



K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-29 & 2026-30 Batch
Department of Civil Engineering

B.Tech. in Civil Engineering with Multidisciplinary Minor



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Curriculum Structure and Evaluation Scheme
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Department of Civil Engineering

Class: S. Y. B. Tech

Semester: III

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max .	Min. for passing	Ma x.	Min. for passing	
CE2311	Mathematics for Civil Engineers	3	-	-	54	90	3	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
CE2055	Strength of Materials	3	-	-	54	90	3	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
CE2075	Surveying and Geomatics	3	-	-	54	90	3	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
CE2215	Building Construction and Planning	4	-	-	72	120	4	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
	Multidisciplinary Minor-I	3	-	-	54	90	3	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
SH2175	Environmental Science	1	-	2	24	60	2	ISE	50	40	40	--	---
								ESE	50			40	--
CE2235	Building Construction and Planning Laboratory	-	-	2	6	30	1	ISE	----	----		50	50
								ESE	----			----	50
CE2115	Surveying and Geomatics Laboratory	-	-	2	6	30	1	ISE	----	----		50	50
								ESE	----			----	50
CE2135	Engineering Mechanics and Materials Testing Laboratory	-		2	6	30	1	ISE	----	----		100	50
	Professional Skills Development and Foreign Languages	-	-	2	6	30	1	ISE	-	----		100	50
	TOTAL	17	-	10	336	660	22						
	TOTAL CONTACT HOURS	27											

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning

Total Contact Hours/week : 27

Total Credits : 22





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Department of Civil Engineering

Sr. No.	Subject Name		Course Code
1.	Professional Skills	Professional Leadership Skills	SH2635
2.	Development and	Interpersonal Skills	SH2615
3.	Foreign Languages	Innovation Tools and Methods for Entrepreneurs	SH2695
4.		Personal Effectiveness and Body Language	SH2595
5.		German Language – Level III	SH2735
6.		Japanese Language – Level III	SH2715

Note:

1. A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.
2. Foreign Language course selected in F. Y. B. Tech Sem-I will remain the same with next levels in Sem-III & IV. (No new entries in S. Y. B. Tech Sem-III)



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Department of Civil Engineering

Class: S. Y. B. Tech

Semester: IV

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max	Min. for passing	Max	Min. for passing	
CE2025	Concrete Technology	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
CE2085	Fluid Mechanics	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
CE2321	Structural Analysis	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
CE2341	Water Resources and Irrigation Engineering	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
CE2362	Infrastructure Engineering I	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
	Multidisciplinary Minor-II	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
CE2185	Concrete Technology Laboratory	-	-	2	6	30	1	ISE	---	----		50	50
								ESE	---	----	--	50	50
CE2381	Highway Materials Testing Laboratory	-	-	2	6	30	1	ISE	---	----		50	50
CE2421	Building Planning and Design Laboratory	-	-	4	12	60	2	ISE	---	----			50
								ESE	---	----	--	50	
CE2165	Fluid Mechanics Laboratory	-	-	2	6	30	1	ISE	---	---		100	50
CE2441	Massive Open Online Course (MOOC)-I**	-	-	-	30	30	1	ISE	---	----		100	50
	Professional Skills Development and Foreign Languages	-	-	2	6	30	1	ISE	---	---		100	50
	TOTAL	18	-	12	390	750	25						
	TOTAL CONTACT HOURS	30											

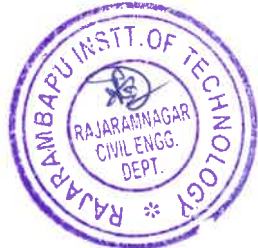
ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning

Total Contact Hours/week : 30

Total Credits : 25

Note: Students are required to undergo industrial training of minimum two weeks in the vacation of Semester-IV and its evaluation will be carried out in the Semester-V.

Note:** MOOC-I course certification marks will be considered for the credits





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Department of Civil Engineering

Sr. No.	Subject Name		Course Code
1.	Professional Skills	Professional Leadership Skills	SH2635
2.	Development and	Interpersonal Skills	SH2615
3.	Foreign Languages	Innovation Tools and Methods for Entrepreneurs	SH2695
4.		Personal Effectiveness and Body Language	SH2595
5.		German Language – Level IV	SH2645
6.		Japanese Language – Level IV	SH2625





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Class: T. Y. B. Tech

Semester: V

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)			Practical (%Marks)	
									Max	Min. for Passing		Ma x	Min. for passing
CE3512	Environmental Engineering	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50	40	---	---	
CE3531	Geotechnical Engineering	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50	40	---	---	
	Program Elective –I	2	-	-	36	60	2	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50	40	---	---	
	Open Elective-I	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50	40	---	---	
	Multidisciplinary Minor-III	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50	40	---	---	
	Multidisciplinary Minor-IV	2	-	-	36	60	2	ISE	20	40	40	--	--
								UT1	15			--	--
								UT2	15			--	--
								ESE	50	40			
SH3036	Scholastic Aptitude-I	2*					Audit	ISE	100	50 (P/NP)	--	--	--
CE3552	Environmental Engineering Laboratory	-	-	2	6	30	1	ISE	---	---		50	50
								ESE	---	---		50	50
CE381	Geotechnical Engineering Laboratory	-	-	2	6	30	1	ISE	---	---		50	50
								ESE	---	---		50	50
CE3772	Mini Project	-	-	6	18	90	3	ISE	---	----		50	50
								ESE	---	---		50	50
CE3572	Industrial Training	-	-	-	30	30	1	ISE	---	---	---	100	50
CE3791	Massive Open Online Course-II**	-	-	-	30	30	1	ISE	---	----	---	100	50
	TOTAL	16	-	10	378	690	23						
TOTAL CONTACT HOURS		26											

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning, P = Pass, NP = Not Pass

Total Contact Hours/week : 26

Total Credits : 23

Note*: Students should complete 5 days (30 Hours) of Scholastic Aptitude training program organized by the Institute.

Note:** MOOC-II course certification marks will be carried out for the credits



Program Elective-I

Sr. No	Course Code	Domain	Course
1	CE3631	Construction	Construction Quality Control
2	CE3641	Management	Construction Equipment Management
3	CE3651	General Engineering	Advanced Fluid Mechanics
4	CE3671		Solid Waste Management
5	CE3711		Engineering Geology
6	CE3731	Structural	Finite Element Method
7	CE3751	Engineering	Repair and Rehabilitation of Structures

Open Elective I

Sr. No.	Course Code	Open Elective Subject Name	Offered by the department
1	OE3411	Energy Audit and Management	Electrical Engineering
2	OE3431	Data Science	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
3	OE3105	Network Administration	Computer Science and Engineering
4	OE3065	Environmental Impact Assessment	Civil Engineering
5	OE3382	Disaster Management	
6	OE3651	Distributed Systems	
7	OE3611	Object Oriented Modeling and Design	Computer Science and Information Technology
8	OE3471	New Product Design & Development	Mechanical Engineering
9	OE3491	Non-Conventional Energy Sources	Mechanical Engineering
10	OE3045	Renewable Energy Sources	Robotics & Automation
11	OE3631	Robotics Engineering & Applications	
12	OE3531	Factory Automation	Mechatronics Engineering
13	OE3551	Cyber Physical System	
16	OE3571	Internet of Things	Electronics & Telecommunication Engineering
17	OE3591	Drone Technology	
18	OE3511	Hydrogen Fuel Cell Technology	Mechanical Engineering



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Class: T. Y. B. Tech

Semester: VI

Course Code	Course	Teaching Scheme						Scheme	Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits		Theory (%Marks)			Practical (%Marks)		
									Ma x	Min. for passing		Ma x	Min. for passing	
CE3521	Design of Steel Structures	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			---	---	
CE3541	Construction Management	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			---	---	
CE3561	Research Methodology	2	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			---	---	
	Program Elective-II	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			---	---	
	Open Elective-II	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			---	---	
	Multidisciplinary Minor-V	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			---	---	
SH3066	Scholastic Aptitude-II	2*					Audit	ISE	100	50 (P/ NP)	--	--	--	
CE3602	Design of Steel Structures Laboratory	-	-	2	6	30	1	ISE	---	---		50	50	
								ESE	---	---		50	50	
CE3146	Minor Project	-	-	12	36	180	6	ISE	--	---		50	50	
								ESE	---	---		50	50	
	TOTAL	17	-	14	348	720	24							
TOTAL CONTACT HOURS		31												

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning, P = Pass, NP = Not Pass

Total Contact Hours/week : 31

Total Credits : 24

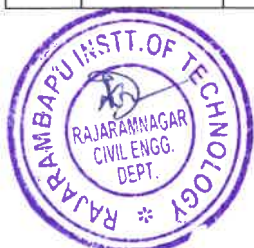
Note*: Students should complete 5 days (30 Hours) of Scholastic Aptitude training program organized by the Institute.



Program Elective – II

Sr. No.	Course Code	Discipline	Course
1	CE3591	Construction Management	Legal Aspects in Construction
2	CE3821		Town Planning
3	CE3612	General Engineering	Optimization Techniques
4	CE3661		Advanced Hydraulic Engineering
5	CE3681		Air Quality Assessment
6	CE3701		Traffic Engineering
7	CE3721		Industrial Waste Management
8	CE3741	Structural Engineering	Advanced Structural Analysis
9	CE3761		Composite Materials and Structures
10	CE3801		Fiber Reinforced Concrete

Open Elective II			
Sr. No.	Course Code	Open Elective Subject Name	Offered by the department
1	OE3721	Industrial Safety	Electrical Engineering
2	OE3421	Data Mining	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
3	OE3681	AI for Agriculture	
4	OE3481	Information Technology Foundation Program	Computer Science and Engineering
5	OE3661	AI for Cybersecurity	
6	OE3085	Materials Management	Civil Engineering
7	OE3501	Operations Research	
8	OE3581	Plumbing (Water and Sanitation)	
9	OE3402	Cyber Security	Computer Science and Information Technology
10	OE3641	AI for Manufacturing	
11	OE3285	Supply Chain Management	Mechanical Engineering
12	OE3325	Entrepreneurship Development	
13	OE3025	Reliability Engineering	Robotics & Automation
14	OE3621	Flexible Manufacturing System	
15	OE3521	Image Processing	Electronics & Telecommunication
16	OE3541	Fuzzy Logic & Neural Network	





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17	OE3701	AI for Sustainability	Engineering
18	OE3441	Supply Chain Analytics	Mechatronics Engineering
19	OE3461	Mobile Robotics	
20	OE3561	Project Management	Mechanical Engineering
21	OE3243	Marketing for Engineers	MBA



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Class: Final Year B. Tech

Semester: VII

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max.	Min. for passing	Max.	Min. for passing	
CE4015	Design of Reinforced Concrete Structures	4	-	-	72	120	4	ISE	20	40	40	---	---
								MSE	30			---	---
								ESE	50			---	---
CE4035	Quantity Surveying and Valuation	3	-	-	54	90	3	ISE	20	40	40	---	---
								MSE	30			---	---
								ESE	50			---	---
CE4055	Infrastructure Engineering II	3	-	-	54	90	3	ISE	20	40	40	---	---
								MSE	30			---	---
								ESE	50			---	---
CE4135	Construction Practices	3	-	-	54	90	3	ISE	20	40	40	---	---
								MSE	30			---	---
								ESE	50			---	---
	Program Elective-III	3	-	-	54	90	3	ISE	20	40	40	---	---
								MSE	30			---	---
								ESE	50			---	---
	Program Elective-IV	3	-	-	54	90	3	ISE	20	40	40	---	---
								MSE	30			---	---
								ESE	50			---	---
	Program Elective-IV Lab	-	-	2	6	30	1	ISE	---	---	---	100	50
CE4075	Design of Reinforced Concrete Structures Laboratory	-	-	2	6	30	1	ISE	---	---	---	50	50
								ESE	---	---	---	50	50
CE4095	Quantity Surveying and Valuation Laboratory	-	-	4	12	60	2	ISE	---	---	---	50	50
								ESE	---	---	---	50	50
CE4115	Skill Development Laboratory	-	-	2	6	30	1	ISE	--	---	---	50	50
								ESE	--	---	---	50	50
	TOTAL	19	-	10	372	720	24						
TOTAL CONTACT HOURS		29											

ISE: In Semester Evaluation, MSE: Mid Semester Examination, ESE = End Semester Exam, TW: Term work, SL: Self Learning

Total Contact Hours/week : 29

Total Credits : 24



Program Elective-III

Sr. No.	Course Code	Discipline	Course
1	CE4235	Construction Management	Total Quality Management
2	CE4391		Advanced Construction Techniques
3	CE4255	General Engineering	Environmental Management System
4	CE4871		Foundation Engineering
5	CE4126	Structural Engineering	Design of Prestressed Concrete structures
6	CE4891		Advanced Design of Steel Structure
7	CE4911		Earthquake Engineering
8	CE4295		Design of bridges

Program Elective-IV Theory

Sr. No.	Course Code	Discipline	Course
1	CE4135	Construction Management	Construction Project Management
2	CE4155		Advanced Concrete Technology
3	CE4811	General Engineering	Environmental Chemistry and Microbiology
4	CE4831		Watershed Management and Remote Sensing Applications
5	CE4175		Rock Mechanics
6	CE4195		GIS and GPS system
7	CE4851	Structural Engineering	Structural Health Monitoring
8	CE4411		Design of Industrial Structures
9	CE4215		Advanced Structural Design

Program Elective-IV Lab

Sr. No.	Course Code	Discipline	Course
1	CE4315	Construction Management	Construction Project Management Laboratory
2	CE4335		Advanced Concrete Technology Laboratory
3	CE4931	General Engineering	Environmental Chemistry and Microbiology Laboratory
4	CE4951		Watershed Management and Remote Sensing Applications Laboratory
5	CE4355		Rock Mechanics Laboratory
6	CE4375		GIS and GPS system Laboratory
7	CE4971	Structural Engineering	Structural Health Monitoring Laboratory
8	CE4991		Design of Industrial Structures Laboratory
9	CE4395		Advanced Structural Design Laboratory



Choice based Internship Model
Model I: Industry Internship (II)

Class: Final Year B. Tech

Semester: VIII

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)			Practical (%Marks)	
									Max.	Min. for passing		Max.	Min. for passing
OE4383	Finance for Engineers (Online Course)	2	-	-	60	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
OE4363	Engineering Management & Economics (Online Course)	2	-	-	60	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
IP4025	Industry Internship & Project	-	-	-	360	360	12	ISE	---	---		50	50
								ESE	---	---		50	50
	TOTAL	-	-	-	480	480	16						

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning

Total Contact Hours/week : —
Total Credits : 16

Note:

- Weekly Contact hours are not mentioned as student is expected to be in industry regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.
- For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.



Model II: Research Internship (RI)

Class: Final Year B. Tech

Semester: VIII

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)			Practical (%Marks)	
									Max.	Min. for passing		Max.	Min. for passing
OE4383	Finance for Engineers (Online Course)	2	-	-	60	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
OE4363	Engineering Management & Economics (Online Course)	2	-	-	60	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
RE4045	Research Internship	-	-	-	360	360	12	ISE	---	---		50	50
								ESE	---	---		50	50
	TOTAL	-	-	-	480	480	16						

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning

Total Contact Hours/week : -
Total Credits : 16

Note:

- 1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.
- 2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.
- 3] Students who opt for a research internship need to undergo a minimum of one month of research internship in outside research organizations or laboratories.

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.



Model III: Entrepreneurial Internship (EI)

Class: Final Year B. Tech

Semester: VIII

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (%Marks)			Practical (%Marks)	
									Max	Min. for passing		Max	Min. for passing
ED4105	Project Management (Online Course)	2	-	-	60	60	2	ISE	25	40	40	-	-
								ESE	75	40		-	-
ED4045	Commercial Aspects of the Project (Online Course)	2	-	-	60	60	2	ISE	25	40	40	-	-
								ESE	75	40		-	-
ED4065	Entrepreneurship Development Program (EDP)	-	-	-	30	30	1	ISE	--	--	--	100	50
ED4085	Entrepreneurial Internship	-	-	-	330	330	11	ISE	---	--	--	50	50
								ESE				50	
	Total	-	-	-	480	480	16						

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning

Total Contact Hours/week :-

Total Credits : 16

Note:

1] Weekly Contact hours are not mentioned as student is expected to be in outside research organization regularly for 20 weeks. However, student needs to report to Institute mentors as and when required.

2] For online course, lecture videos of each unit will be made available through college platform to the students. For each unit there will be separate assignment. Students need to submit all assignments within specified time.

Weightage: 25% weightage for unit wise assignments + 75% weightage for final exam. Final exam will be held at college campus.

3] A one week Entrepreneurship Development Program (EDP) will be conducted after completion of 7th semester and before start of 8th semester.

