budget

CO4: apply quantitative techniques for linear programming, transportation and assignment problems

Course Articulation Matrix (CAM): P20OE302DCOST MANAGEMENT OF

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**P20OE302D.1**	1	1	1	1	1
CO2	**P20OE302D.2**	1	1	1	1	1
CO3	**P20OE302D.3**	2	1	1	1	1
CO4	**P20OE302D.4**	2	1	1	1	1
P20OE302D		**1.5**	**1**	**1**	**1**	**1**

P20OE302ECOMPOSITE MATERIALS

Class:M.Tech. III-Semester

Specialization(s):SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives(LOs):
This course will develop students' knowledge in/on...
LO1: composite material properties and applications
LO2: properties and applications of fibers and rule of mixture
LO3: manufacturing and applications of metal matrix, ceramic matrix and carbon-carbon composites
LO4: polymer matrix composites, manufacturing and applications

UNIT- I (9)

Composite Materials: Definition, classification, characteristics, advantages, applications, functional requirements of reinforcement and matrix, effect of reinforcement on composite performance - size, shape, distribution and volume fraction

UNIT-II (9)

Reinforcements: Preparation - layup, curing, fibers-glass, carbon, Kevlar, boron, properties and applications- fibers, whiskers, particle reinforcements, mechanical behavior of composites, rule of mixtures, inverse rule of mixtures, isostrain and isostress conditions

UNIT-III (9)

Manufacturing of Metal Matrix Composites: Casting – solid state diffusion technique,cladding – hot isostatic pressing, properties and applications

Manufacturing of Ceramic Matrix Composites: Liquid metal infiltration – liquid phasesintering, properties and applications

Manufacturing of Carbon/carbon Composites: Knitting, braiding, weaving, properties and applications

UNIT-IV (9)

Manufacturing of Polymer Matrix Composites: Preparation of molding compounds and prepregs, manufacturing of polymer matrix composites - hand layup, autoclave, filament winding, compression molding and reaction injection molding, properties and applications

Text Books:

[1] Chawla K.K., *Composite Materials*, 4th ed. New York: Springer, Verlag, 2019. (*Chapters 1, 2, 5,6, 7 & 8*)

Reference Books:

[1] Agarwal, B.D. and Broutman, L. J., *Analysis and Performance of Fiber Composites*, 4th ed.USA:John Wiley & Sons, 2017.

[2] Strong A.B., *Fundamentals of Composite Manufacturing*, 2nded. SME, 2007.

[3] Sharma S.C., *Composite materials*, 1sted. New Delhi: Narosa Publications, 2000.

[4] Mathews F.L. and Rawlings R.D., *Composite materials: Engineering and Sciencel*, 1st ed.England: Chapman and Hall, 1994.

[5] Krishnan K., Chawla *Composite Materials Science and Engineering*, India: Springer Private Limited, 2009.

[6] P.K. Mallick, *Fiber Reinforced Composite materials, Manufacturing and Design*, New York: CRCPress, Taylor and Francis Group, 2010.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: classify composite materials and explain their applications

CO2: outline properties and applications of reinforcements

CO3: categorize manufacturing methods for metal matrix composite, ceramic matrix composite, carbon/carbon composite and their properties.

CO4: compare manufacturing methods of polymer matrix composites

Course Articulation Matrix (CAM): P20OE302E COMPOSITE MATERIALS

CO		PO1	PO2	PO3	PSO1	PSO2
CO1	**20OE302E.1**	1	1	1	1	-
CO2	**20OE302E 2**	1	1	1	1	-
CO3	**20OE302E.3**	1	1	1	1	-
CO4	**20OE302E.4**	1	1	1	1	-
20OE302E		**1**	**1**	**1**	1	-

P20OE302F : WASTE TO ENERGY

Class: M.Tech. III-Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop students' knowledge on /in...
LO1: concept of waste to energy
LO2: production of energy form waste
LO3: technologies for waste to energy
LO4: standards for waste to energy plants and carbon credits

UNIT – I (9)

Introduction: Principles of waste management and waste utilization, waste management hierarchy and 3R principle of reduce, reuse and recycle, waste as a resource and alternate energy source

Waste Sources & Characterization: Waste production in different sectors such as domestic, industry and agriculture, classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous), characterization of waste for energy utilization