4] Students who opt for an entrepreneurial internship need to undergo a one-month internship at an outside reputed organization or firm



Multidisciplinary Minor

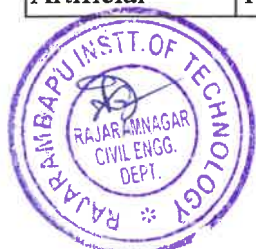
- Student should choose any one specialization given by the department and complete all the five courses under the specialization to earn 170 Credits.
- Following are the baskets of multidisciplinary minor courses

MDM Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by Department
Construction Engineering	1	CEMD2011	Building Construction and Planning	III	Civil Engineering
	2	CEMD2021	Building Estimation and Valuation	IV	
	3	CEMD3011	Infrastructure Engineering	V	
	4	CEMD3031	Smart Cities and Sustainable Development	V	
	5	CEMD3021	Environmental Engineering	VI	
Software Programming	1	CSMD2011	Introduction to Data Structures	III	Computer Science & Engineering
	2	CSMD204	Fundamentals of Database Systems	IV	
	3	CSMD305	Software Testing	V	
	4	CSMD3031	Object-oriented Programming in Python	V	
	5	CSMD3021	Artificial Intelligence	VI	
Electrical Power System	1	EEMD2011	Electrical Power Generation	III	Electrical Engineering
	2	EEMD2021	Power System	IV	
	3	EEMD3011	Electrical Machines	V	
	4	EEMD3051	Electrical Technology	V	
	5	EEMD3021	Smart Grid	VI	
Electronics System Design	1	ECMD2011	Electronics Devices and Applications	III	Electronics & Telecommunication Engineering
	2	ECMD2021	Electronics Communication Systems	IV	
	3	ECMD3011	Advanced Communication	V	



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MDM Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by Department
			Systems		
	4	ECMD3031	Electronic Product Design	V	
	5	ECMD3021	Industrial Electronics	VI	
Software Development	1	CIMD2011	Data Structures	III	Computer Science & Information Technology
	2	CIMD2021	Computer Algorithms	IV	
	3	CIMD3011	Introduction to DBMS	V	
	4	CIMD3031	OOP using Java	V	
	5	CIMD3021	Software Engineering	VI	
Product Design and Development	1	MEMD2031	Design Thinking	III	Mechanical Engineering
	2	MEMD2041	Behavioral Engineering and Design	IV	
	3	MEMD3051	Product Design Tools and Techniques	V	
	4	MEMD3071	Design and Prototyping	V	
	5	MEMD3041	Marketing and Business Fundamentals for New Products	VI	
Automobile Engineering	1	MEMD205	I. C. Engine	III	Mechanical Engineering
	2	MEMD206	Automotive Drivetrain	IV	
	3	MEMD309	Automotive Chassis Systems	V	
	4	MEMD311	Automotive Engineering Laboratory	V	
	5	MEMD306	Electric Vehicles	VI	
Mechatronics Engineering	1	MCMD2011	Fundamentals of Mechatronics	III	Mechatronics Engineering
	2	MCMD2021	Industrial Fluid Power	IV	
	3	MCMD3011	Sensor and Instrumentation	V	
	4	MCMD3031	Industrial Automation	V	
	5	MCMD3021	Industrial Robotics	VI	
Artificial	1	AIMD2011	Object Oriented	III	Computer Science &



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MDM Basket Name	Sr. No.	Course Code	Course Name	Semester	Offered by Department
Intelligence			Programming		Engineering (AI-ML)
	2	AIMD2021	Data Structures and Algorithms	IV	
	3	AIMD3011	Machine Learning	V	
	4	AIMD3031	Business Intelligence	V	
	5	AIMD3021	Principles of AI	VI	
Robotics & Automation	1	RAMD2011	Fundamentals of Robotics & Automation	III	Robotics & Automation
	2	RAMD2021	Sensors and Actuators	IV	
	3	RAMD3011	Kinematic & Dynamics for Robots	V	
	4	RAMD3051	Robot Programming	V	
	5	RAMD3021	Industrial Automation & Control	VI	





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B. Tech. in Civil Engineering with Double Minor (Multidisciplinary and Specialization Minor)



B.Tech. in Civil Engineering with Double Minor degree

1. It is required to complete SIX courses (each of 3 credits) from ONLINE platform to earn total of 18 credits under Double Minor (DM) certification.
2. Student must complete and earn the credits for all the six courses starting from Second Year First semester (3rd semester) to Final Year Second Semester (8th semester).
3. Basket of the DM courses and respective semester is mentioned in the following table.

Sr. No.	Semester	Course	Code
1	III	DM – I	EEDM3XXX
2	IV	DM – II	EEDM4XXX
3	V	DM – III	EEDM5XXX
4	VI	DM – IV	EEDM6XXX
5	VII	DM – V	EEDM7XXX
6	VIII	DM – VI	EEDM8XXX

4. To select course platform, first preference must be given to NPTEL.
5. Other than NPTEL, courses from COURSERA and UDEMY platforms are allowed to register only in following cases,
 - a. If timeline of NPTEL course is not in line with timeline of academic calendar.
 - b. The suitable succeeding course in line with previous course is not available on NPTEL.
 - c. If any other unavoidable circumstances occurs.
6. Platform and course selection must be as per recommendation of BOS of the department.
7. Student will get the credits of respective DM course in following conditions,
 - a. In case of course selected from NPTEL platform, student have to complete the timely assignments, PASS the exam and secure the certificate.
 - b. In case of course selected from COURSERA or UDEMY, student have to secure the certificate and appear for VIVA(oral) exam.
8. While selecting online course, following points must be taken care of,
 - a. Selected course must be of basic or fundamental level.
 - b. Contents of the course should not be covered in any of the course offered in regular curriculum or not listed in any elective (open or program elective) or in Multidisciplinary Minor (MDM)
 - c. Duration of each online course must be of EIGHT weeks for NPTEL and 30+ hours for UDEMY, COURSERA courses.





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B.Tech. in Civil Engineering with Honor and Multidisciplinary Minor



B.Tech. in Civil Engineering with Honor and Multidisciplinary

Minor degree

1. It is required to complete SIX courses (each of 3 credits) from ONLINE platform to earn total of 18 credits under Honor certification.
2. Student must complete and earn the credits for all the six courses starting from Second Year First semester (3rd semester) to Final Year Second Semester (8th semester).
3. Basket of the Honor courses and respective semester is mentioned in the following table.

Sr. No.	Semester	Course	Code
1	III	Honor - I	EEH3XXX
2	IV	Honor - II	EEH4XXX
3	V	Honor - III	EEH5XXX
4	VI	Honor - IV	EEH6XXX
5	VII	Honor - V	EEH7XXX
6	VIII	Honor - VI	EEH8XXX

4. To select course platform, first preference must be given to NPTEL.
5. Other than NPTEL, courses from COURSERA and UDEMY platforms are allowed to register only in following cases,
 - a. If timeline of NPTEL course is not in line with timeline of academic calendar.
 - b. The suitable succeeding course in line with previous course is not available on NPTEL.
 - c. If any other unavoidable circumstances occurs.
6. Platform and course selection must be as per recommendation of BOS.
7. Student will get the credits of respective Honor course in following conditions,
 - a. In case of course selected from NPTEL platform, student have to complete the timely assignments, PASS the exam and secure the certificate.
 - b. In case of course selected from COURSERA or UDEMY, student have to secure the certificate and appear for VIVA (oral) exam.
8. While selecting online course, following points must be taken care of,
 - a. Selected course must be of advanced level and not basic or fundamental level.
 - b. Contents of the course should not be covered in any of the course offered in regular curriculum or not listed in any elective (open or program elective)
 - c. Duration of each online course must be of EIGHT weeks for NPTEL and 30+ hours for COURSERA, UDEMY courses.



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B.Tech. in Civil Engineering-Honors with Research and Multidisciplinary Minor



Honors with Research and Multidisciplinary Minor

The student will work on Research Project or Dissertation for 18 Credits in the Fourth Year in respective discipline. The distribution of 18 Credits for Research project in Sem-VII and Sem-VIII is given below. To get B.Tech. in Civil Engineering-Honors with Research and Multidisciplinary Minor degree Student need to earn total 188 Credits which consist 170 credits of regular Multidisciplinary Minor courses and 18 credits of Research courses.

Class: Final Year B. Tech

Semester: VII

		Teaching Scheme						Evaluation Scheme					
Course Code	Course	L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
									Max.	Min. for passing		Max.	Min. for passing
REH4011	Intellectual Property Rights	-	-	-	60	60	2	ISE	50	40	40	---	---
								ESE	50	40		---	---
REH4031	Research project (Synopsis) phase - I	-	-	-	60	60	2	ISE	--	--	--	50	50
								ESE	--	--		50	50
REH4051	Research Specific core course - I (Online NPTEL course)	-	-	-	90	90	3	ISE	50	40	40	--	--
								ESE	50	40		--	--
	TOTAL	-	-	-	210	210	7						

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning

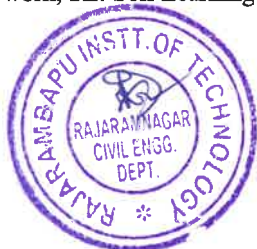
Note: For Evaluation of Online NPTEL course ISE Marks will be marks obtained by students in the assignments given by NPTEL, students who will secure NPTEL certification will be only eligible for ESE of the same course which will be conducted at institute

Class: Final Year B. Tech

Semester: VIII

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW + SL	Total Hrs.	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
									Max.	Min. for passing		Max.	Min. for passing
REH4021	Research project phase - II	-	-	-	330	330	11	ISE	--	--	--	50	50
								ESE	--	--	50		
	TOTAL	-	-	-	330	330	11						

ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, TW: Term work, SL: Self Learning



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S. Y. B. Tech. Syllabus
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Department of Civil Engineering

Class:- S. Y. B. Tech. Civil	Semester-III
Course Code : CE2311	Course Name: Mathematics for Civil Engineers

L	T	P	Credits
3	-	-	3

Course Description:

The course is offered as the core science course. This course intends to develop the competency in students to apply Mathematical ideas in civil engineering problems. The course consists of topics in Linear Differential Equations, Application of LDE to Civil Engineering Problems, Linear Partial Differential Equations with Constant Coefficients, Vector Analysis, Statistics, and Probability Distribution.

Course Outcomes:

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

1. Solve problems on linear differential equations (LDE) and linear partial differential equations (PDE).
2. Apply linear differential equations (LDE) to deflection of beams and columns
3. Apply rules of vector differential calculus to evaluate gradient, divergence and conservative vector field.
4. Compute Karl Pearson's coefficient of correlation and to fit regression lines.
5. Solve problems on probability distributions.

Prerequisite: Engineering Mathematics I and II

Course Content		
Unit No	Description	Hrs
1	Linear Differential Equations (LDE): Definition, Complete Solution of Linear Differential Equations with Constant Coefficients, Complete Solution of Linear Differential Equations with Variable Coefficients.	06
2	Application of LDE: Application to: Bending of Beams- Simply Supported Beam and Cantilever Beam, Buckling of Columns, Rod, Struts.	06
3	Vector Analysis : Differentiation of Vectors, Scalar and Vector point function, Gradient, Divergence, Directional Derivative, Curl, Solenoid, and Irrotational vector field.	06
4	Linear Partial Differential Equations with Constant Coefficients: Definition, Linear Homogeneous Partial Differential Equations of nth Order with Constant Coefficients, Application of partial differential Equation: Heat equation, wave equation.	06
5	Statistics: Coefficient of Correlation, Lines of Regression of Bivariate Data, Fitting of Curves (Lines and Parabola) by Least Square Principle.	06
6	Probability Distribution: Random Variable, Discrete and Continuous Probability Distributions, Binomial, Poisson and Normal Distributions.	06



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References -

Textbook:

- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Reference Books:

- Erwin Kreyszig, Advanced Engineering Mathematics, Wiley.
- B.V. Raman, Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
- N. P. Bali, A. Saxena, N. Ch. S. N. Iyengar, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.
- S. S. Sastry, Introductory Methods of Numerical Analysis.
- Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing house.
- P. N. Wartikar, J. N. Wartikar, A Text book of Applied Mathematics, Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune.





Class: S. Y. B. Tech. Civil	Semester: III
Course Code : CE2055	Course Name: Strength of Materials

L	T	P	Credits
3	-	-	3

Course Description:

This course introduces the fundamental principles of mechanics of deformable bodies and their application to the analysis of structural members subjected to various types of loading. It develops an understanding of stress, strain, elastic constants, and deformation of axially loaded members, including composite sections and thermal stresses. The course covers the analysis of two-dimensional stress systems through principal stresses and maximum shear stresses. It also focuses on the determination of shear forces and bending moments in statically determinate beams under different loading and support conditions. Students learn the theory of simple bending, flexure formula, moment of resistance, and shear stress distribution in beam sections to evaluate structural strength and safety. The course further introduces the stability of axially loaded columns through Euler's and Rankine's theories for predicting buckling and safe load-carrying capacity. The analytical skills developed in this course provide a strong foundation for advanced studies in Structural Analysis, Reinforced Concrete Design, Steel Structures, and other structural engineering subjects, enabling students to analyze and design safe, stable, and efficient engineering structures.

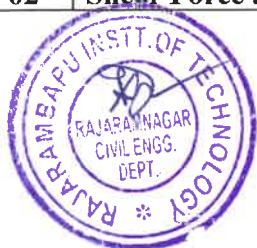
Prerequisite: Engineering Physics, Engineering Mathematics and Engineering Mechanics

Course Learning Outcomes:

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

1. Analyze structural members subjected to axial loading using the fundamental principles of mechanics of materials.
2. Construct and interpret shear force and bending moment diagrams for statically determinate beams.
3. Evaluate bending and shear stress distributions in structural members by applying classical theories.
4. Determine principal stresses, principal planes, and maximum shear stresses for two-dimensional stress systems using stress transformation equations.
5. Analyze the stability of axially loaded columns by applying Euler's and Rankine's theories.

Course Content		
Unit No.	Description	Hrs.
01	Simple Stresses, Strains and Elastic Constants: Concept of stress and strain, Hooke's law, Elastic constants and their relationships, Stress-Strain behavior of materials, Deformations in composite sections under axial loading, compound bars and temperature stresses.	07
02	Shear Force and Bending Moment:	05



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	Concept of shear force and bending moment for determinate beams for various loadings. Relation between shear force, bending moment and loading. Shear force and bending moment diagrams for various loading and support conditions.	
03	Bending Stresses: Bending Stresses: Theory of simple/pure bending. Derivation for flexure formula. Bending stress distribution diagrams. Moment of Resistance, flitched beam.	06
04	Shear Stresses: Introduction, Derivation of shear stress equation, Shear stress distribution diagrams of various shapes cross-sections, average and maximum shear stress.	06
05	Principal Stresses: Concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress.	06
06	Axially Loaded Columns: Critical load and buckling, derivation of Euler's formula. Concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula.	06

References:

Text Books:

- H. Shah, and S. Junnarkar, "Mechanics of Structures", Charotar Publishing House Pvt Limited, New Delhi.
- S. Ramamrutham, "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited, New Delhi.

Reference Books:

- R. Vaidyanathan, P. Perumal, P. Lingeswari, "Mechanics of Solids and Structures", Scitech Publications Pvt. Ltd., Chennai.
- S. Timoshenko, "Strength of Materials Part-I: Elementary Theory and Problems", CBS Publishers.



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Department of Civil Engineering

Class: S. Y. B. Tech. Civil	Semester: III	L	T	P	Credits
Course Code : CE2075	Course Name: Surveying and Geomatics	3	-	-	3

Course Description:

The course equips students with theoretical and practical surveying knowledge and skills, relevant to the needs of construction industry and society. Before starting of any Civil Engineering project, surveying knowledge is very essential to a Civil Engineer. Surveying is offered as the course in the first semester of second year engineering consists of two modules, the first module focuses on the Temporary and permanent Adjustments in leveling, Reciprocal, Profile Levelling and Cross sectioning, Methods of Plotting Contours, Plane table techniques, Calculation of earthwork in cutting and embankment for civil engineering works. The second module focuses on Theodolite traversing and EDM measurements, Tachometry and Layout surveys, hydrographic surveying techniques and Curve surveying.

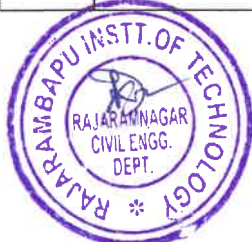
Course Learning Outcomes:

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

1. Calculate reduced levels and identify the characteristics of contours.
2. Calculate the angular and linear measurements by using theodolite and tachometry principle.
3. Design and set out the curve on field.
4. Describe the principles of surveying with advanced techniques like Total station, GIS, GPS in construction works

Prerequisite: Fundamentals of Basic Civil Engineering, Engineering Mathematics.

Course Content		
Unit No.	Description	Hrs
01	Fundamentals of surveying Definition, objectives, uses, classification of survey, principles of surveying, introduction to map and map projection, scales and types of scale, error and types of error.	06
02	Levelling Terms and Types of levelling, Equipment used for levelling, calculation of elevation (RL)-methods, corrections in levelling, Contouring, Characteristics of Contours, Uses of Contour Maps, Direct and Indirect methods of contouring	06
03	Theodolite Surveying Principle, systems of bearings, types of Theodolites, Measurement of Horizontal and Vertical Angles, Theodolite Traversing – closing error,	06





	Calculation of latitudes and departures, Adjustment of Closed Traverse.	
04	Advanced Surveying Techniques Electronic Distance Measurement (EDM) instruments, Surveying using Total Station –Working principle and use of Total station, Data observations in T.S, Basics of Geographical information system (GIS) working principle, types and methodology. Analysis using raster and vector data, Open-source software, Geographical Positioning system (GPS) - working principle, types and methodology. Different segments: space, control and user segments – satellite, Hand Held and Geodetic receivers.	06
05	Curves and Computation of Area and Volume Types and necessity Curve, Design and data collection for setting out of simple circular and compound curves, Areas and Volumes Calculations for any plotted plan by instrumental and mathematical methods.	06
06	Applications of surveying: Setting out work: Setting out building, pipeline surveying, road alignment and culverts, Hydrographic Survey: Introduction, Hydrographic survey Methods, Lead lines, sounding, Civil Engineering Applications. Drone surveying: Working flow, types of drones, data collection, post processing for map preparation.	06

Reference:-

Reference Books:

- Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill.
- Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning – Van Nostrand Reinhold.
- Plane and Geodetic surveying for Engineers. Vol. I by David Clark, Constable.

Text Books:

- Surveying and Levelling by N. N. Basak , Tata McGraw Hill, New Delhi.
- Surveying Vol. I, II and III - Dr. B.C. Punamia, Laxmi Publishers. New Delhi.
- Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh.
- Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
- Plane Surveying by A. M. Chandra, New Age International Publishers.



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Department of Civil Engineering

Class: S. Y. Civil	Semester- III
Course Code: CE2215	Course Name: Building Construction and Planning

L	T	P	Credits
4	--	--	4

Course Description:

The course Building Construction and Planning provides an overview of the properties, characteristics, and applications of various building materials used in construction. It offers an understanding of building components and their functional design, and enables students to plan residential buildings in accordance with the principles of building planning and applicable building regulations. The course also covers essential building services, including plumbing and electrification layouts, as well as various building finishes and their applications.

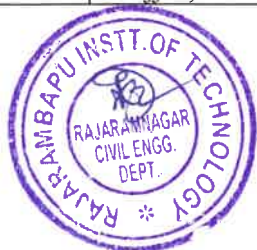
Course Learning Outcomes:

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

1. Select suitable construction materials for different building applications.
2. Explain the building components and functional design of a door, window and staircase.
3. Design residential building plan using principles of planning and government rules.
4. Prepare plumbing, furniture, and electrification layouts for buildings.
5. Describe various building finishes and their applications in construction.

Prerequisite: Basic knowledge of engineering graphics.

COURSE CONTENT		
Unit No.	Details of Content	Hrs.
1.	Construction Materials Properties, characteristics, and applications of various construction materials such as stone, aggregates, bricks, steel, aluminum, timber, glass, flooring materials, roofing materials, ceiling materials, cladding materials, and plumbing materials. Introduction to mortar, Plain Cement Concrete (PCC), and Reinforced Cement Concrete (RCC).	08
2.	Substructure of Building Types of structures: Load Bearing Structures and Framed Structures. Concept of Safe Bearing Capacity (SBC) of soil. Building components in substructure, Types of foundations and their suitability. Types of masonry: Brick masonry and stone masonry; bonds in brickwork and stone masonry. Building components in superstructure: Columns, beams, slabs, walls, sills. Doors and windows: Technical terms, classification, and functional design. Lintels, chajjas, ventilators, parapet walls. Types of roofing systems. Staircases:	10



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S. Y. B. Tech. Syllabus

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Department of Civil Engineering



	Technical terms, classification, and functional design. Introduction to ramps, ladders, lifts, and escalators.	
3.	Planning of Buildings and Bye-laws Types of buildings. Site selection criteria. Importance of sun path and wind diagrams. Basic requirements of good buildings. Principles of planning: Aspect, prospect, privacy, grouping, roominess, circulation, flexibility, sanitation, ventilation, economy and elegance. Orientation of buildings under Indian conditions. Concept of green buildings. Bye-laws: Definition, necessity, and provisions as per 'National Building Code of India' and 'Unified Development Control and Promotion Regulations (UDCPR) for Maharashtra State'. Procedure for obtaining building permission.	06
4.	Planning, Design and Drawing of Residential Buildings Introduction and necessity of building drawings. Types of building drawings: Layout plan, site plan, submission drawing, and working drawing. Conventional signs and symbols. Agencies involved in building construction and their responsibilities. Planning and design of residential buildings. Preparation of site plans and floor plans for bungalow/residential buildings.	10
5.	Building Services Plumbing and Drainage Services: Concept and preparation of plumbing and drainage plans for buildings. Introduction to plumbing systems, sanitary fittings, water supply and drainage layouts, types of traps and pipe fittings, septic tanks, soak pits, and rainwater harvesting systems. Furniture Layout and Electrification Plans: Furniture requirements and standard dimensions for residential buildings. Principles of furniture layout planning for various rooms. Preparation of electrification plans including types of wiring systems, symbols for electrical points and appliances, and guidelines for location of electrical fixtures.	08
6.	Building Finishes Plastering and pointing. Paints: Characteristics and constituents, classification, properties, applications, common defects, and procedures for surface preparation and paint application. Varnishes: Characteristics, ingredients, types, properties, applications, and procedures for application of varnishes on wooden surfaces. Distemper, Whitewashing, and Colour Washing: Materials used, preparation methods, application procedures, properties, advantages, and applications.	06

References –



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To be implemented for 2025-29 and 2026-30 Batch

Department of Civil Engineering

References Books: -

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons. Mehta, Scarborough, Armpriest, Building Construction, Pearson Education
- W.B Macay, "Building Construction", Pearson Education
- S.Mantri, "The A to Z of Practical Building Construction and its Management", Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, "Building Drawing And Planning With An Integrated Approach To BuiltEnvironment", Tata McGraw-Hill Education Pvt. Ltd.

Text Books: -

- S. P. Arora, S. P. Bindra, "Building Construction", Dhanpat Rai Publications
- Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, "Building Construction", Laxmi Publications.
- S. C. Rangwala, "Building Construction", Charotar Publishing House Pvt. Limited

Codes of Practice :-

- Unified Development Control and Promotion Regulations:2019 (UDCPR: 2019) for Maharashtra State.
- NBC 2016, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 – 1989, Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi



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S. Y. B. Tech. Syllabus
 To be implemented for 2025-29 and 2026-30 Batch
Department of Civil Engineering

Class: S. Y. B. Tech.	Semester- III
Course Code: CEMD2011	Course Name: Building Construction and Planning

L	T	P	Credits
3	-	-	3

Course Description:

This course introduces students to the fundamentals of building construction and planning. It covers the properties, characteristics, and applications of various building materials used in construction. The course provides knowledge of the functional design and construction of different building components, along with the principles of building planning and relevant building bye-laws. Students learn the basics of planning residential buildings by considering functionality, safety, ventilation, lighting, and aesthetics. The course also includes an overview of building services and finishes commonly employed in modern buildings.

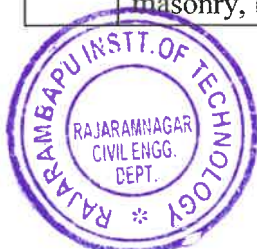
Course Outcomes:

After successful completion of this course, students will be able to:

1. Select suitable building materials for various construction applications based on their properties and uses.
2. Design functional building components considering structural and service requirements.
3. Plan and draw residential buildings in accordance with principles of planning and building bye-laws.
4. Prepare basic plumbing and electrification layouts for buildings.
5. Explain the properties, applications, and procedures of commonly used building finishing materials.

Prerequisite: Basic knowledge of engineering graphics.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Construction Materials: Properties and applications of various materials viz. cement, stone, aggregate, brick, steel, flooring materials, roofing materials, cladding materials, plumbing materials, mortar, plain cement concrete (PCC), reinforced cement concrete (RCC) and pre-stressed concrete (PSC).	06
2.	Components of Building I: Types of structures: Load Bearing Structure and Framed Structure, sectional details of load bearing and framed structure showing substructure components -PCC bed, footing walls, plinth. Concept of soil bearing capacity, types of foundation and their suitability, types of brick and stone masonry, bonds in brickwork.	06



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3.	Components of Building II: Superstructure components of the buildings: column, beam, slab, wall, sill, lintel, chajja, ventilator, roofing, parapet, ramp, lift and escalator, doors, windows. Staircase: technical terms, classification, functional design.	06
4.	Planning of Buildings and Bye-laws: Types of buildings, site selection criteria, concept of planning, principles of planning. Bye-laws: definition, necessity, procedure for obtaining building permit, general building requirements: setback, marginal distance, height and FSI as per unified development control and promotion regulations (UDCPR) for Maharashtra state. Introduction and necessity of building drawings, concept of scale, types of building drawings-layout plan, site plan, measured, submission, working and perspective drawing. Introduction to RERA (Real Estate Act, 2016), Introduction to National Building Code (NBC).	07
5.	Building Services: Concept of plumbing and drainage plan, plumbing systems, types of traps, fittings, septic tank, soak pit, rainwater harvesting, and plumbing layout for buildings, preparation of plumbing and electrification layouts for building.	06
6.	Building Finishes: Plastering and pointing, types and application procedure Paints- characteristics of ideal paints, constituents, classification, suitability, applying procedure and applications, defects. Varnishes- characteristics of good varnish, ingredients, types, suitability, application procedure and applications. Distemper- ingredients, applying procedure and applications. White washing and colour washing.	05

References –

References Books: -

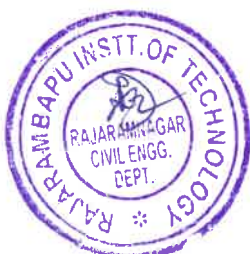
- V. B. Sikka, A Course in Civil Engineering Drawing, S. K. Kataria & Sons.
- W. B. McKay, Building Construction, Pearson Education.
- S. Mantri, The A to Z of Practical Building Construction and Its Management, Satya Prakashan.
- C. M. Kale, M. G. Shah, and S. Y. Patki, Building Drawing and Planning: An Integrated Approach to Built Environment, Tata McGraw-Hill Education Pvt. Ltd.

Text Books: -

- S. P. Arora and S. P. Bindra, A Textbook of Building Construction, Dhanpat Rai Publications.
- B. C. Punmia, A Textbook of Building Construction, Laxmi Publications.

Government Rules & Regulations: -

- Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR 2020), Urban Development Department, Government of Maharashtra.





Class: S. Y. B. Tech.	Semester- III
Course Code: CSMD2011	Course Name: Introduction to Data Structures

L	T	P	Credits
3	-	-	3

Course Description:

The Data Structures and Algorithms course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving in computer science. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables, and learn how to analyze their time and space complexity. The course extensively explores the design and analysis of algorithms, encompassing various topics such as sorting, searching, and graph traversal. Emphasis is placed on understanding algorithmic paradigms and their applications. Through programming assignments and theoretical exercises, students will gain practical experience in implementing algorithms and solving real-world problems. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Describe the characteristics of various data structures such as stacks, queues, trees, and graphs.
2. Explain the operations and applications of linear data structures.
3. Compare linear and non-linear data structures with respect to their structure, operations, and applications.
4. Determine and justify appropriate data structures for solving real-world problems effectively.

Prerequisite: Basic knowledge of C programming, Knowledge of basic mathematical concepts

Course Content		
Unit No.	Details of Content	Hrs.
1.	Introduction to Data Structures: Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types (ADT).	06
2.	Stack: Definition & Concepts, Operations on Stack, Applications of Stack, Polish expressions, Reverse Polish Expression and conversions, Recursion.	06
3.	Queue: Queue and its sequential representation, Simple Queue, Circular Queue, Double Ended Queue, Priority Queue, Applications of Queue.	06



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4.	Linked List: Definition and structure of singly linked list, doubly linked list and circular linked list. Operations: creation, traversal, insertion, deletion.	06
5.	Tree: Definitions and concepts, Terminology, Binary trees, Binary Tree Representations, Binary Tree Traversals, Binary Search Tree, Insertion and Deletion in BST, Applications of Tree.	06
6.	Graph: Definition and concepts, Graph Representation, Graph Terminology, Graph Traversals – Depth First Search and Breadth First Search. Applications of Graph.	06

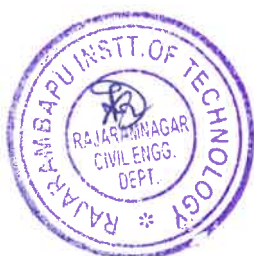
References:

Text Books:

- Amol M. Jagtap and Ajit S. Mali, Data Structures Using C: A Practical Approach for Beginners, (Publisher not specified).
- Seymour Lipschutz, Data Structures, McGraw-Hill (Schaum's Outlines Series).
- Ashok N. Kamthane, Introduction to Data Structures in C, Pearson Education.

Reference Books:

- Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley.
- ISRD Group, Data Structure Using C, Tata McGraw-Hill (ACE Series).





Class: S. Y. B. Tech.	Semester-III
Course Code: EEMD2011	Course Name: Electrical Power Generation

L	T	P	Credits
3	-	-	3

Course Description:

This course provides an understanding of the principles and performance of systems used for the generation of electrical energy. It covers the conversion of primary energy sources such as coal, hydro, natural gas, nuclear, solar, and wind into electrical power through conventional and renewable power plants.

With a multidisciplinary approach, it familiarizes students with modern generation technologies, efficiency considerations, environmental aspects, and the role of electrical energy in the evolving global energy scenario.

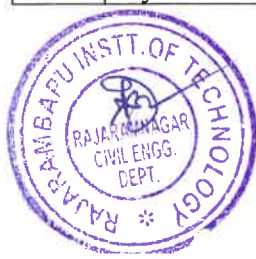
Course Outcomes:

After successful completion of this course, students will be able to:

1. State the principle of energy conversion and explain operation of electrical power generation.
2. Analyze the performance of generating power plants.
3. Compare different power generation technologies considering technical, economic, and environmental factors.
4. Estimate power output, efficiency, and performance parameters of various generation systems.
5. Explain working principle with layout, need, and advantages of alternate electrical energy resources.

Prerequisite: Basic Electrical Engineering, Basic Mechanical Engineering, Basic Civil Engineering, Engineering Physics and Chemistry.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Solar Power Generation: Solar radiation, solar energy collectors, solar power plant, solar power tower, conversion of solar heat to electricity, PV cells, PV power generation, solar energy storage, Numerical on solar thermal and solar PV power generation.	06
2.	Wind Power Generation: Wind speed and power relation, power extracted from wind, components of Wind power system, maximum power operation, operation and layout of standalone and grid connected Wind Turbine Generators (WTG), Numerical on wind power generation.	06
3.	Thermal Power Plant: Main equipment, coal handling plant, pulverizing plant, draft system, boiler, super-heater, re-heater, steam turbine, ash handling plant, condenser and cooling tower, feed water heater, economizer, air preheater, auxiliary supply, layout of thermal power plant. heat balance and efficiency, supercritical	06



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	technology, Numerical on thermal power generation.	
4.	Hydro Power Plant: Main components, storage reservoirs, dam, surge tank, penstock, spillway, tailrace, turbines, layout of hydro-power plant, site selection, run-off and its measurement, hydrograph, flow duration curve, mass curve, Hydro potential in India, problems in hydro-power plant development, Numerical on hydro power generation.	06
5.	Nuclear Power Plant: Fundamentals of nuclear power, layout of nuclear power plant, selection of site, radioactivity & nuclear reactions, nuclear fission chain reaction in reactors, reactor classification, control of reactors, disposal of nuclear waste and effluent, biological effects of radiation, shielding, development of nuclear power plant in India.	06
6.	Alternate Energy Sources: Fuel Cell: Principle, types of fuel cell, fuel for fuel cells, limitations and future prospects Biomass Energy: Availability of biomass, fluidized bed combustion, biomass power plant. Tidal Energy: Tidal phenomenon, tidal barrage, tidal power schemes. Geothermal Energy: General, heat extraction, vapor-turbine cycle, difficulties and disadvantages	06

References:

Text Books:

- B. R. Gupta, Generation of Electrical Energy, S. Chand Publishing.
- S. Rao and B. B. Parulekar, Energy Technology: Non-Conventional, Renewable and Conventional, Khanna Publishers.

Reference Books:

- John Twidell and Tony Weir, Renewable Energy Resources, Taylor & Francis.
- Yasuo Koizumi, Tomio Okawa, and Shoji Mori, Fundamentals of Thermal and Nuclear Power Generation, Elsevier.





Class: S. Y. B. Tech.	Semester-III
Course Code: ECMD2011	Course Name: Electronics Devices and Applications

L	T	P	Credits
3	-	-	3

Course Description:

This course introduces analog and digital electronics devices along with their circuits and applications. It deals with fundamentals of analog electronic devices such as R-L-C components, Diodes and its applications, BJT and FET. It focuses on working principles of operational amplifiers, electrical parameters of Op-Amp and its applications. This course also consists of number system, their conversions, logic gates, combinational and sequential logic circuits.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Describe the fundamental concepts of electronics and working principles of different devices.
2. Analyze different analog and digital electronics circuits.
3. Design digital electronics circuits with truth table and logic diagram.

Prerequisite: Fundamental concepts of Mathematics and Physics.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Introduction to Electronic components Resistor, Inductor, Capacitor, Transformer, Diodes: P-N Junction Diode, Zener diode, LED, Photo diode. Applications of diodes: Rectifiers, Clippers and Clampers.	06
2.	Bipolar Junction Transistor & Field Effect Transistor Introduction to transistors, BJT characteristics, Common Emitter configuration of BJT. Application of BJT: Transistor as a switch, Transistor as an amplifier. Introduction & types of FET.	06
3.	Operational Amplifiers Block Diagram of Op-Amp, Characteristics of Op-Amp, Virtual ground concept, Inverting and Non-inverting amplifier. Linear Applications of Op-Amp: Adder, Subtractor. Non-linear Applications of Op-Amp: Schmitt Trigger, Comparator.	06
4.	Fundamentals of Digital System Number systems: Decimal, Binary, Octal, Hexadecimal, Binary coded decimal (BCD), Number system conversions, Binary Arithmetic, 1's and 2's complements, Logic gates.	06
5.	Combinational Logic Circuits Standard representation for logic functions, K-map, Minimization of logic functions using K-map, Half Adder, Full Adder, Half Subtractor, Full Subtractor, 1-Bit Comparator, Multiplexer, Demultiplexer, Encoder,	06



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	Decoder.	
6.	Sequential Logic Circuits: S-R flip-flop, D flip-flop, J-K flip-flop, T flip-flop. Applications of flip-flops: Shift registers, Counters: Ripple/asynchronous counters, Synchronous counters, Counters design using flip flops, Ring counter & Twisted ring/Johnson counter.	06

References:

Text Books:

- Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson.
- Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, PHI.
- A. Anand Kumar, Fundamentals of Digital Circuits, PHI.

Reference Books:

- Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, Tata McGraw Hill.
- R. P. Jain, Modern Digital Electronics, Tata McGraw Hill.





Class: S. Y. B. Tech.	Semester- III
Course Code: CIMD2011	Course Name: Data Structures

L	T	P	Credits
3	-	-	3

Course Description:

This course considers common data structures that are used in various computational problems. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, and graphs. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics. The course covers various applications of data structures. The course also focuses on typical use cases for these data structures.

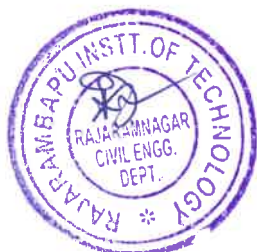
Course Outcomes:

After successful completion of this course, students will be able to:

1. Explain basic terminologies of data structures.
2. Write algorithms for operations performed on data structures.
3. Demonstrate the working of various data structures like stack, queue, linked list, tree, graph, etc.
4. Compare static and dynamic representations of data structures.
5. Choose appropriate data structure while developing solution to the problem.

Prerequisite: Basics of C Programming Language

Course Content		
Unit No.	Details of Content	Hrs.
1.	Introduction to Data Structures Introduction to data structures, basic terminologies in data structure, Need and Applications, classification of data structures, Operations on data structures, Abstract Data Types.	06
2.	Array Data Structures Introduction of Array, Representation of Array, Memory allocation of Array, types of arrays, operation in array, Applications of Array, Advantages and Disadvantages of Array.	04
3.	Stack and Queue Stack: Definition, Representation, Operations and Applications of Stack. Queue: Definition, Representation, Operations and Applications of Linear Queue, Circular queue, Deque, Priority Queue.	07
4.	Linked Lists Definition, Terminologies, Representation, Operations, singly linked list, doubly linked list, Circular linked list, Stack using linked list, Queue using linked list.	07
5.	Trees Terminology in data Structure Tree definition, Terminologies and Applications, Binary trees and types. Binary tree traversals, Binary search trees, AVL tree, B tree.	06





6.	Graphs Terminology in data Structure Graph Definition, Terminologies and Applications, Types of graphs, Representation of graph using adjacency matrix and adjacency list, Graph traversal Techniques: Depth first and Breath first search.	06
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References:

Text Books:

- G. S. Baluja, Data Structure Through C: A Practical Approach, Dhanpat Rai Publications.
- S. Tanenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C, PHI.

Reference Books:

- Alfred V. Aho, John E. Hopcroft, and J. D. Ullman, Data Structures and Algorithms, Addison-Wesley.
- Ashok N. Kamthane, Introduction to Data Structures in C, Pearson Education.
- Yashwant P. Kanetkar, Data Structures Through C, BPB Publications.