UNIT – II (9)

Technologies for Waste to Energy: Biochemical conversion – energy production from organic waste through anaerobic digestion and fermentation, thermo-chemical conversion – combustion, incineration and heat recovery, pyrolysis, gasification, plasmaarc technology

Waste to Energy Options: Landfill gas, collection and recovery, Refuse Derived Fuel (RDF) – Fluff, Briquettes, Pellet, Alternate Fuel Resource (AFR) – production and use incement plants, thermal power plants and industrial boilers, conversion of wastes to fuel resources for other useful energy applications, energy from plastic wastes – non- recyclable plastic waste for energy recovery, energy recovery from wastes and optimization of its use, benchmarking and standardization, energy analysis

UNIT – III (9)

Energy production: Waste activities – collection, segregation, transportation and storage requirements, location and siting of 'waste to energy' plants, industry specific applications – in-house use – sugar, distillery, pharmaceuticals, pulp and paper, refinery and petrochemical industry

Centralized and Decentralized Waste to Energy Plants: Centralized and decentralized energy production, distribution and use, comparison of centralized and decentralized systems and its operations

UNIT-IV (9)

Waste to Energy & Environmental Implications: Environmental standards for waste toenergy plant operations and gas clean-up, savings on non-renewable fuel resources

Carbon Credits: Carbon foot print calculations and carbon credits transfer mechanisms

Text Book:

[1] *Waste to Resources: A Waste Management Handbook*, NewDelhi: TERI Press,2014. *(Unit – I, III & IV)*

[2] Sunil Pandey, *Industrial and Urban Waste Management in India*, New Delhi : TERI Press, 2015(Unit –II)

Reference Books:

[1] Banwari Lal and Patwardhan ,*Wealth from Waste: Trends and Technologies*, New Delhi :TERIPress, 2014.

[2] S.N Mukhopadhyay, *Fundamentals of waste and Environmental Engineering*, New Delhi: TERI Press, 2016.

[3] Gazette Notification on Waste Management Rules 2016.

[4] CPCB Guidelines for Co-processing in Cement/Power/Steel Industry.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: outline the operations of waste sources and alternate energy sources

CO2: adopt waste to energy technologies

CO3: list the stages of waste to energy production

CO4: appraise environmental standards and estimate carbon foot print

Course Articulation Matrix (CAM) P20OE302F WASTE TO ENERGY						
CO		PO1	PO2	PO3	PSO1	PSO2
CO1	P20OE302F.1	1	1	1	-	-
CO2	P20OE302F.2	1	1	1	-	-
CO3	P20OE302F.3	1	1	1	-	-
CO4	P20OE302F.4	1	1	1	1	1
P20OE302F		1	1	1	1	1

P20OE302G : RENEWABLE ENERGY SOURCES

Class: M.Tech. III-Semester

Specialization(s): SE&C, DE, VE, PE, SE DS, DC &CSP

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course Learning Objectives (LOs):
This course will develop student's knowledge in/on

LO1: different types of renewable energy sources and principles of solar energy systems
LO2: principles of wind energy and geothermal energy systems
LO3: harnessing energy from oceans and biomass
LO4: working of fuel cells and different types of energy storage systems

UNIT-I (9)

Introduction: Conventional and non-conventional sources of energy – brief description of different renewable energy sources

Solar energy: Introduction to prospects of solar PV systems: photovoltaic effect and electrical equivalent circuit of a PV cell, Dependence of a PV cell characteristic on temperature, solar cell output characteristics, flat plate and concentrating collectors, solar applications-solar heating/cooling technique, solar distillation, drying, streetlighting, domestic lighting, solar PV pumping systems

UNIT-II (9)

Wind Energy: Principles of wind power, evaluation of wind intensity, operation of a wind turbine and wind power curve, different types of wind turbine generators, topography and classification of wind turbines and its applications

Geothermal Energy: Origin and types of geothermal energy, operational difficulties, liquid dominated systems

UNIT-III (9)

Energy from Oceans: Ocean temperature differences, ocean waves, energy from the waves, introduction of tidal power, basic principle of tidal power, components of tidal power plants

Bioenergy: Introduction, bio-mass conversion technologies, photo synthesis, biogas generation, biogas from power plant wastes, methods of maintaining biogas production, utilization of biogas, biogas gasification

UNIT-IV (9)

Chemical energy sources: Introduction to fuel cells, principle of operation of fuel cell,classification of fuel cells, advantages, disadvantages and applications of fuel cells

Types of energy storage systems: Introduction, mechanical energy storage systems, batteries, ultra-capacitors, super conducting magnetic storage, applications

Case study on present scenario of energy generation in India

Textbooks:

[1] Rai G.D, *Non-Conventional Energy Sources*, 4th ed. New Delhi: Khanna Publishers, 2010.