Class: S. Y. B. Tech.	Semester- III
Course Code: MEMD2031	Course Name: Design Thinking

L	T	P	Credits
3	-	-	3

Course Description:

Maximizing the success of new products and services can drive growth and shareholder value, lead to significant competitive advantage and leapfrog a company ahead of its competitors. However, innovation is risky and most new products fail in the marketplace. Often, failure is due to an ineffective process. Thus, expertise in the design and marketing of new products is a critical skill for all managers, inside and outside of the marketing department. In this course, we first focus on the tools and techniques associated with analysing market opportunities and then focus on designing new products and services. This course will introduce the new product development process and cover the two main areas of focus:

- Discovery - opportunity identification.
- Design - concept and product design, development and evaluation.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Identify the new product opportunities and sources of new product ideas.
2. Elaborate the product life cycle and product design process.
3. Integrate the customer and end-consumer needs into design process.
4. Assimilate the various product characteristics to design a novel product.
5. Participate effectively in group work sessions and teams to become acquainted with the importance of teamwork and collaboration that is critical to new product success.

Prerequisite:

Course is open to all Students. The course demands application of creativity, sensitivity towards solving problems and liking for doing something new and creative.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Discovery- Opportunity Identification for New products Product life cycle, need for new products, strategic planning and new product opportunity, sources of new product ideas, S curves and technology forecasting. Product idea generation, Product Design Process steps.	06
2.	Creativity and Innovation Definition, relevance of Creativity and Innovation in new product design, Improving creativity and innovation, hindrances to creative thinking, importance and formation of teams. Improving creativity and innovation, hindrances to creative thinking, importance and formation of teams.	06



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3.	Identifying Customer Needs Understanding customer needs, Voice of the customer, gathering customer needs, organizing and prioritizing needs, Product mission statement, establishing product function.	06
4.	Establishing Product Specification Product Teardown and Experimentation, Benchmarking, Quality Function Deployment (QFD)	06
5.	Product Portfolios and Portfolio Architecture Product Architecture-types, establishing architecture, Modular design-basic clustering method, advanced functional methods	06
6.	Product Concept Generation, Selection and Testing Concept generation process and methods, Concept selection mechanism and techniques, Concept Testing-Purpose, process and methods.	06

References:

Reference Books:

- Ulrich, Eppinger, Anita Goel, Product Design and Development, McGraw Hill Publishing.
- Otto & wood, Product Design, Pearson Education, reprint.
- Charles Flurscheim, Industrial Design in Engineering, the Design Council, London.
- Devdas Shetty, Design for product success, Society for Manufacturing Engineering.





S. Y. B. Tech. Syllabus

To be implemented for 2025-29 and 2026-30 Batch

Department of Civil Engineering

Class: S. Y. B. Tech.	Semester- III
Course Code: MEMD205	Course Name: I. C. Engine

L	T	P	Credits
3	-	-	3

Course Description:

This course describes the fundamentals of internal combustion engines used in automotive and allied application. The effect of operation and design of internal combustion engines on their performance, efficiency, fuel requirements, and environmental impact is studied. Topics include thermodynamics of engine processes, engine fluid flow; fuel systems in SI and CI engines, combustion, heat transfer and friction phenomena and recent engine technologies are studied under this course. Students examine the design features and operating characteristics of different types of internal combustion engines wise spark-ignition, compression ignition engines.

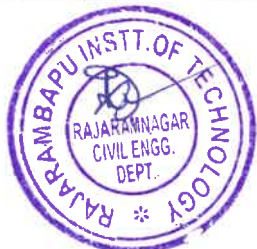
Course Outcomes:

After successful completion of this course, students will be able to:

1. Explain construction and working of SI and CI engines
2. Perform a primary thermodynamic analysis of Otto and diesel cycle engines.
3. Select proper fuel system for IC engine
4. Evaluate engine emissions and pollution norms.
5. Interpret modern engine technologies

Prerequisite: Nil.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Basics of I. C. Engines Introduction, Classification of I. C. Engines, Basic engine components and nomenclature, applications, Difference between two stroke and four stroke engine, difference between SI and CI engines.	06
2.	Engine Cycles Theoretical cycles (Air standard cycles and Fuel Air cycles), Deviation of actual cycles from theoretical cycles, Various losses in actual cycles, Valve timing diagram for high and low speed engine, Port timing diagram.	06
3.	Engine Systems Heat rejection and cooling, Air cooling, liquid cooling, Introduction to lubrication systems, Types of lubrication systems, Air intake system, filters & manifolds, Mufflers and resonators, Supercharging, Turbocharging.	06
4.	Fuel Systems in I. C. Engines Carburetion, A/F ratio, Mixture requirements at different loads and speeds, Simple carburetor, Complete carburetor systems, Introduction to MPFI system, Requirements of injection systems, types of injection system, CRDI systems and its comparison with other systems, Injection pumps, injectors, nozzles, Governors, trouble shooting in fuel systems.	06



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5.	Engine emissions and control methods Emissions from SI and CI engines, need to control emissions, emission Standards, pollution norms like EURO, BHARAT etc. methods to control emissions like catalytic converter.	06
6.	Recent trends in I C Engines Alternative Fuels Homogeneous Charge Compression, Ignition Engine, Lean Burn Engine, Stratified Charge Engine, Surface Ignition Engine, Four Valve and Overhead cam Engines, Electronic Engine Management, Common Rail Direct Injection Diesel Engine, Gasoline Direct Injection Engine.	06

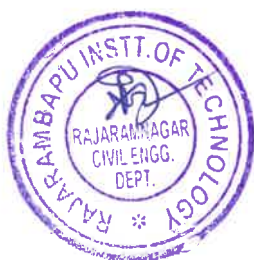
References:

Text Books:

- M. L. Mathur, R. P. Sharma, Internal Combustion Engine, 8, Dhanpat Rai Publications.
- V. Ganeshan, I C Engine, Tata McGraw Hill Publication.
- V. M. Domkundwar, A Course in Internal Combustion Engines, Dhanpat Rai & Co.

Reference Books:

- E. F. Obert, I.C. Engine & Air Pollution, Harper & Row Publishers.
- SAE, Automotive Handbook, Bosch.
- John b Heywood, Internal Combustion Engine, Tata McGraw Hill Publication.





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Class: S. Y. B. Tech.	Semester- III
Course Code: MCMD2011	Course Name: Fundamentals of Mechatronics

L	T	P	Credits
3	-	-	3

Course Description:

This course aims at providing fundamental understanding about the basic elements of a mechatronics system, interfacing, and its practical applications.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Identify various elements of mechatronics systems.
2. Select appropriate sensor/Actuator/controller/control algorithm for different applications.
3. Develop PLC/ microcontroller-based applications.

Prerequisite: The students should have knowledge of basic electronics.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Introduction: Introduction to Mechatronics, Key elements of Mechatronics, Block diagram of mechatronics system, Control systems and Modes of control, Difference between traditional and concurrent design process.	02
2.	Sensors and transducers: Transducers- classification, Development in Transducer technology Sensors - Introduction, Need of Sensors, Classification, Working and Application of- Potentiometer Sensors, Strain Gauge Elements. Capacitive Elements, Eddy Current, Proximity Sensors, Inductive, Proximity Sensors, Light Sensors, Pressure Sensors, Pneumatic Sensors, Pyro electrical Sensors, Piezoelectric Sensors, Shaft Encoders. Selection of Sensors.	08
3.	Drives and Actuators: Introduction and Classification of Actuators. Need and Scope. Hydraulic Actuation systems – Linear, Single and Double Acting system, Pneumatic Actuation systems- Gear Motors and Vane Motors. Electrical Actuation Systems – solenoid type Devices, Stepper Motors, and Servo Motor. Selection of Actuators.	06
4.	Controllers: PLC- Introduction, definitions, PLC block diagram, Difference between Relay panel and PLC, Selection of PLC, Programming formats, Ladder logic programming. Microcontroller and Microprocessor- Introduction, Comparison of Microcontroller and Microprocessor, Architecture – Pin configuration of 8051 Microcontroller, Assembly programming	08



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5.	Signal Conditioning: Operational amplifier circuits, filtering circuits, Analog, and Digital signal conversion.	06
6.	Advanced applications in mechatronics: Mechatronics in automated manufacturing, Artificial intelligence in mechatronics, Fuzzy logic in mechatronics, Case studies of mechatronics systems.	06

References:

Text Books

- Devdas Shetty and Richard A. Kolk, Mechatronics System Design, PWS Publishing Company (Thomson Learning Inc.).
- William Bolton, Mechatronics: A Multidisciplinary Approach, Pearson Education.
- R. K. Rajput, A Textbook of Mechatronics, S. Chand & Company Pvt. Ltd.
- William Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Prentice Hall.

Reference Books

- David G. Alciatore and Michael B. Hstand, Introduction to Mechatronics and Measurement Systems, McGraw Hill Education.





Class: S. Y. B. Tech.	Semester-III	L	T	P	Credits
Course Code: AIMD2011	Course Name: Object Oriented Programming	3	-	-	3

Course Description:

This course introduces object-oriented programming using the Java programming language. Students will learn how to program in Java and use some of its most important APIs. Special importance will be assigned to the object-oriented nature of Java and its use of polymorphism. Hands-on labs and exercises will enable students toward becoming highly skilled Java Application developers.

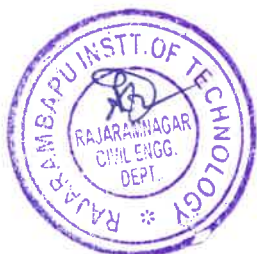
Course Outcomes:

After successful completion of this course, students will be able to:

1. Identify and integrate basic object-oriented programming concepts and apply them in problem-solving.
2. Construct and test inheritance concepts for reusing the program.
3. Develop and test a program using loops, decision statements, and functions in Python.
4. Evaluate the given Plot data using appropriate Python visualization libraries.

Prerequisite: Basic Programming Skills.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Oops Concepts and Java Programming: OOP concepts: Procedural and object-oriented programming paradigm, Classes and objects, data abstraction, encapsulation, constructors, inheritance, polymorphism and overloading, Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, control flow statements, arrays, console input and output, garbage collection, exploring string class.	06
2.	Multiple Inheritance, Interfaces and Packages: Inheritance: Inheritance hierarchies, super and subclasses, preventing inheritance, Polymorphism: dynamic binding, method overriding, Interface: Interfaces VS Abstract classes, implement interfaces, accessing implementations through interface references, Packages: Defining, creating and accessing a package, importing packages.	06



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3.	Introduction to Python fundamentals: Python introduction, Python syntax, Python comments, Python variables, Python data types, Python numbers, Python casting, Python strings, Python Booleans, Python operators.	06
4.	Lists, Tuples, Sets, Dictionaries: Access, change, add and remove list elements, loop lists, list comprehension, list methods, access, update, unpack tuples, loop tuples, tuple methods, Access, add, remove set items, set methods, access, add, change, remove dictionary items, nested dictionaries, dictionary methods.	06
5.	Python conditional statements: If-else, while, for, lambda, arrays, Python Iterators, Python scope Python classes and objects: Classes, objects, parameterized and non-parameterized init constructor, object methods, self-parameter, association, aggregation and inheritance using python.	06
6.	Python for Machine Learning Numpy, Pandas, Matplotlib and Seaborn,	06

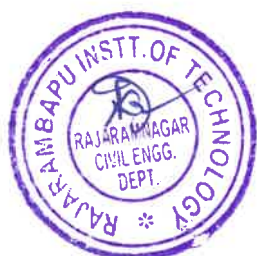
References:

Text Books

- Herbert Schildt and Dale Skrien, Java Fundamentals: A Comprehensive Introduction, McGraw Hill.
- Herbert Schildt, Java: The Complete Reference, McGraw Hill.
- Charles Dierbach, Introduction to Computer Science Using Python, Wiley India.
- Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press.

Reference Books

- P. Radhakrishna, Object-Oriented Programming Through Java, CRC Press.
- Charles R. Severance, Python for Everybody: Exploring Data Using Python 3, Shroff Publishers.





Class: S. Y. B. Tech.	Semester- III
Course Code: RAMD2011	Course Name: Fundamentals of Robotics & Automation

L	T	P	Credits
3	-	-	3

Course Description:

This course provides an in-depth understanding of the fundamental concepts and applications of robotics and automation. It provides an introduction to robotics, its history and development, various types of end effectors, grippers, kinematic and dynamics of robotics, robot drive systems, sensors and actuators and fundamentals of robot programming and applications. This course also introduces the need for automation, its types and various applications of automation technology in industries.

Course Outcomes:

After successful completion of this course, students will be able to:

1. Differentiate various robotic configurations and performance metrics.
2. Compare various end effectors, sensors, and drive systems in robotic applications.
3. Illustrate kinematic and dynamic principles applied to robotic systems.
4. Outline robot programming solutions for diverse applications.
5. Distinguish various types and aspects of automation.
6. Relate the knowledge of Programmable Logic Controllers (PLCs) to industrial automation tasks.

Prerequisite: Engineering Science Courses, Engineering Mathematics, Basic Mechanics, Programming Fundamentals.

Course Content		
Unit No.	Details of Content	Hrs.
1.	Introduction to Robots: Definition - Historical background - Various generations of robots – Robot Anatomy - Robot configuration: Polar, Cylindrical, Cartesian coordinate, Joint-arm configuration - Degree of freedom - Work volume and Dead zone - Dynamic performance: Speed of response and Stability - Precision of movement: Spatial Resolution, Accuracy, Repeatability and Compliance.	06
2.	Robot End Effectors, Sensors and Drive Systems: End Effectors: Characteristic features - Types: Mechanical grippers, Magnetic grippers, Vacuum cups, Adhesive gripper, Hooks and Scoops - Tools as end effectors - Robot / End-effectors interface - Consideration in Gripper selection and Design Sensors: Transducers and Sensors - Sensors in Robotics: Tactile, Proximity and Range Sensors, Miscellaneous sensors and sensor-based systems - Robot Vision System. Robot Drive System: Hydraulic, Electric and Pneumatic.	06





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3.	Robot Kinematics & Dynamics: Representation of objects in 3-D space-position and orientation, representation of orientation using roll, pitch and yaw angles, representation of orientation using Euler angles. Denavit - Hartenberg notations- link and joint parameters-rules for coordinate assignments, forward and inverse kinematics, Introduction to inverse and forward dynamics, determination of inertia tensor, Lagrange-Euler formation for joint torque	06
4.	Robot Programming and Its Applications: Lead-through Programming, Walk-through Programming, Use of Teach pendants - Capabilities and limitations. Textural Programming: requirements of robot programming language, problems pertaining to robot programming languages, Common languages/Software used- - Robot program as a path in space Applications: Factors influencing the selection of Robots - Robots for Materials handling, Assembly, Agriculture and Chemical Plants - Advanced applications. Intelligent Robots - Introduction to Mobile Robots, Legged Robots and Remote-Controlled Robots, Automated Guided Robots, Micro Robots - Control and Safety Issues.	06
5.	Introduction to Automation: Mechanization and Automation - History of Automation - Reasons for automation - Merits and limitations - Automation systems - Types of Automation: Fixed, Flexible and Programmable Automation - Intelligent Industrial Automation - Automation and Robotics.	06
6.	Introduction to Programmable Logic Controller (PLCs): Principles of operation of Programmable Logic Controller (PLC), PLC verses computer, PLC hardware components, Scan time of a cycle, Industrial PLC, Application of PLCs.	06

References:

Text Books:

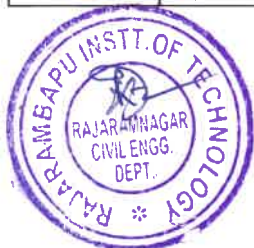
- Mittal R K & Nagrath, Robotics and Control, McGraw Hill Publication TMH.
- S. K. Saha, Introduction to Robotics, TMH.
- Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G., Ashish Dutta, "Industrial Robotics, Technology, Programming & Applications", Tata McGraw Hill Education Pvt. Ltd. New Delhi.

Reference Books:

- John J Craig, Introduction to Robotics, Pearson Edu.
- Fu K.S, Robotics, McGraw Hill.
- Niku SB, "Introduction to Robotics – Analysis, Control, Applications", John Wiley & Sons Ltd.

NPTEL Course on Robotics:

- https://onlinecourses.nptel.ac.in/noc19_me74/preview.
- https://onlinecourses.nptel.ac.in/noc20_de11/preview.





Class:- S.Y. B. Tech. Civil	Semester- III
Course Code : SH2175	Course Name: Environmental Science

L	T	P	Credits
1	-	2	2

Course Description:

The syllabus of Environmental Science provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Project has been incorporated to enhance high potential in the student and built research and positive attitude towards environment related issues, which will help them in their social and technical life ahead. The project is designed to make them apply practical knowledge with relevant tools and techniques to solve real life problems related to the environment and industry. This course will help students in developing eco-friendly approach to achieve sustainable development.

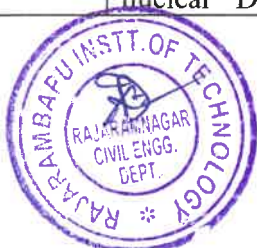
Course Learning Outcomes:

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

1. Apply interdisciplinary knowledge from various fields of science and engineering to address environmental issues.
2. Evaluate environmental impacts of human activities on the environment.
3. Use scientific approach to identify and solve environment related problems.
4. Design suitable solutions to address environmental challenges.
5. Participate in group work to become acquainted with the importance of teamwork collaboration.
6. Develop presentation and report writing skills.

Course Content

Unit No	Description	Hrs
1.	Natural Resources and Ecosystem Renewable and Non-renewable resources, Forest resources, water resources, Mineral resources, food resources, Energy resources, alternative energy resources Land resources, Structure and Functions of ecosystem, biotic and abiotic components, food chains, food web, Biodiversity, types of biodiversity, conservation of biodiversity.	04
2.	Environmental Pollution and Health Environmental Pollution, types of pollution, Air pollution, Water Pollution, Noise Pollution, Soil Pollution, Marine Pollution, Radioactive Pollution, Thermal Pollution (Causes, sources and effects, abatement methods), Pollution Case studies-Bhopal Gas Tragedy, Chernobyl Accident: A nuclear Disaster, Ganga Water Pollution, Solid Waste management	04



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	(Causes, sources, effects & control measures), Hazardous waste management, Plastic waste management, E-waste management. Disaster management and risk analysis.	
3.	Climate change and Sustainable development From unsustainable to sustainable development, Urban problems related to energy, Water conservation: Rainwater harvesting, Watershed management, Climate change, Global Warming, Ozone layer depletion, Acid Rain, Consumerism & waste Products, Concepts of Eco-labeled products, Eco-mark, Awareness of Environmental Legislation.	04

Guidelines for Project:

1. The distribution of project group will be done by project coordinator and respective head of the department to the faculty.
2. Project will be the team work consisting min 3 to max 5 students.
3. Project topic should be application oriented and with consideration to Environmental science problems in their respective stream. Selection and finalization will be through project guide.
4. Prepare project report as per guidelines.
5. Project group must provide complete solution to the selected problem with conceptual clarity.
6. The project will be evaluated by respective branch HOD and project guide and senior faculty.
7. The project should be presented before the committee, which shall evaluate for 50 marks.

References –

Text Books:

- D.K.Asthana, Meera Asthana, A Textbook of Environmental Studies, S.Chand Publication Revised edition, 2006.
- S. Deswal & A. Deswal, Basic course in environmental Studies, Dhanpat Rai & Co Ltd., Delhi, Second revised edition, 2009.

Reference Books:

- Eldon D Enger, Bradley F. Smith, Environmental science – a study of inter-relationships Wm C Brown Publishers 1989
- Francois Ramade Ecology of Natural resources, John wiley & Sons
- Robert Leo Smith, Ecology and field biology, Harper Collins Publishers
- Gilbert M. Masters, Introduction to Environmental Engineering & Science, Prentice Hall International Inc. Second Edition





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Class: S. Y. B. Tech Civil	Semester-III	L	T	P	Credits
Course Code: CE2235	Course Name: Building Construction and Planning Laboratory	--	--	2	1

Course Description:

The Building Construction and Planning Laboratory course is designed to develop the building construction, planning, and drafting skills of students. The course enables students to understand the functional design and detailing of various building components and to prepare drawings using AutoCAD. Students will also learn to prepare site plans, floor plans and door-window schedules for residential buildings. This course give knowledge of building construction practices, building components, and principles of building planning through site visits and preparation of technical reports.

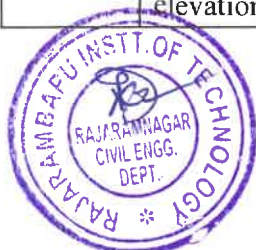
Course Learning Outcomes:

After successfully completing the course, student will able to:

1. Prepare functional designs and drawings of building components using free hand and CAD tools.
2. Design residential building plans and prepare detailed drawings using CAD tools.
3. Analyze the arrangement of building components in an ongoing building construction project and the functional planning of an existing building through site visits, and prepare a technical report.

Prerequisite: Engineering Graphics and AutoCAD software.

Expt. No.	Name of Experiment	Hrs.
1.	Introduction and necessity of building drawings, concept of scale, Types of building drawings-layout plan, site plan, submission drawing and working drawings.	02
2.	Preparation of freehand sketches of building components such as doors, windows, ventilators, lintels, chajjas, and staircases.	02
3.	Planning, design, and drafting of a panelled door using CAD tools. Preparation of detailed drawings including elevation, sectional plan, and sectional elevation showing dimensions, frame, shutter, panels, joints, fittings and labeling.	04
4.	Planning, design, and drafting of a staircase (any one type such as dog-legged, open-well, or quarter-turn staircase) using CAD tools. Preparation of detailed drawings including plan, elevation, and sectional elevation showing dimensions, tread-riser details, landing, handrail, and	04



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	labeling.	
5.	Site visits to ongoing and completed residential building and preparation of technical reports based on observations.	04
6.	Preparation of sectional view drawings of load bearing and framed structure showing various building components using CAD tools.	04
7.	Planning and design of a residential building (minimum 100 sq.m. area). Preparation of site plan, floor plans, area statement, and door-window schedule using CAD tools. (Individual Project).	04

References –

References Books: -

- V. B. Sikka, “A Course in Civil Engineering Drawing”, S. K. Kataria and Sons. Mehta, Scarborough, Armpriest, Building Construction, Pearson Education
- W.B Macay, “Building Construction”, Pearson Education
- S.Mantri, “The A to Z of Practical Building Construction and its Management”, Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, “Building Drawing And Planning With An Integrated Approach To BuiltEnvironment”, Tata McGraw-Hill Education Pvt. Ltd.

Text Books: -

- S. P. Arora, S. P. Bindra, “A Text Book of Building Construction”, Dhanpat Rai Publications
- Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, “Building Construction”, Laxmi Publications.
- S. C. Rangwala, “Building Construction”, Charotar Publishing House Pvt. Limited

Codes of Practice :-

- Unified Development Control and Promotion Regulations:2019 (UDCPR: 2019) for Maharashtra State.
- NBC 2016, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 – 1989, Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi





S. Y. B. Tech. Syllabus

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Class: S. Y. B. Tech. Civil	Semester: III	L	T	P	Credits
Course Code : CE2115	Course Name: Surveying and Geomatics Laboratory	-	-	2	1

Course Description:

The course equips students with theoretical and practical surveying knowledge and skills, relevant to the needs of construction industry and society. Before starting of any Civil Engineering project, surveying knowledge is very essential to a Civil Engineer. Surveying Lab is offered as the course in the first semester of second year engineering consists of practical's which focuses on the demonstrations of Levelling, Methods of Plotting Contours, Plane table techniques, Theodolite & tacheometry, Curve setting, setting out of structures in civil engineering.

Course Learning Outcomes:

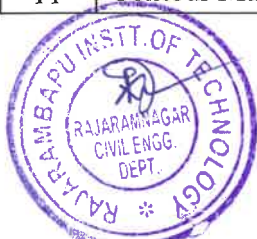
After successful completion of the course, students will be able to,

1. Calculate the reduced levels.
2. Measure the angular and linear measurements by using theodolite and tachometry.
3. Perform the setting out of the simple curves.
4. Use the Total station, DGPS to prepare the topographical map.

Prerequisite: Fundamentals of Basic Civil Engineering, Engineering Mathematics.

Course Content

Unit No.	Description	Hrs
1	Calculate the elevations by Rise fall and collimation plane method by using Dumpy Level.	02
2	Measurement of area of map by using digital Planimeter.	02
3	Measurement of horizontal angle by Repetition and Reiteration method of Theodolite surveying.	02
4	Measurement of vertical angle by using Theodolite	02
5	Setting out of Simple circular curves by Rankine's method	02
6	Demonstration on Measurements by using total station- Angle, Distance and Elevation.	02
7	Traversing or Map preparation by using total station and post procedure software's	02
8	Setting out of buildings by using total station : stake out	02
9	Study of Differential Global Positioning System (DGPS) and Traversing Using DGPS Equipment	02
10	Area Calculation and Traversing Using DGPS Equipment	02
11	Contour Mapping by Using DGPS Survey	02





12	Project Prepare the Contour map for given area by using total station/DGPS	02
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References:

Reference Books:

- Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill.
- Principles of Surveying. Vol. I by J. G. Olliver, J. Clendinning – Van Nostrand Reinhold.
- Plane and Geodetic surveying for Engineers. Vol. I by David Clark, Constable.

Text Books:

- Surveying and Levelling by N. N. Basak , Tata McGraw Hill, New Delhi.
- Surveying Vol. I, II and III - Dr. B.C. Punamia, Laxmi Publishers. New Delhi.
- Surveying and Levelling Vol. I and II - T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh.
- Surveying Vol. I and II - S. K. Duggal, Tata McGraw Hill, New Delhi.
- Plane Surveying by A. M. Chandra, New Age International Publishers.





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Class: S. Y. B. Tech. Civil	Semester: III	L	T	P	Credits
Course Code : CE2135	Course Name: Engineering Mechanics and Materials Testing Laboratory	-	-	2	1

Course Description:

Engineering Mechanics Laboratory deals with performing experiments, interpreting results, and correlate theoretical and experimental results. This lab focuses verification of Laws of forces, principle of moment, and compare coefficient of friction for various contact surfaces. This laboratory course, also deals with the testing of various construction materials such as steel, different metals, bricks and timber.

Course Learning Outcomes:

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

1. Verify fundamental laws of static mechanics.
2. Assess tensile behavior of steel.
3. Determine shear and impact strength of metals.
4. Verify quality of burnt clay brick.
5. Determine flexural strength of timber beam.

Prerequisite: Engineering Mathematics, Engineering Physics

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	Verification law of polygon of forces	02
2.	Verification law of moment using Bell Crank Lever	02
3.	Verification of Lami's theorem	02
4.	Support Reactions of simple beam and compound beam	02
5.	Compare value of coefficient of friction for various contact surfaces	02
6.	Analysis of simple truss	02
7.	Tension test on Mild and HYSD steel bars	02
8.	Tensile coupon test on mild steel	02
9.	Shear test on metals	02
10	Impact test on metals	02
11	Water absorption & compression test on burnt brick	02
12	Bending test on timber beam	02





References:

Codes of Practice:

- **IS:1608-1 (2018)** Metallic materials — Tensile testing, Part 1: Method of test at room temperature.
- **IS:1786 (2008)** High strength deformed steel bars and wires for concrete reinforcement.
- **IS:5242 (1979)** Method of test for determining shear strength of metals.
- **IS:1757-1 (2014)** Method for Charpy impact test (V-notch) on metallic materials.
- **IS:1598 (1977)** Method for Izod impact test of metals.
- **IS:3495-1 to 4 (1992)** Methods of tests of burnt clay building bricks.
- **IS:1077 (1992)** Common Burnt Clay Building Bricks — Specification.
- **IS:1708-1 to 18 (1986)** Methods of testing small clear specimens of timber.

Text Books:

- Bhavikatti S. S., Rajashekarappa, “Engineering Mechanics”, New age International publication (India) Pvt. Ltd. New Delhi,
- S. Ramamrutham, “Engineering Mechanics”, Dhanpat Rai Publishing Company Ltd., New Delhi.
- H. Shah and S. Junnarkar “Mechanics of Structures”, Charotar Publishing House Pvt Limited, New Delhi.
- S. Ramamrutham “Strength of Materials”, Dhanpat Rai Publishing Company (P) Limited, New Delhi.

Reference Books:

- S. Junnarkar, “Elements of Applied Mechanics”, Charotar Publishing House (India) Pvt. Ltd., Anand (Gujarat)
- R. Vaidyanathan, P. Perumal, P. Lingeswari, “Mechanics of Solids and Structures”, Scitech Publications Pvt. Ltd., Chennai.
- Ferdinand L. Singer, “Engineering Mechanics (Statics and Dynamics)” Publications (India) Pvt. Ltd. Noida.
- Timoshenko and Young, “Engineering Mechanics (Statics and Dynamics)”, McGraw Hill Publication, New York.





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Choice Based Professional Skills Development and Foreign Languages Programme
for
Second Year B. Tech.
(Sem. III and IV)

Professional Skills Development and Foreign Languages Courses

1. Professional Leadership Skills (SH2635)
2. Interpersonal Skills (SH2615)
3. Innovation Tools and Methods for Entrepreneurs (SH2695)
4. Personal Effectiveness and Body Language (SH2595)
5. German Language - Level III (SH2735)
6. German Language - Level IV (SH2645)
7. Japanese Language - Level III (SH2715)
8. Japanese Language - Level IV (SH2625)

***An Important Notes:**

- *A student has to complete any two courses out of six choices offered under Choice Based Professional Skills Development Programme. A course in each semester will be allocated without any repetition.*
- *Foreign language course selected in F.Y. Sem-I will remain the same with next levels in Sem-III and IV. (No new entries in S.Y.B.Tech Sem.-III)*



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Class:- S. Y. B. Tech .	Semester-III/IV
Course Code : SH2635	Course Name : Professional Leadership Skills

L	T	P	Credits
-	-	2	1

Course Description: This course is one of various courses offered under Choice Based Professional Skills Development programme. This course guides those special students who want to be entrepreneurs and professional leaders. This course covers various aspects of Leadership which includes Team formation, conflict management, motivation, and presentation skills.

Course Outcomes:

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

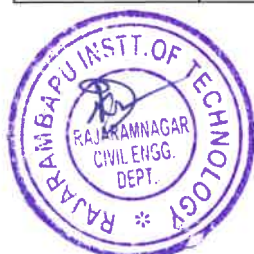
1. Demonstrate self-management skills through co-curricular activities.
2. Explain the traits of a leadership through real life examples.
3. Exhibit the ability to work effectively in team.
4. Apply decision making techniques in formal meetings.
5. Prepare a presentation as per the audience and context requirements.

Prerequisite: A Student, who is going to enroll for this course should have -

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Ability to communicate moderately in English.

Minimum 12 sessions will be conducted from the following list.

Course Content		
Experiment No	Description	Hrs
1.	SMART Goal Setting, SWOT/C Analysis and Action Plan: Discussion on Dos and Don'ts, Advantages, and Generation of the Document by Students and its Assessment	02
2.	Assertiveness and Positive Thinking: Types of Behaviour, Benefits of Being Assertive and Positive Thinking, Developing Positive Attitude, Case Studies and Presentations	02
3.	Self Management: Need of Self Management, Developing Self Acceptance, Steps of Self Management, Individual Classroom Activity and its Assessment	02
4.	Leadership Styles and Change Management: Introduction to Different Types of Leaderships, Effective Organizational Change Management, Individual Classroom Activity and its Assessment	02
5.	Team Formation and Leading a Team-I: Why Teams? Roles and Responsibilities in Teams, Strategies for Team Development, Barriers to Teams, Steps of Team Development	02



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6.	Team Formation and Leading a Team – II: Case Studies of Teams and Student Presentations	02
7.	Business Meetings and Decision Making – I: Preparing for the Meeting, Role of Chairperson and Participants in Meetings	02
8.	Business Meetings and Decision Making – II: Mock Meetings, Decision Making Case Studies and Feedback	02
9.	Conflict Management: Types of Personalities, Possible Reasons of Conflicts at Work Place, Conflict Resolution Strategies, Conflict Management Case Studies and Feedback	02
10.	Time Management: Time Management Techniques, Introduction to Time Management Tools, Benefits of Time Management, Case Studies and Presentations	02
11.	Presentation Skills – I: Preparation, Types of Presentations - Informative, Instructional, Arousing, Persuasive, Decision-making, Presentation Tools	02
12.	Presentation Skills – II: Body Language, Managing Questions and Student Presentations Student Presentations and Feedback, Student Presentations and Feedback	02
13.	Creative and Critical Thinking: Approaches to Creative Thinking, Strategies for Creative Thinking, Characteristics and Strategies of Critical Thinking	02
14.	Motivating People: Types of Motivation, Components of Motivation, Steps in Keeping Motivation Level High	02

References -

1. Krishna Mohan and Meera Banerji; *Developing Communication Skills*, Macmillan India Ltd., New Delhi
2. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning.
3. Jeff Butterfield, *Soft Skills for Everyone*, Cengage Learning India Private Limited.
4. John Seely, *Oxford Guide to Effective Writing and Speaking*; Oxford University Press.
5. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.



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Class: - S. Y. B. Tech.	Semester- III/IV	L	T	P	Credits
Course Code : SH2615	Course Name : Interpersonal Skills	-	-	2	1

Course Description: This course offers the tips and techniques to lead a life full of success, prosperity and happiness by changing the current mind set to that of positive and harmonious thinking. It further teaches upon important aspects such as priorities in life, how to manage stress, teamwork , laws of nature , human body as a divine computer , power of mind etc.

Course Outcomes:

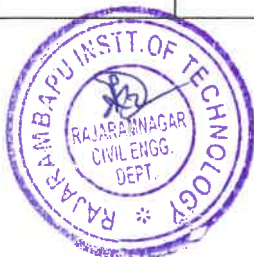
After successful completion of the course, students will be able to,

1. Exhibit interpersonal communication skills.
2. Analyze self for SWOT to achieve the goal stated.
3. Demonstrate decision-making skills.
4. Apply conflict resolution styles appropriate in different situations.
5. Demonstrate skills to manage balance in work and life.

Prerequisite: A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

Course Content		
Experiment No	Description	Hrs
1.	Importance of Universal Laws of Nature in Human Life.- Overview, scientific, universal, secular, usefulness in every walk and phase of life, overview of Universal Laws of Nature, determining factor in human life, important laws of nature and its influence on life of individual, family, society and world at large. wisdom, living life in tune with laws of nature	02
2.	‘You are the Architect of your Destiny’ - This unit will make you aware that none else but you alone are responsible and accountable for what you achieve in your life , freedom of decisions, choices to make up your future, guiding powers to make the choices in your life, achieving life full of health, wealth , success , peace and happiness for yourself and all	02
3.	Setting and Achieving Goals – Defining your own goals in life ,	02



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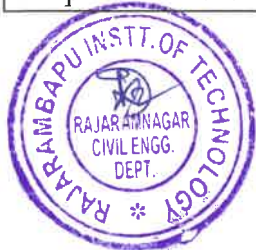
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	Concept of power of mind , concepts of interaction of conscious and subconscious levels of mind, tips and techniques to harness the amazing power of subconscious mind to achieve goals, Visualization and auto-suggestion techniques, real life examples	
4.	Work-life Balance – What is means by work-life balance, priorities in life, time management, its importance, practical tips that enable to achieve work-life balance	02
5.	Art of Harmonious Thinking. – Importance , concept of harmonious thinking, Wishful Thinking, Positive Thinking, difference between Harmonious Thinking and Positive Thinking, powerful techniques to inculcate the habit of Harmonious Thinking, concept of Spiritual Thinking , Divine Universal Prayer – the life changer, Bless All technique, benefits of chanting the prayer	02
6.	Spirituality in Day-to-day Life – Concept of Love Work, 7 dimensions of Love Work, benefits us as individual, family, society and entire human race, important to be a good human being, usefulness to become successful, tools to apply the different 'Life skills ' in day-to-day life, simple but powerful and useful techniques such as attitude of gratitude , attitude of win-all	02
7.	Human Values – Ethics and Human values, difference in ethics and values, Qualities of human values	02
8.	Communication Skills – Ability to commendably read, write, speak and listen by conforming knowledge and presenting in a structured, cohesive fashion, Understanding and demonstrating workplace communication in the context of organization's business, understanding one's core skills for job	02
9.	Interpersonal Skills – Presenting interpersonal skills by amiable and respecting individuals, effective listening to stakeholders, bonding and developing rapport, Team success	02
10.	Decision Making – Importance of correct decision making, Analytical thinking / mind, Information processing ability, Making sound judgment and confident decision	02
11.	Cross cultured sensitizations & Adaptability – Adapting multinational & multicultural environment, embracing diversity, culturally sensitive and bonding to colleagues and stakeholders, sense of belongings and promotion of unity at work place	02
12.	Evaluation of Students for their Understanding of Various Concepts Discussed.	02

References -

1. Spiritual Wisdom in Day-to-day life – Blogs by Mr. Pralhad Wamanrao Pai





2. Towards the goal of beautiful life – Book by Satguru Shri Wamanrao G. Pai
3. Power of your subconscious mind – Dr. Murphy
4. Seven people of highly effective people – Stephen Covey
5. How to win friends and influence people – Dale Carnegie
6. S. Hariharan, et al; *Soft Skills*, MJP Publishers, Chennai (2010)
7. Gopalaswamy Ramesh et al. *The ACE of Soft Skills: Attitude, Communication and Etiquette for Success*, New Delhi: Pearson Education, 2012. Print.
8. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning, 2012. Print.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





Class: - S. Y. B. Tech.	Semester-III/IV	L	T	P	Credits
Course Code : SH2695	Course Name : Innovation Tools and Methods for Entrepreneurs	-	-	2	1

Course Description: This course helps students to identify different tools for developing the solution that student has already learned to ideate in the previous course “Creativity and Design Thinking”. Further, students get information about various tools to carry out competitor analysis and user journey map. It would help him to come up with detailed specifications and USP of the product based on the competitor survey.