Reference books:

[1] B.H. Khan, *Non-conventional Energy Resources*, 2nd ed. New Delhi: McGraw Hill Publishers,2006.

[2] Felix A. Farret, M. Godoy Simoes, *Integration of Alternative Sources of Energy*, New York: John Wiley & Sons, 2006.

[3] Bansal N. K. Kaleeman and M. Miller, *Renewable Energy Sources and Conversion Technology*,New Delhi: Mc GrawHill Publishers, 2006.

[4] Duffie and Beckman, *Solar Energy Thermal Process*, New York: John Wiley & Sons, 2006.

Course Learning Outcomes (COs):

Upon completion of this course, the student will be able to...

CO1: compare conventional and non-conventional energy resources; describe solar cell characteristics and discuss applications of solar energy

CO2: compute power output of wind and describe principle of geothermal energy system

CO3: describe harnessing of electric power from oceans and biomass

CO4: describe principle of operation of fuel cells and list different types of energy storage systems

Course Articulation Matrix (CAM): P20OE302G RENEWABLE ENERGY SOURCES

CO		PO 1	PO 2	PO 3	PSO1	PSO2
CO1	**P20OE302G.1**	2	1	1	-	-
CO2	**P20OE302G.2**	2	1	1	-	-
CO3	**P20OE302G.3**	2	1	1	-	-
CO4	**P20OE302G.4**	2	1	1	-	-
P20OE302G		**2**	**1**	**1**	**-**	**-**

P20SC303 : DISSERTATION PHASE-I /INDUSTRIAL PROJECT

Class:M.Tech.III - Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
-	-	18	9

Examination Scheme:

Continuous Internal Evaluation	100
End Semester Examination	--

Course Learning Objectives (LOs):
This course will develop students' knowledge on /in...
LO1: selecting problem-based Dissertation title in one of the areas of specialization
LO2: literature review and well-documented report writing
LO3: effective technical presentation skills with creating PPTs and speaking with technical knowledge
LO3: creating video pitch

Registration Presentation: The Registration Dissertation Presentation shall include a brief report and presentation focusing the identified topic, literature review, time schedule indicating the main tasks, and expected outcome.

Progress Presentation-I: At the end of first stage (third semester), student shall be required to submit a preliminary report of work done for evaluation to the project coordinator and present the same before the *Department Post Graduate Review Committee* (DPGRC).

Evaluation for Dissertation / Industrial Project:

Dissertation work shall be normally conducted in two stages: Dissertation *Phase-I* in third semester and Dissertation *Phase-II* in fourth semester.

Dissertation *Phase-I*:

(i) The Department *Post Graduate Review Committee (DPGRC)* shall be constituted with HoD as a Chairman, M.Tech. Coordinator as a Convener and three to five other faculty members representing various specializations in that particular programmeas members.

(ii) (a) Student shall take up independent Dissertation Phase-I on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their programme of study, which would supplement and complement the program assigned to each student

(or)

(b) Student shall take up industrial project (in any industry) relevant to the courses offered in their programme of study, which would supplement and complement theprogram assigned to each student

(iii) DPGRC shall allot a faculty supervisor to each student for guiding on

(a) Selection of topic

(b) Literature survey and 50% work to be carried out during phase-I

(c) Preparing a report in proper format

(d) Effective oral presentation on dissertation phase-I before the DPGRC

(e) Right conduct of research and academic activity to promote academic integrity

(f) Use of anti-plagiarism software to detect plagiarism in the report and submission of dissertation report within acceptable plagiarism levels

(iv) In case of students with industrial projects, internal guide shall be there to trackthe progress from time to time