Course Outcomes:

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

1. Define complex problems, predict emerging trends, and model trade-offs and contradictions to generate innovative solutions.
2. Analyze real-world problems using systematic innovation techniques, TRIZ, functional analysis, and creative problem-solving tools to identify contradictions and generate innovative solutions
3. Evaluate business opportunities through frugal and disruptive innovation approaches, business model canvas, and institutional support mechanisms for entrepreneurship development.
4. Apply design thinking methodologies, user journey mapping, competitor analysis, and product/software design specifications to develop user-centric and value-driven products or services.
5. Develop a comprehensive entrepreneurial project report incorporating technical, financial, economic, production, and managerial aspects, and prepare an effective investor pitch to communicate business ideas professionally.

Prerequisite: A Student who is going to enroll for this course should have following abilities:

1. Creativity and Innovativeness
2. Problem identification
3. Apply design thinking approach to develop working prototype
4. Structured approach to problem solving



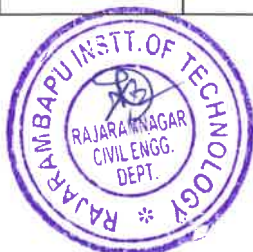
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Course Content		
Experiment No	Description	Hrs
1.	Systematic Innovation: Define the problem in depth with all details, Trend prediction, Modeling the problem to identify tradeoffs and contradictions	02
2.	TRIZ: Theory of Inventive problem solving (TRIZ), HIT Matrix, Scamper, Algorithms of brain storming and innovation, Functional analysis	02
3.	Frugal and Disruptive Innovation: Biomimicry and frugal innovation for prototyping, Disruptive innovation.	02
4.	User Journey Map: Map showing user interaction at every stage of product/service. Step-by step process of UJM creation	02
5.	Competitor analysis: Analysis of competitor and users for similar products, effectiveness of existing solutions and identifications of gaps	02
6.	Product/Software Design Specifications: Detailed specifications for better product design, detailed UI for software for clarity on user interaction, specify USPs of the product in comparison to the competitors	02
7.	Business Canvas: A. Definition of a Business Model B. The 9 Building Blocks: 1. Customer 2. Value Propositions 3. Channels, distribution, 4. Customer relationships 5. Revenue 6. Key Resources 7. Key Activities 8. Key Partnerships 9. Cost Structure	02
8.	Design Thinking (Part I): Customer Insights, Ideation, Visual Thinking.	02
9.	Design Thinking (Part II): A. Prototyping. B. Storytelling. C. Scenarios	02
10.	Institutional arrangement for Entrepreneurship Development: Institutional arrangement for Entrepreneurship Development – DIC, ITCOT, SIDCO, NSIC, SISI, TIIC, SIDBI, Commercial Banks	02
11.	Project Report: a) Economic Aspects b) Technical Aspects c) Financial Aspects d) Production Aspects e) Managerial Aspects	02
12.	Investor Pitch Tool: a) Introduction b) Helpful Tips about preparation, pitching and content sharing	02



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	c) Does and Don'ts	d) Introduction	
	e) Problem	f) Solution/Product/Service	
	g) Traction	h) Market Opportunities/ Size	
	i) Competition	j) Go To Market Strategies	
	k) Financials	l) Team	

References -

1. J. Knapp. Design Sprint, Simon & Schuster Publisher.
2. D. Silverstein. The Innovator's Toolkit, Wiley Publishing House.
3. M. A. Orloff. ABC-TRIZ: Introduction to creative design thinking with modern TRIZ modeling, Springer Publication.
4. M. Lavery. Entrepreneurship, OpenStax Publication.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.



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Class: - S. Y. B. Tech.	Semester- III/IV	L	T	P	Credits
Course Code : SH2595	Course Name : Personal Effectiveness and Body Language	-	-	2	1

Course Description: This course is one of various courses offered under Choice Based Professional Skills Development programme. The course with its interactive and need based sessions helps students in knowing and managing self, set and pursue meaningful goals, and develop positive personal qualities for sustainability in today's global world.

Course Outcomes:

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

1. Develop skills to build self-esteem and positive attitude.
2. Develop interpersonal skills characterized by effective communication
3. Define nonverbal clues during interpersonal dialogue.
4. Demonstrate responsiveness towards time, stress, and health issues.
5. Interpret the non-verbal behaviour of a person.

Prerequisite: A Student, who is going to enroll for this course, should have following English language abilities:

1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

Minimum 12 sessions will be conducted from the following list.

Course Content		
Experiment No	Description	Hrs
1.	Self-awareness and Self Esteem Meaning, Factors influencing self-esteem- environmental and social factors Developing self-esteem- strategies for building self-esteem	02
2.	Goal Setting Long term and short-term goals, Steps in goal setting (SMART)- - identify strategies - consider possible blocks and ways to deal with them - outline the steps - set deadlines	02
3.	Self-Analysis SWOT Analysis, who am I, Attributes, Importance of Self Confidence	02
4.	Personality Typing Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging Perceiving	02
5.	Life Skills for Personal Effectiveness Values: Punctuality, Honesty, Loyalty, Dependability, Reliability- Application of Life Skills in day - to- day life - Life Skills for Adolescents and Youth	02



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6.	Time Management Strategies for effective time management (Principles, Planning, Identify & Control time stealers, Prioritize, Problems and Solutions, learn to say NO	02
7.	Stress Management Sources of stress, types, signs and symptoms of stress - positive aspects of stress - negative aspects of stress	02
8.	Stress Management Techniques Coping mechanisms, Deep Breathing Exercise, Meditation and Visual Imagery techniques, Muscle Relaxation, Peer Sharing, Emotional Intelligence	02
9.	Decision-making Definition, Informed Decision Making, Consequences of Decision Making and Models of Decision Making	02
10.	Creative Thinking Out-of-the box thinking, Stages of Creative Thinking, Factors hindering creative thinking, Characteristics of Creative thinkers	02
11.	Interpersonal skills Meaning, need to develop interpersonal skills, components of interpersonal skills, techniques to improve skills, benefits with real life examples/case studies	02
12.	Art of Communication Verbal & Non-Verbal Communication, 7'Cs of Effective Communication Importance of Effective Communication	02
13.	Body Language – I Non-verbal codes: Kinesics, Proxemics	02
14.	Body Language – II Vocalics, Haptics, Appearance	02

References -

1. S. Hariharan, *Soft Skills*, MJP Publishers, Chennai.
2. Gopalaswamy Ramesh, *The ACE of Soft Skills: Attitude, Communication and Etiquette for Success*, New Delhi: Pearson Education.
3. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited.
4. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)
5. Masters, L. Ann, *Personal Development for Life and Work*, New Delhi: Cengage Learning.
6. Covey, Stephen R., *Seven Habits of Highly Effective People: Powerful Lessons in Personal Change*
7. Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, Third impression.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





Class: - S. Y. B. Tech.	Semester-III	L	T	P	Credits
Course Code : SH2735	Course Name : : German Language - Level III	-	-	2	1

Course Description: This course meets the requirements of student's overall personality development. The course helps the student in learning German as a foreign language. Vocabulary building activities, grammar, reading skills and basic conversational skills are addressed in this course.

Course Outcomes:

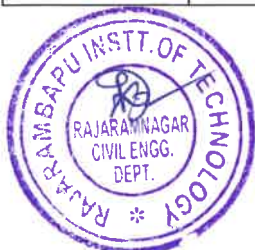
After successful completion of the course, students will be able to,

1. Demonstrate the ability to use German vocabulary and expressions related to professions and everyday communication.
2. Interpret and respond to simple German texts and dialogues to comprehend information in familiar real-life contexts.
3. Apply German grammatical structures in spoken and written communication.
4. Communicate effectively in German through role-plays, conversations, and presentations.
5. Develop confidence in using German language skills for practical situations by integrating listening, speaking, reading, and writing abilities.

Prerequisite: A Student, who is going to enroll for this course, should have following German language abilities:

1. Adequate knowledge of basic grammar of German language.
2. Intermediate level vocabulary of German language.
3. Communicate moderately using German language.

Course Content		
Experiment No	Description	Hrs
1.	Professions and their workplace Getting acquainted with different professions, usual tasks in particular profession , likes, dislikes etc.	02
2.	Job advertisements reading and understanding. To express oneself about his preferences for part time jobs. his likes and dislikes	02
3.	Short texts about finding jobs(for understanding the short paragraphs) & telephonic conversation Grammar- conjunctions and ,or, but (und ,oder ,aber)	02
4.	Grammar-Present Perfect Tense Exercises based on present perfect tense	02



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5.	Present perfect tense with helping verb haben and sein. Difference between these two verbs and related exercises	02
6.	Vocabulary of clothes and conversation while buying the clothes	02
7.	Grammar- 'W' questions related to clothes(welche und diese) Exercises related to welche und diese in nominative and accusativ	02
8.	Grammar- present perfect tense of separable and non-separable verbs	02
9.	Dativ verbs Exercises related to dativ verbs	02
10.	Dialog between shopkeeper and customer Personal Pronomen in Dativ	02
11.	Orientation in the shopping mall. Understanding the floors and information on notice boards.	02
12.	Revision of the grammar and doubts clearing	02
13.	Test and presentations assigned to students during semester	02

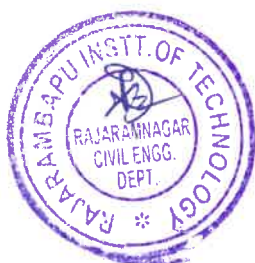
References -

1. Studio D – A 1, Cornelsen Verlag, Goyal Publishing House, New Delhi.
2. Tangram Aktuell – A 1, Goyal Publishing House, New Delhi.
3. Language A 1, Goyal Publishing House, New Delhi.
4. Network A 1, Goyal Publishing House, New Delhi.

The extra notes will be provided to the students to complete the required syllabus.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.



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Class: - S.Y. B. Tech.	Semester- III	L	T	P	Credits
Course Code : SH2715	Course Name : Japanese Language - Level III	-	-	2	1

Course Description: This course is designed to introduce students to the everyday language of Japan. Lessons are organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

Course Outcomes:

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

1. Make use of basic conversations in various situations.
2. Apply Japanese grammatical structures accurately in spoken and written communication.
3. Identify the sentence patterns.
4. Explain insights about the communication required for living in Japan.
5. Interpret Japanese work ethics required in their professional career.

Prerequisite: A Student, who is going to enroll for this course, should have following Japanese language abilities:

- 1) Knowledge of basic grammar of Japanese Language.
- 2) Communicate moderately using Japanese Language.

Course Content		
Experiment No	Description	Hrs
1	Polite way of request for something, using ㇿ forms of the verbs.	02
2	Expressions used for offering to do something.	02
3	To ask for permission to do something.	02
4	Pattern used to express prohibition.	02
5	Use of ㇿ forms of the verbs to express sequence in action.	02
6	How to join two or more than two sentences together.	02
7	How to express something done after something.	02
8	Introduction of interrogative pronouns used to specify one item out of list of 2 or more than 2 things.	02
9	Rules for adjective – adjective combinations in one sentence.	02
10	How to make ない forms of the verbs.	02



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11	Use of ない forms of the verbs to ask or to tell someone not to do something.	02
12	Must do pattern using なければなりません。	02
13	How to make dictionary forms of the verbs.	02
14	Uses Potential form できる	02
15	How to express the hobby.	02

***Note:** Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

References -

1. Minna No Nihongo I (3A Corporation, Japan), Publications: Goyal publishers.
 2. Nihongo shouhou, Publication: JALTAP
- Other reference material, practice papers & CDs for listening practice.
The extra notes will be provided to the students as per the requirement of the syllabus.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





Class: S. Y. B. Tech. Civil	Semester: IV
Course Code : CE2025	Course Name: Concrete Technology

L	T	P	Credits
3	-	-	3

Course Description:

Concrete Technology is one of the core courses offered in the fourth semester of the Civil Engineering undergraduate program, comprising six units. Concrete is a composite material and is considered to be the most widely used building material in the construction industry. The course 'Concrete Technology' has been so designed that its contents will give an overview of the properties of different materials used for the manufacture of concrete and the role played by the materials in obtaining a good quality product called 'concrete'. The study of the course will help students understand the behaviour of this versatile composite material from the stage of its design, manufacture, to the stage of its placement in actual field conditions. The course intends to build competency in the students to select appropriate materials (through testing) for making concrete, design concrete mixes of different grades, carry out lab as well as field tests on concrete (in fresh & hardened state) and orient them with qualitative aspects concreting process.

Course Outcomes:

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

1. Select appropriate concrete ingredients by analyzing their properties, sustainability, and compliance with relevant Indian Standards.
2. Explain the production, placing and curing practices of fresh concrete for achieving the desired quality and performance.
3. Choose appropriate quality control tests to evaluate the properties of fresh and hardened concrete.
4. Design concrete mixes for specified grades using IS-10262 methods.

Prerequisite: Possess basic knowledge of building construction and planning course.

Course Content		
Unit No.	Description	Hrs
01	Cement & Water: Cement: Manufacturing processes, Field Tests, Physical properties of cement such as fineness, consistency test, Initial and final setting time, soundness, compressive strength, and specific gravity. Hydration of cement, chemical compounds of cement. Grades of cement, Types of cement. Water: Specifications of water as per IS 456 – 2000.	05
02	Aggregate: Physical properties such as sieve analysis and fineness modulus, specific gravity and water absorption, silt content, Bulking of sand, Bulk density, moisture content, Flakiness index, Elongation index, Alkali-Aggregate reaction, Grading of Aggregate, Artificial and recycled aggregate.	05



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03	Admixtures: Types of admixtures, Chemical and mineral admixtures Plasticizers and superplasticizers and their effects on workability, Air entraining agents, Retarders, and their effects on the mix proportions. SCM/Pozzolanic admixtures, Fly ash, fly ash on fresh concrete, Silica fume, metakaolin, Ground Granulated Blast Furnace Slag.	05
04	Fresh Concrete: Batching, w/c ratio, Mixing, Transportation, placing of concrete, including pumping and compaction techniques for good quality concrete, Workability of concrete and methods of measuring workability, Factors affecting workability, Segregation and bleeding, Curing of concrete, Different methods of curing, Temperature effects on fresh concrete.	06
05	Concrete Mix Design: Nominal Mix Concrete, Objectives of mix design, Factors governing mix design, Methods of expressing proportions. Mix design by IS code method as per IS-10262:2019 and acceptance criteria.	07
06	Hardened Concrete & Concrete Testing: Hardened Concrete: Strength of concrete, Factors affecting strength of concrete, Characteristic strength - compressive, tensile and flexure strength, Relation between compressive & tensile strength. Introduction to durability and shrinkage of concrete. Nondestructive testing: Schmidt's rebound hammer – Mechanical & digital, Ultrasonic pulse velocity method. Concrete core cutting and testing.	08

References:

Codes of Practice:

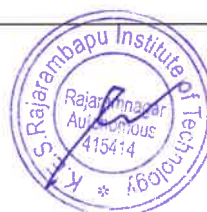
- Bureau of Indian Standards IS: 10262-2019. Indian standard code of practice for recommended Guidelines of Concrete Mix Design plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 456: 2000. Indian standard code of practice for plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 1199: 1959. Indian standard code of methods of sampling and analysis of concrete. New Delhi, BIS.
- Handbook on Concrete Mixes SP 23: 1982, 2001.

Text Books:

- Gambhir, M.L. (2005). Concrete Technology, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.

Reference Books:

- Mehta, P. K. and Monteiro, P.J. M. (2006). Concrete Microstructure, Properties and Materials. Third Edition, Mc Graw Hill Publications, NY.
- Santhakumar, A.R. (2009). Concrete Technology, Published by Oxford University Press, New Delhi.
- Shetty, M.S. (2008). Concrete Technology, Multicolor Illustrative Edition, S. Chand & Company Ltd., New Delhi.



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Class: S. Y. B. Tech Civil	Semester-IV
Course Code: CE2085	Course Name: Fluid Mechanics

L	T	P	Credits
3	--	--	3

Course Description

Fluid mechanics is the branch of physics that studies the mechanics of fluids (liquids and gases) and the forces on them. Fluid mechanics has a wide range of applications, including for civil engineering, mechanical engineering, chemical engineering, geophysics, astrophysics, and biology. Fluid mechanics can be divided into fluid statics, the study of fluids at rest and fluid dynamics, the study of the effect of forces on fluid motion.

Course Outcomes:

After completing the course, the student should be able to: -

1. Describe the properties of fluids and principles of fluid statics.
2. Apply the principles of fluid kinematics and fluid dynamics to solve flow problems.
3. Analyze flow through pipes and open channels.
4. Apply dimensional analysis and similitude in hydraulic engineering problems.
5. Evaluate the performance of hydraulic pumps for engineering applications.