(v) There shall be only Continuous Internal Evaluation (CIE) for Dissertation Phase-I

(vi) CIE for the Dissertation Phase-I in third semester is as follows:

Assessment	Weightage
Dissertation Phase-I Supervisor Assessment	50%
DPGRC Assessment: ***(i)*** *Registration Presentation* ***(10%)*** ***(ii)*** *Progress Report on Phase-I* ***(10%)*** ***(iii)*** *Video pitch on Phase-I* ***(10%)*** ***(iv)*** *Progress Presentation -I and viva voce* ***(20%)***	50%
Total Weightage:	**100%**

Note: It is mandatory for the student to

(i) appear for progress presentation -I and viva voceto qualify for courseevaluation

(ii) create a good video pitch on dissertation phase-I

(a) **Dissertation Topic:** The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals/Technical Magazines on the topics of potential interest

(b) **Working Model:** Each student is required to develop a working model/ process/software package/system, on the chosen work and demonstrate before the DPGRC as per the dates specified by DPGRC at the end of dissertation phase-II

(c) **Progress Report:** Each student is required to submit a well-documented progress report on dissertation phase-I as per format specified by DPGRC

(vii) The student has to register for the Dissertation Phase-I as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce

(b) he/she fails to submit the report in prescribed format

(c) he/she fails to fulfill the requirements of Dissertation Phase-I evaluation as per specified guidelines

(viii) (a) The CoE shall send a list of students registered for supplementary to the HoD concerned

(b)The DPGRC, duly constituted by the HoD, shall conduct Dissertation Phase-Ievaluation and send the award list to the CoE within the stipulated time

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: select current topics in their specialization and allied areas from peer reviewed journals / technical magazines/ conference proceedings

CO2: demonstrate the skills for performing literature survey, identify gaps, analyze the technical content and prepare a well-documented dissertation report

CO3: create informative ppts with effective oral presentation, showing knowledge on the subject and sensitivity towards social impact of the dissertation

CO4: demonstrate dissertation through effective video pitch

Course Articulation Matrix (CAM): P20SC303DISSERTATION PHASE-I /INDUSTRIAL PROJECT

CO		PO 1	PO 2	PO 3	PSO 1	PSO 2
CO1	**P20SC303.1**	2	-	2	2	2
CO2	**P20SC303.2**	2	-	2	2	2
CO3	**P20SC303.3**	-	2	-	1	1
CO4	**P20SC303.4**	-	2	-	1	1
P20SC303		**2**	**2**	**2**	**1.5**	**1.5**

P20SC304 : INTERNSHIP EVALUATION

Class: M.Tech.III - Semester **Specialization:** Structural Engineering & Construction

TeachingScheme:

L	T	P	C
-	-	18	9

ExaminationScheme:

Continuous Internal Evaluation	100
End Semester Examination	--

Course LearningObjectives (LOs):
This course will develop students' knowledge on /in...
LO1: selection of internship in one of the areas of course specialization
LO2: practical and real time subject application
LO3: writing well-documented report
LO4: effective technical presentation skills with creating PPTs

Guidelines for Internship:

(1) The students shall undergo 6-8 weeks internship during summer/winter vacation at industry/R&D organization / Academic Institutes like IITs &NITs.

(2) The students preferably shall undergo internship at one organization only. In caseof any difficulty, the stipulated period of internship shall be completed at differentorganizations with minimum of two weeks internship at every stage.

(3) The internship evaluation shall be done in the III semester of study and hence the students shall complete the prescribed period of internship before start of III semester (from end of I semester to commencement of III semester).

(4) The internship evaluation shall be done by *Department Post Graduate Evaluation Committee (DPGRC).*

Evaluation for Internship:

There shall be only Continuous Internal Evaluation (CIE) for Internship Evaluation

(ix) CIE for the Internship in third semester is as follows:

Assessment	Weightage
Internship Supervisor's Evaluation: *a) Completion of Internship Assignment* **(10%)** *b) Quality of work in completing the Internship Assignment* **(10%)** *c) Attendance, punctuality and work hours* **(10%)**	**30%**
DPGRC Assessment: ***a)*** *Duration (8 /6 weeks)* **(15% / 10%)** ***b)*** *Internship Report* **(35%)** ***c)*** *Oral Presentation (with PPT) and viva voce* **(20%)**	**70%**
Total Weightage:	**100%**

Note: It is mandatory for the student to

(i) appear for oral presentation (with PPT) and viva voceto qualify for course evaluation

(a) **Internship Report:** Each student is required to submit a well-documented internship report as per format specified by DPGRC

(b) **Anti-Plagiarism Check:** The internship report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(c) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the DPGRCas per the schedule notified by thedepartment

(x) The student has to register for the Internship as supplementary examination in the following cases:

(a) he/she is absent for oral presentation and viva-voce

(b) he/she fails to submit the report in prescribed format

(c) he/she fails to fulfill the requirements of Internship evaluation as per specified guidelines

(xi) (a) The CoE shall send a list of students registered for supplementary to the HoD concerned

(b) The DPGRC, duly constituted by the HoD, shall conduct Internship evaluation and send the award list to the CoE within the stipulated time

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: learn new concepts and apply them to the solution of engineering problems

CO2: function effectively on multidisciplinary teams and interface with other areas of organization

CO3: clearly communicate their ideas in writing and prepare a well-documented internship report

CO4: create informative PPTs and clearly communicate their ideas orally demonstrating technical knowledge

Course Articulation Matrix (CAM): P20SC304 : INTERNSHIP EVALUATION

CO		PO 1	PO 2	PO 3	PSO 1	PSO 2
CO1	**P20SC304.1**	2	-	2	2	2
CO2	**P20SC304.2**	2	-	2	2	2
CO3	**P20SC304.3**	-	2	-	1	1
CO4	**P20SC304.4**	-	2	-	1	1
P20SC304		**2**	**2**	**2**	**1.5**	**1.5**

DEPARTMENT OF CIVIL ENGINEERING
KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15
(An Autonomous Institute under Kakatiya University, Warangal)

PRR-20

SCHEME OF INSTRUCTION & EVALUATION FOR TWO YEAR POSTGRADUATE PROGRAMME

M. TECH. STRUCTURAL ENGINEERING & CONSTRUCTION

SEMESTER-IV

Sr. No.	Course Type	Course Code	Course Name	Teaching scheme			Credits	Evaluation Scheme								
								CIE - TA							ESE	Total Marks
								I²RE				Minor	MSE	Total		
				L	T	P		ATLP	CRP	CP	PPT					
1	PROJ	P20DC401	Dissertation Phase - II	-	-	30	15	-	-	-	-	-	-	60	40	100
			Total:	-	-	30	15							60	40	100

[L= Lecture, T = Tutorials, P = Practicals, C = Credits, ATLP = Assignments, CRP = Course Research Paper, CP = Course Patent, PPT = Course Presentation, Minor=Minor Examination, MSE=Mid Semester Examination and ESE=End Semester Examination]

Total Contact Periods/Week: 30 **Total Credits: 15**

P20SC401 : DISSERTATION PHASE-II

Class:M.Tech.IV - Semester **Specialization:** Structural Engineering & Construction

Teaching Scheme:

L	T	P	C
-	-	30	15

Examination Scheme:

Continuous Internal Evaluation	60
End Semester Examination	40

Course LearningObjectives (LOs):
This course will develop students' knowledge on /in...

LO1: recognize and formulate a problem to analyze, synthesize, evaluate, simulate and create their project

LO2: design an innovative product by applying current knowledge and adopt to emergingapplications of engineering and technology

LO3: creating PPTs and effective technical presentation and knowledge skills

LO4: writing technical paper in scientific journal style & format

Progress Presentation -II shall be conducted during the 5th /6th week of IV semester.

Progress Presentation -III shall be conducted during the 12th /13th week of IV semester.

Evaluation for Dissertation Work:

Dissertation *Phase-II*:

(i) Student has to continue the Dissertation work in 4th semester as Dissertation Phase-II

(ii) There shall be Continuous Internal Evaluation (CIE) for 60 marks and End Semester Examination for 40 marks.