Prerequisites: Engineering Mechanics

Course Content		
Unit No.	Description	Hrs.
1.	Fundamental Concepts of Fluid Flow: Introduction to Fluid mechanics, Properties of fluid (density, unit weight, specific surface, viscosity, surface tension, capillarity, compressibility), Vapour pressure and cavitation. Pascal's law and its applications, Classification of fluids.	04
2.	Fluid Statics Fluid pressure: Absolute, atmospheric, gauge and vacuum pressures, Pressure head, Pressure measuring devices, hydrostatic forces on submerged surfaces (horizontal, vertical and inclined surface), Buoyancy and floatation: Buoyancy, buoyant force, centre of buoyancy, metacentre, metacentric height, theoretical background of stability of submerged and floating bodies.	06
3.	Fluid Kinematics & Fluid Dynamics: Displacement, velocity and acceleration of fluid particles, Continuity equation, Introduction to: rotational and irrotational flow, velocity potential and stream function flow net. Euler's equation, Bernoulli's equation and its applications for measurement of flow, impulse momentum theorem and its application, siphon, water hammer in pipes	06





4.	Flow Through Pipes Introduction, Reynolds experiment, Laws of fluid friction for laminar and turbulent flow, Introduction to Laminar and turbulent flow in pipes. Head loss: Concept of major and minor head loss, Darcy-Weisbach equation for determination of major loss, determination of minor losses, pipes connected in series and parallel, concept of equivalent pipe, Turbulent flow in smooth and rough pipes. Introduction to pipe network design (PND)	06
5.	Flow Through Open Channels Classification of flow, Uniform flow, Prismatic and non prismatic channel, hydraulically efficient channel cross sections (rectangular, trapezoidal, circular) concept of specific energy, subsequent depths, subcritical and supercritical flow in rectangular channels, hydraulic jump, practical section for open channel flow. Introduction, theoretical background of Notches and weir for measurement of flow, types.	08
6.	Dimensional Analysis, Similitude and Pumps Dimensional homogeneity, Buckingham's π theorem, important dimensional numbers and their significance, geometric, Kinematic and dynamic similarity, Model studies: distorted and undistorted models, scale effect in models. Pumps, types of pumps, efficiency, characteristics of pumps, head calculations, engineering application of pumps	06

Text Book:

- Modi and Seth, "Hydraulics and Fluid mechanics including Hydraulic Machines" A. D. Computers, New Delhi.
- R. K. Bansal, "Fluid Mechanics" Lakshmi Publications Pvt. Ltd.

Reference Books:

- S. Nagarathanam, "Fluid Mechanics" Khanna Publication, Delhi.
- R. S. Khurmi, "Fluid Mechanics" S. Chand & Company Ltd. New Delhi.
- R. S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.
- Jagdish Lal, "Fluid Mechanics and hydraulics" Metropolitan Book Co-Ltd.
- Yunus A. Cengel John M. Oimbala, "Fluid Mechanics (SI Units)", Tata McGraw Hill.
- John F. Douglas, Janul and M. Gasiosek and John A. Swaffield "Fluid Mechanics" by Pearson Education Asia".



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Class: S. Y. B. Tech Civil	Semester-IV
Course Code: CE2321	Course Name: Structural Analysis

L	T	P	Credits
3	--	--	3

Course Description:

This course provides a comprehensive understanding of structural members and systems subjected to various loading conditions. It builds upon Strength of Materials principles and serves as a foundation for advanced structural analysis and design. The course evaluates combined direct and bending stresses in structural members like eccentrically loaded columns, chimneys, dams, and retaining walls. It develops analytical skills for determining slopes and deflections of statically determinate beams using classical methods, including Double Integration, Macaulay's, Moment-Area, and Conjugate Beam methods. Students also learn the analysis of moving loads through Influence Line Diagrams for beams using Muller-Breslau's Principle. The course introduces static and kinematic indeterminacy and analyzes statically indeterminate beams and frames using the Consistent Deformation Method and Moment Distribution Method. The knowledge and skills enable students to evaluate structural behavior, predict member response, and provide a foundation for advanced courses in Structural Analysis, Reinforced Concrete Design, Steel Structures, Bridge Engineering, and other structural engineering applications.

Course Outcomes:

1. Analyze the behavior of structural members subjected to combined direct and bending stresses.
2. Determine the slopes and deflections of statically determinate beams using classical analytical methods.
3. Construct and interpret Influence Line Diagrams for beams to evaluate the effects of moving loads using Muller-Breslau's Principle.
4. Analyze statically indeterminate structures by applying the Consistent Deformation Method and Moment Distribution Method.

COURSE CONTENT		
Unit No.	Details of Content	Hrs.
1.	Combined Direct and Bending Stresses: Combined direct and bending stresses, eccentric load on short columns, kern of a section, eccentricity of load about both axes of section. Chimneys subjected to wind pressure, dams and retaining walls.	06
2.	Slope and Deflection of Beams I: Slope and deflection of determinate beams – Double Integration method, Macaulay's method.	06
3.	Slope and Deflection of Beams II:	06



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	Slope and deflection of determinate beams – Moment area method, Conjugate beam method	
4.	Influence Line Diagrams: Muller-Breslau's Principle, Influence Line Diagrams for Simple and compound beams.	06
5.	Consistent Deformation Method: Concept of degree of static and kinematic indeterminacy, degree of freedom. Consistent deformation method- fixed beam and propped cantilever with uniform section, yielding of support.	06
6.	Moment Distribution Method: Fixed end moments, relative and total stiffness, distribution factor, analysis of continuous beam, sinking of support, analysis of portal frame.	06

References

Text Books:

- H. Shah and S. Junnarkar "Mechanics of Structures", Charotar Publishing House Pvt Limited, New Delhi.
- S Ramamrutham "Strength of Materials", Dhanpat Rai Publishing Company Pvt. Limited, New Delhi.
- S Ramamrutham "Theory of Structures", Dhanpat Rai Publishing Company Pvt. Limited, New Delhi.
- R.Vaidyanathan, P.Perumal, S.Lingeswari "Mechanics of Solids and Structures", Scitech Publications Pvt. Ltd., Chennai.

Reference Books:

- S. Timoshenko "Strength of Materials Part-I", CBS Publisher Private Limited, New Delhi.
- J. Gere, "Mechanics of Materials", CBS Publisher Private Limited, New Delhi.
- L. Negi and R.Jangid "Structural Analysis", Tata McGraw Hill Pub.Co., New Delhi.
- C. Wang "Intermediate Structural Analysis" (Indian Edition) McGraw Hill Education, New Delhi





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Department of Civil Engineering

Class: S. Y. B. Tech. Civil	Semester: IV
Course Code : CE2341	Course Name: Water resources and Irrigation Engineering

L	T	P	Credits
3	-	-	3

Course Description:

This course is designed to provide students with a comprehensive understanding of water management and irrigation practices. Throughout the course, students will explore the processes involved in surface water and groundwater hydrology, addressing the aspects such as runoff, hydrographs, and groundwater movement. Furthermore, students will learn about different irrigation methods suitable for various crops. By the end of this course, students will have gained a strong foundation in water resources and irrigation engineering, enabling them to address real-world challenges in water management effectively.

Course Outcomes:

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

1. Apply average and missing rainfall determination methods.
2. Determine maximum flood discharge using unit hydrograph, method of superposition in water resources planning.
3. Explain groundwater occurrence, infiltration, and well hydraulics principles.
4. Design suitable irrigation methods based on crop water requirements.
5. Evaluate the stability and failure criteria of gravity and earthen dams.
6. Explain canal design principles and modern irrigation techniques.

Prerequisite: Environmental science, Mathematics, Fluid mechanics

Course Content		
Unit No.	Description	Hrs
1.	Introduction to hydrology: Hydrological cycle and its components; Precipitation-types and forms, measurement, analysis of Precipitation data, mass rainfall curves, Doppler weather radar and satellite-based rainfall estimation; intensity-duration-frequency (IDF) curves, depth-area-duration (DAD) analysis. Evaporation and evapotranspiration- factors affecting and measurement methods.	06
2.	Surface water hydrology: Runoff- factor affecting, Rainfall-runoff relationship Hydrograph: Component parts of hydrograph, Storm hydrograph, Base flow and Separation of base flow, direct runoff hydrograph, Unit hydrograph, theory, assumptions limitations and use, concept of S-curve hydrograph and Superposition	06
3.	Ground water hydrology: Occurrence of ground water Zones of underground water, Infiltration - factors affecting and measurement methods movement of ground water and	06



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	its velocity. Zones of underground water: Well hydraulics: types of wells, steady and unsteady flow into wells, Dupuit's assumptions, radial flow to wells, drawdown and cone of depression, yield of open wells and tube wells, specific capacity of wells, recuperation test, pumping test, and groundwater well losses.	
4.	Irrigation engineering: Irrigation methods and their efficiencies. Crop water requirement: Principal crops and crop seasons in India, Classes and availability of soil water, Duty, delta, base period and their relationship, factors affecting duty, methods of improving duty, Assessment and efficiency of irrigation water. Gross command area, cultural command area and command area calculations based on crop water requirement. Depth and frequency of irrigation.	06
5.	Dam Stability Analysis: Types of dams, selection of site for dams, selection of type of dam, and control levels. Gravity dam: Component parts, Forces acting on dam. Stability requirements Earthen dam: Component parts, Construction and types of earthen dam, plotting of phreatic line, Modes of failure, seepage control measures. Field visit to Gravity dam.	07
6.	Canal Structures and Design: Types of canals, canal alignment, canal investigation and surveys, typical canal sections, balancing depth, Kennedy's and Lacey's silt theories, design concepts of alluvial channels, and numerical problems, Cross Drainage (C.D.) Works, Modern irrigation practices: canal automation systems, smart irrigation systems, water auditing, and sustainable water distribution techniques	05

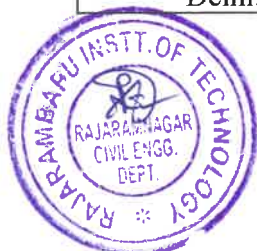
References:

Text Books

- S. K. Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.
- K. Subramanya, Engineering Hydrology, Tata McGraw Hill Education, New Delhi.
- P. Jaya Rami Reddy, A Textbook of Hydrology, Laxmi Publications, New Delhi.
- H. M. Raghunath, Engineering Hydrology, New Age International Publishers, New Delhi.

Reference Books:

- R. K. Sharma, Hydrology and Water Resources Engineering, Dhanpat Rai Publications, New Delhi.
- A. M. Michael, Irrigation: Theory and Practice, Vikas Publishing House Pvt. Ltd., New Delhi.
- R. S. Varshney, S. C. Gupta and R. L. Gupta, Theory and Design of Irrigation Structures, Vol. I & II, Nem Chand & Bros., Roorkee.
- Savindra Singh, Fundamentals of Hydrology, Pravalika Publications, Allahabad.
- K. N. Duggal, Fluid Mechanics and Hydraulic Engineering, S. Chand Publications.
- Punmia B. C., Irrigation and Water Power Engineering, Laxmi Publications, New Delhi.





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Class: S. Y. B. Tech. Civil	Semester-IV	L	T	P	Credits
Course Code: CE2362	Course Name: Infrastructure Engineering I	3	-	-	3

Course Description

Transportation plays important role in the development of the country. Efficient road, railway and air transport network is essential to cater the increased need of the passengers and goods trips. Study of this course imparts knowledge for road transportation, traffic survey, materials used for road & quality control, pavement design, highway construction & maintenance. Railway engineering is a multi-faceted engineering discipline dealing with the design, construction and operation of all types of rail transport systems

Course Outcomes:

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

1. Design the geometric components of highways.
2. Determine traffic volume for design of road.
3. Design the flexible and rigid pavement.
4. Explain design parameters of railway and it's geometric component parts.

Prerequisites: Nil

Course Content		
Unit No.	Description	Hrs.
1.	Highway Development and Planning Introduction: Classification of roads, Brief history of road development in India, Present status of roads in India, NHAI, NHDP, PMGSY, MSRDC. Geometric Design of Highways: Terrain classification, Design speed. Highway cross-section elements, Sight distance, Overtaking sight distance, Intermediate sight distance.	06
2.	Geometric Design of Roads Design of Horizontal Alignment: Horizontal curves, Design of super elevation and its provision, Radius at horizontal curves, Widening of pavements at horizontal curves, Methods of extra widening. Design of vertical alignment: Different types of gradients, Grade compensation on curves, Summit curves, Valley curves.	06
3.	Traffic Engineering: Traffic studies on flow, speed, Travel time - Delay and O-D study, PCU, Peak hour factor, Parking study, Accident study and analysis. Traffic signs and signals. Types of intersections and channelization, Highway capacity and level of service of rural highways and urban roads.	05





4.	Flexible Pavement Design: Highway material properties and its characteristics, Elements of flexible pavement, Concept of IRC charts, Design factors, Design of flexible pavement using IRC: 37-2018. Highway construction and maintenance.	07
5.	Rigid Pavement Design: Elements of rigid pavements, Design factors, Stresses, dowel & tie bars, Design of rigid pavement using IRC: 58-2015.	06
6.	Railway Engineering: Development of railways in India, Permanent way and railway track components, Different gauges in India, Railway lines classification, Introduction to railway line components, Function and types of rails, Geometric Design: Alignment, Gradient, Horizontal Curves, Superelevation.	06

References

Reference Books:

- Khanna, S.K., Justo C.E.G. and Veeraragavan A., Highway Engineering, Tata McGraw Hill Education
- Yang, H. Huang, Pavement Analysis and Design, Pearson Education.
- Mundrey, J. S., "Railway Track Engineering", Tata McGraw Hill Education.
- Rangwala Abdulla S., "Railway Engineering", Charotar Publishing House.
- Saxena, S.C., Arora S. P., "A Text Book of Railway Engineering", Dhanpat Rai and Sons.

Codes of Practice:

- IRC 37 (2018), Guidelines for the Design of Flexible Pavements, Indian Roads Congress, New Delhi, 4th Edition.
- IRC 58 (2015), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress.
- MoRTH (2013), Specification for Road and Bridge Works, Ministry of Road Transport and Highways, 5th Revision.





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Multidisciplinary Minor- II

Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: CEMD2021	Course Name: Building Estimation and Valuation	3	-	-	3

Course Description:

The Building Estimation and Valuation course is designed to develop students' proficiency and confidence in preparing estimates for various civil engineering structures. The course enables students to analyze the rates of different building items and understand the principles of cost estimation. By studying this course, students will become capable of preparing estimates, rate analyses, and various construction bills required at construction sites with greater accuracy and efficiency.

Course Learning Outcomes:

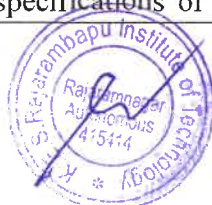
After successful completion of the course, students will be able to,

1. Explain the types of estimates and their basic requirements in construction projects.
2. Describe measurement sheets, abstract sheets, and detailed specifications for various construction items.
3. Prepare detailed estimates for load-bearing structures and framed structures.
4. Perform rate analysis for different construction activities.
5. Explain the concepts of tenders and contracts used in construction practice.
6. Describe the fundamental terms and principles of valuation in civil engineering.

Prerequisite: Unit conversions and the fundamental knowledge of different construction materials with their rates.

Course Content

Unit No	Description	Hrs
1	Introduction: General introduction to Quantity surveying, Purpose of estimates, Types of Estimates- Approximate and Detailed, Various items to be included in estimates of building, road and culvert with their modes of measurement, I.S. 1200, Prime cost, Provisional sums, Provisional quantities, administrative approval and technical sanction to estimates. Introduction to SSR., General notes and guide lines of SSR.	06
2	Specifications: Specifications- purpose and types, General specifications for different class of buildings, Detailed specifications of building items like PCC,	06



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	RCC, brick and stone masonry, plastering, flooring.	
3	Detailed estimate of buildings: Measurement sheet, Abstract sheet, long wall-short wall and center line method for finding quantities. Detailed estimate of load bearing and RCC buildings.	07
4	Rate Analysis and Schedule of Reinforcement: Importance of rate analysis, Factors affecting the cost of materials, labour, Task work, Transports, Overhead charges, market rates of various materials, labours. Rate analysis preparation of PCC, RCC, brick and stone masonry, plastering, pointing, flooring.	06
5	Introduction of Tender and Contracts: Tender- Notice, Documents, Procedure and Types, Contract- Types, Conditions, Earnest money, Security deposit, Validity period, Defect liability period, Liquidated and unliquidated damages, Arbitration, Escalation of cost, Daily reports maintained on site.	05
6	Valuation: Definition, Necessity, Cost, Price, Value, Types of values, Depreciation and obsolescence, sinking fund, Methods of calculating depreciation, Annuity, Year purchase, Land valuation, Methods of land and building valuation, Freehold and leasehold property, Mortgage, Mortgage deed and Precautions.	06

References:

Reference Books

- B. N. Dutta, Estimating and Costing in Civil Engineering, UBS Publishers & Distributors Pvt. Ltd.
- M. Chakraborty, Estimating, Costing, Specification and Valuation in Civil Engineering, UBS Publishers & Distributors Pvt. Ltd.
- B. S. Patil, Civil Engineering Contracts and Estimates, Universities Press Pvt. Ltd.
- S. C. Rangwala, Elements of Estimating and Costing, Charotar Publishing House.

I. S. Codes:

- Updated I. S. 1200
- Updated S. S. R.





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Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: CSMD204	Course Name: Fundamentals of Database Systems	3	-	-	3

Course Description:

A database is an organized collection of data. A relational database, more restrictively, is a collection of schemas, tables, queries, views, and other elements. It defines data models, relational models, constraints that can be used in design of the relational database, also it focuses on file structure, transaction management and recovery of databases. The course also provides an overview of SQL which is used for implementation of relational databases. data. A general-purpose DBMS is a software system designed to allow the definition, creation, querying, update and administration of databases.

Course Learning Outcomes:

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

1. Describe the fundamental elements of relational database management systems.
2. Design ER-models to represent simple database application scenarios.
3. Write SQL query to perform various operations on the database.
4. Analyze principle of integrity constraints, Hashing and Indexing on databases.
5. Illustrate the transaction management, concurrency control and crash recovery.

Prerequisite: A basic understanding of programming concepts (using languages such as Python, Java, or C++) and foundational knowledge of data structures and algorithms.