(iii) The evaluation for Dissertation Phase-II is as follows:

Assessment	Weightage
Dissertation Supervisor Assessment (10%) *DPGRC* Assessment: *(i) Progress Presentation -II (10%)* *(ii) Progress Presentation -III (10%)* *(iii) Working model/process/software package/system developed (10%)* *(iv) Dissertation Video pitch (10%)* *(v) Dissertation Paper (10%)*	**60%**
End Semester Examination: *(i) Dissertation Report (20%)* *(ii) Oral presentation with PPT andviva-voce (20%)*	**40%**
Total Weightage	**100%**

Note: It is mandatory for the student to

(i) appear for oral presentation (with PPT) andviva-voce to qualify for course evaluation

(ii) write dissertation paper in given journal format

(ii) create a good video pitch on dissertation phase-I & II

(a) **Working Model:** Each student is required to develop a working model/ process/system on the chosen work and demonstrate before the DPGRC as perthe dates specified by DPGRC at the end of dissertation phase-II

(b) **Dissertation Report:** Each student is required to submit a well-documented dissertation report as per the format specified by DPGRC

(c) **Anti-Plagiarism Check:** The dissertation report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(d) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the DPGRC as per the schedule notified by the department

(e) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her dissertation Phase-I & II. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include key points about his / her business idea / plan (if any) and social impact

***(iv)* Dissertation Synopsis Presentation (DSP):**

(a) Students, with the consent of supervisor, shall apply to the DPGRC for conduct of dissertation synopsis presentation (DSP). This shall normally happen when the supervisor feels that the student has done significant work to qualify for M.Tech. dissertation.

(b) Those students who clear DSP shall only be allowed to submit the dissertationreport for end semester examination

***(v)* Dissertation Report:**

After clearing DSP, student shall be required to submit two bound copies of dissertation report, one for the department and other for the Dissertation Supervisor. The Dissertation report shall be evaluated by the DPGRC and external examination shall be conducted on a pre-notified date.

Course Learning Outcomes (COs):

On completion of this course, students will be able to...

CO1: apply knowledge to practice to design & conduct experiments and utilize modern tools for developing working models / process / system leading to innovation and entrepreneurship

CO2: design the hardware/software to demonstrate the principle of working to correlate the analytical simulation and experimental results

CO3: create informative PPT and demonstrate communication skills through effective oral presentation showing knowledge on the subject and sensitivity towards social impact of the Dissertation

CO4: write a "Dissertation paper" in scientific journal style and format from the prepared Dissertation report and create a video pitch on Dissertation

Course Articulation Matrix (CAM): P20SC401DISSERTATION PHASE-II						
CO		PO 1	PO 2	PO 3	PSO 1	PSO 2
CO1	P20SC401.1	2	-	2	2	2
CO2	P20SC401.2	2	-	2	2	2
CO3	P20SC401.3	-	2	-	1	1
CO4	P20SC401.4	-	2	-	1	1
P20SC401		2	2	2	1.5	1.5

COURSE CREDIT STRUCTURECOURSE WEIGHTAGE

Semester	PRR-20 Curriculum	As per Model Curriculum
I	19	18
II	19	18
III	15	16
IV	15	16
Total:	68	68

Courses	% Weightage ofCourses
Professional Theory	42.85 % (9/21)
Professional Lab	38.1 % (8/21)
Other	19.05 % (4/21)
Total:	100 % (21/21)

SEMESTER vs COURSE CATEGORY WEIGHTAGE

Number of Courses / Number of Credits (*Course Category wise*)

Semester	MC	PC	PE	OE	PROJ	AC	TOTAL
I	1/2	4/10	2/6	-	-	1/1	8/19
II	-	4/10	2/6	-	1/2	1/1	8/19
III	-	-	1/3	1/3	2/9	-	4/15
IV	-	-	-	-	1/15	-	1/15
Total	1/2	8/20	5/15	1/3	4/26	2/2	21/68
% Weightage of Course Category	2.94 % (2/68)	29.41 % (20/68)	22.05 % (15/68)	4.41 % (3/68)	38.23 % (26/68)	2.94 % (2/68)	100 % (68/68)

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Estd: 1980
KITSW

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE

(An Autonomous Institute under Kakatiya University, Warangal)

(Sponsored by EKASILA EDUCATION SOCIETY)

(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B)

WARANGAL - 506 015, Telangana, INDIA

Tel. Nos : +91 9392055211, +91 7382564888, Fax : (0870) 2564320

E-mail: principal@kitsw.ac.in

www.kitsw.ac.in