Course Content

Unit No	Description	Hrs
1	Introduction to Database Concepts Purpose of Database Systems, Data abstraction, Data Models, Entities and Entity sets, Mapping Constraints, E-R Diagram, Reducing E-R Diagrams to Tables, Generalization and Aggregation.	06
2	Relational Model Structure of Relational Databases, Structured Query Language (SQL): Data Definition Language, Data Manipulation Language, Aggregate functions, Set Operations.	06
3	Integrity Constraints and Database Design Domain Constraints, Referential Integrity, Functional Dependencies, Decomposition, Normalization: 1NF, 2NF, 3NF	06
4	Data Storage and Indexes File Organization, Data Dictionary Storage, Indexing: B+ tree indexing	06





	and B tree indexing, Hashing: Static and Dynamic.	
5	Basic of Transactions Concepts of transaction processing, ACID properties, Transaction states, Serializability, Testing for serializability.	06
6	Concurrency Control and Recovery System Lock-based protocols, Timestamp - based Protocols. Crash Recovery: Failure Classification, Log-Based Recovery, Checkpoints.	06

References:

Text Books

- Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, Database System Concepts, Tata McGraw Hill.
- C. J. Date, A. Kannan, and S. Swamynathan, An Introduction to Database Systems, Pearson Education.

Reference Books

- Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education.



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Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: EEMD2021	Course Name: Power System	3	-	-	3

Course Description:

The power system comprises of generation, transmission and distribution of electric power. This course covers economics of power generation using different types of generating sources. Different types of loads in power system, Moreover, this course covers importance of power factor in power system and different types of tariffs. Overview of transmission and distribution systems.

Course Learning Outcomes:

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

1. Write the basic working principles of different generating sources.
2. Analyze different types of loads
3. Explain importance of power factor and tariffs in power system.
4. Identify various components in power transmission and distribution system.
5. Select substation equipment as per requirement.
6. Describe the role of AI in substation automation.

Prerequisite: Basic Electrical Engineering, Basic Mathematics and Physics.

Course Content

Unit No	Description	Hrs
1	Power Generation: Structure of power system, generating stations – operation and working of conventional and nonconventional energy sources. Comparison between them.	06
2	Variable load on power stations: Load curves and types of loads – base and peak loads, cost of electrical energy, depreciation and its methods.	06
3	Power factor and Electric Tariff: Power triangle, power factor and causes of low power factor and methods of power factor improvement. Tariff and its characteristics.	06
4	Electrical and Mechanical Design of Transmission lines: Construction of transmission lines and its components, line resistance, inductance and capacitance. Sag and its calculation, String efficiency	06



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5	Supply systems: AC and DC transmission systems and comparison. Overhead and underground system, Construction of cables and types.	06
6	Substation and AI Applications: Classification of substations, outdoor and indoor substations. Symbols for equipment's in substations and their functions Introduction to AI in substations for fault detection, predictive maintenance, load forecasting, and smart monitoring using intelligent control systems.	06

References:

Text Books

- V. K. Mehta, Principles of Power System, S. Chand Publishing.
- Ashfaq Husain, Electrical Power Systems, CBS Publishers & Distributors.

Reference Books

- S. Sivanagaraju and S. Satyanarayana, Electric Power Transmission and Distribution, Pearson Education.
- W. D. Stevenson Jr., Elements of Power System Analysis, McGraw Hill International.



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Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: ECMD2021	Course Name: Electronics Communication Systems	3	-	-	3

Course Description:

Analog and Digital Communication are the fundamental and core subjects in Electronics and Telecommunication Engineering. The course provides knowledge of basic principles of communication, modulation and demodulation techniques, transmission and reception methods in analog as well as digital communication.

Course Learning Outcomes:

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

1. Describe different communication systems.
2. Explain applications of analog and digital modulation techniques.
3. Analyze different modulation and demodulation techniques.
4. Explain the use of satellite communication.

Prerequisite: Fundamental concepts of engineering and Mathematics.

Course Content

Unit No	Description	Hrs
1	Amplitude Modulation & Demodulation Electromagnetic spectrum, Introduction to communication system, Need for modulation. Amplitude Modulation, Definition, Time domain and frequency domain description, power relations in AM waves. Generation of AM waves, Detection of AM Waves.	06
2	Frequency Modulation & Demodulation Introduction of FM, Description of systems, Mathematical representation of FM, Frequency Spectrum of FM wave, Phase modulation, Intersystem comparisons, pre-emphasis and de-emphasis, Generation of Frequency Modulation and Demodulation methods, Angle Modulation.	06
3	Radio Receivers Function of AM receiver, receiver parameters: Sensitivity, Selectivity, Dynamic Range, Tracking, Fidelity, Receiver Types- Tuned Radio Frequency (TRF) receiver, AM Receiver- RF section, Mixer, IF Frequencies and Amplifiers, FM Receivers- Common circuits, Comparison with AM receivers, Amplitude Limiting.	06
4	Digital Modulation Techniques And Data Formats Data Formats, ASK, FSK, PSK, coherent and non-	06



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	coherent reception, BPSK, DPSK, QPSK, 16-QAM, MSK, Waveforms and Comparison of digital modulation.	
5	Satellite Communication: Basic concepts of Satellite Communications, Satellite subsystems, Satellite Link design, Orbital Mechanics.	06
6	Satellite Application: DBS, VSAT, GPS, Case Studies – Mars Mission, Chandrayan.	06

References:

Text Books

- K. Sam Shanmugan, Digital and Analog Communication Systems, Wiley India.
- R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill.
- George Kennedy and Bernard Davis, Electronic Communication Systems, Tata McGraw Hill.

Reference Books

- Bernard Sklar, Digital Communications: Fundamentals and Applications, Pearson Education.
- Wayne Tomasi, Electronic Communication Systems, Pearson Education.
- Herbert Taub and Donald L. Schilling, Principles of Communication Systems, Tata McGraw Hill.
- Louis E. Frenzel Jr., Communication Electronics: Principles and Applications, Tata McGraw Hill.





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Class:- S. Y. B. Tech	Semester-IV	L	T	P	Credits
Course Code : CIMD2021	Course Name : Computer Algorithms	3	--	--	3

Course Description:

This course introduces students to the design of computer algorithms, as well as analysis of sophisticated algorithms. It contains design and analysis of algorithms to solve wide variety of problems including searching, sorting and graph algorithms. It covers various techniques that can be used to solve new problems you face, like divide and conquer, greedy algorithms, dynamic programming etc.

Course Learning Outcomes:

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

1. Analysing asymptotically the performance of algorithms.
2. Compare and analyse searching and sorting algorithms.
3. Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.
4. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.
5. Describe computational complexity theory to classify computational problems according to their inherent difficulty.

Prerequisite: Basic knowledge of Mathematics

Course Content

Unit No	Description	Hrs
1.	Introduction Introduction, Characteristics of algorithm, Pseudocode conventions, Recursive algorithms, Performance analysis – time and Space complexity, asymptotic notations..	05
2.	Searching and Sorting Methods Linear Search, Binary Search, Bubble sort, Quick Sort, Merge Sort, Selection Sort, Insertion sort, Radix Sort, Bucket Sort. Divide and Conquer- General method, Finding the maximum and minimum, Strassen's matrix multiplication.	07
3.	Greedy Method General method, Knapsack problem, Job sequencing with deadlines, Minimum-cost spanning trees – Prim's And Kruskal's algorithms, Optimal storage on tapes, Single source shortest paths.	05
4.	Dynamic Programming General method, Multistage graphs, All pair shortest paths, 0/1 Knapsack problem, Reliability design, Traveling sales person problem.	07
5.	Backtracking General method, n-Queens problem, Subset sum problem, Graph coloring	06



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	problem, Travelling sales person problem.	
6.	Introduction to Complexity Theory The P and NP Classes, Polynomial, time reductions, NP- Hard and NP- Complete classes. NP-Hard graph problems- Clique decision problem, Vertex cover problem, Travelling sales person decision problem, Randomized algorithms.	06

References -

Text Books:

- Ellis Horowitz, Satraj Sahani, Saguthevar Rajasejaram, "Fundamentals of Computer Algorithms", Universities Press.
- Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms".
- **Reference Books:**
- Sara Baase & Allen VanGelder, "Computer Algorithms: Introduction to Design & Analysis", Addison Wesley.
- Alfred V. Aho , The design and analysis of computer algorithms, Addison-Wesley Pub





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Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: MEMD2041	Course Name: Behavioral Engineering and Design	3	-	-	3

Course Description:

This course delves into the principles and practices of behavioral engineering and design as applied to the creation of new products, encompassing physical consumer goods as well as software and mobile applications. Through theoretical exploration and hands-on projects, students will learn how to design products that effectively influence user behavior and enhance user experience.

Course Learning Outcomes:

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

1. Analyze the fundamental concepts, theories and ethical considerations of behavioral engineering in product design.
2. Apply psychological principles and behavioral insights to analyze user behavior and product design scenarios.
3. Analyze the role of persuasive design techniques in influencing user engagement, adoption and behavior change in consumer products.
4. Incorporate aesthetic appeal into product designs, assessed through objective criteria such as visual appeal ratings.
5. Incorporate ergonomic considerations into product designs assessed through objective criteria such as user comfort.

Prerequisite: Course on Design Thinking.

Course Content

Unit No	Description	Hrs
1	Behavioral Engineering and Design for Product Innovation: Overview of behavioral engineering and its relevance in product design, Key concepts and theoretical frameworks, Understanding the role of psychology in product development, Ethical considerations in designing products for behavior change.	06
2	Human Behavior and Product Design: Psychological principles influencing user behavior, Factors affecting consumer decision-making, User experience (UX) design principles for physical and digital products, Designing for emotional engagement and user satisfaction.	06
3	Applying Behavioral Insights in New Product Development: Integrating behavioral research into the product design process,	06



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	Behavioral design techniques for enhancing product adoption and usage, Case studies of successful products leveraging behavioral engineering principles, Hands-on exercises in applying behavioral insights to product ideation and prototyping.	
4	Persuasive Design for Consumer Products: Principles of persuasive design in consumer product development, creating compelling product experiences through persuasive techniques, Designing for habit formation and behavior change, Ethical considerations in persuasive product design.	06
5	Aesthetics: Principles of aesthetic design and its impact on user perception, Integrating aesthetics with functional design requirements	06
6	Ergonomics in Product Design: Understanding anthropometrics and ergonomics in product design, Case studies of products exemplifying successful integration of aesthetics and ergonomics	06

References:

- Nir Eyal, Hooked: How to Build Habit-Forming Products, Penguin Books.
- Don Norman, The Design of Everyday Things, Basic Books.
- Stephen Anderson, Seductive Interaction Design: Creating Playful, Fun, and Effective User Experiences, New Riders.
- William Lidwell, Kritina Holden, and Jill Butler, Universal Principles of Design, Rockport Publishers.
- Mark S. Sanders and Ernest J. McCormick, Human Factors in Engineering and Design, McGraw-Hill.





Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: MEMD206	Course Name: Automotive Drivetrain	3	-	-	3

Course Description:

This course introduces the fundamentals of automotive drivetrain systems and their role in transmitting engine power to the wheels. The course covers the construction, working principles, performance characteristics, and applications of clutches, gearboxes, propeller shafts, universal joints, differentials, and final drive systems. It also introduces modern transmission technologies such as Automated Manual Transmission (AMT), Continuously Variable Transmission (CVT), Dual Clutch Transmission (DCT), hybrid drivetrains, and electric vehicle drivetrain architectures. Emphasis is given to drivetrain efficiency, torque transmission, vehicle performance, and emerging trends in mobility systems.

Course Learning Outcomes:

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

1. Explain the layout, components, and working principles of automotive drivetrain systems.
2. Analyze the construction, operation, and performance characteristics of different clutch systems.
3. Analyze various automotive transmission systems including manual, automatic, CVT, AMT, and DCT with respect to their construction, operation, and performance characteristics.
4. Examine the function and performance of propeller shafts, universal joints, and constant velocity joints in power transmission.
5. Evaluate the construction and working of differential and final drive systems for vehicle performance.
6. Assess hybrid and electric vehicle drivetrain technologies with respect to efficiency, energy management, and future mobility trends.

Prerequisite: Nil.

Course Content

Unit No	Description	Hrs
1	Introduction to Automotive Drivetrain: Layout of automobile power transmission system, Types of drivetrains: FWD, RWD, AWD, 4WD, Requirements of a good drivetrain, Torque, power flow, and losses in drivetrain	06



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2	Clutches: Functions and requirements of a clutch, Single plate, multi-plate, cone, and centrifugal clutches, Clutch materials and wear characteristics, Hydraulic and electronic clutch actuation.	06
3	Gearboxes and Transmission Systems: Manual transmission: sliding mesh, constant mesh, synchromesh, Automatic transmission: torque converter and planetary gear sets, Introduction to Continuously Variable Transmission (CVT), Dual Clutch Transmission (DCT) and Automated Manual Transmission (AMT)	06
4	Propeller Shafts and Universal Joints: Construction and function of propeller shafts, universal joints and constant velocity (CV) joints, slip joints, driveline vibration issues, torque transmission characteristics of shaft systems.	06
5	Differential and Final Drive Systems: Construction and working of differential systems, open differential, limited slip differential, locking differential, axle arrangements, final drive ratios, effect of differential action during vehicle cornering and traction conditions.	06
6	Modern and Electric Vehicle Drivetrains: Hybrid electric drivetrain configurations – series, parallel, and power-split systems; electric vehicle drivetrain architecture, regenerative braking systems, drivetrain efficiency and energy management, future trends in automotive drivetrain technology.	06

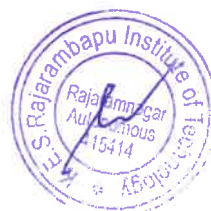
References:

Text Books

- Kripal Singh, Automobile Engineering (Vol. I), Standard Publishers Distributors.
- N. K. Giri, Automobile Engineering, Khanna Publishers.
- S. Srinivasan, Automotive Mechanics, Tata McGraw Hill.
- K. K. Ramalingam, Automobile Engineering, SciTech Publications.
- R. K. Rajput, Automobile Engineering, Laxmi Publications.
- G. B. S. Narang, Automobile Engineering, Khanna Publishers.

Reference Books

- Heinz Heisler, Advanced Vehicle Technology, Elsevier.
- N. S. Chhikara, Automobile Engineering (Vol. II), Satya Prakashan.
- K. Newton, W. Steeds, and T. K. Garrett, The Motor Vehicle, Society of Automotive Engineers (SAE).
- William H. Crouse and Donald L. Anglin, Automotive Mechanics, Tata McGraw Hill Education.
- P. W. A. Kett, Motor Vehicle Science (Vol. I), Longman.
- James D. Halderman and Chase D. Mitchell, Automotive Engines: Theory and Servicing, Pearson Education.





Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: MCMD2021	Course Name: Industrial Fluid Power	3	-	-	3

Course Description:

Fluid power has the highest power density of all conventional power-transmission technologies. Learn the benefits and limitations of fluid power, how to analyse fluid power components and circuits, and how to design and simulate fluid power circuits using Automation Studio for applications.

In this course, you will be introduced to the fundamental principles and analytical modelling of fluid power components, circuits, and systems. You will learn the benefits and limitations of fluid power compared with other power transmission technologies; the operation, use, and symbols of common hydraulic & pneumatic components; how to formulate and analyse models of hydraulic & pneumatic components and circuits; and how to design and predict the performance of fluid power circuits.

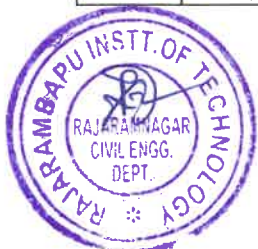
Course Learning Outcomes:

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

1. Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
2. Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.
3. Create & simulate basic hydraulic and pneumatic circuit diagrams for different applications.
4. Design, develop & analyze simple hydraulic and pneumatic systems for given task.

Prerequisite: Fundamental concepts of fluid mechanics, basic electrical engineering, and engineering mechanics.

Course Content		
Unit No	Description	Hrs
1	Fluid Power Systems and Fundamentals: Introduction to fluid power, Advantages of fluid power, Application of fluid power system, Types of fluid power systems, Properties of hydraulic fluids, General types of fluids, Fluid power symbols. (ISO/JIC), Use of Automation studio to draw circuits.	06
2	Hydraulic System and Components (Pumps and Actuators): Pumping theory, Pump classification, Gear pump, Vane Pump,	06



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	construction and working of pumps, pump performance, piston pump, Variable displacement pumps, Linear hydraulic actuators, Types of hydraulic cylinders, Single acting, Double acting cylinders, Special cylinders like tandem, Rod less, Telescopic - Construction and application, cushioning mechanism, Mounting of actuators, Rotary actuators - Gear, Vane and Piston motors.	
3	Hydraulic Valves, Accumulators and Circuits: Directional control valve .4/2, 4/3, 5/3-way valves, Shuttle valve check valve, Pressure control valve, Flow control valve (Fixed and adjustable), Electrical control solenoid valves, Types of accumulators, Accumulators circuits, Intensifier Circuit and Application, Speed control circuits, synchronizing circuit and industrial application circuits copying circuit and press circuit, regenerative circuit.	06
4	Pneumatic Systems, Components and Circuits: Properties of air Compressors, Filter, Regulator, and Lubricator Unit, Air control valves, Quick exhaust valves and pneumatic actuators, Pneumo-hydraulic circuit, Time delay circuits, Sequential circuit design for simple applications using cascade method.	06
5	Fluid Logic Control System: Hydro Mechanical servo systems, Electro-hydraulic and Electro-pneumatic systems and proportional valves, Introduction to fluidic devices, simple circuits, PLC applications in fluid power control, Failure and troubleshooting in fluid power systems, Pneumatic positioning and servo systems, air hydro boosters.	06
6	Hydraulic/Pneumatic Circuit Design Steps in hydraulic circuit design, and simulation using Automation Studio. Steps in pneumatic circuit design, and simulation using Automation Studio.	06

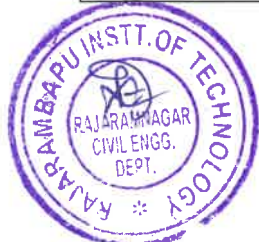
References:

Text Books

- Anthony Esposito, Fluid Power with Applications, Prentice Hall.
- Andrew Parr, Industrial Hydraulic and Pneumatic Systems, Butterworth-Heinemann. (This is the standard text; if your syllabus specifically intends another author named Stewart, please verify the details.)
- H. P. Garg, Industrial Hydraulics and Pneumatics, Dhanpat Rai Publications.
- S. R. Majumdar, Oil Hydraulic Systems: Principles and Maintenance, Tata McGraw Hill.

Reference Books

- Vickers Inc., Industrial Hydraulics Manual, Vickers.
- FESTO Didactic, Hydraulics – Basic Level (TP501 Handbook), FESTO Didactic.





Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: AIMD2021	Course Name: Data Structures and Algorithms	3	-	-	3

Course Description:

The Data Structures and Algorithms course is a comprehensive study of fundamental concepts and techniques essential for efficient problem-solving in computer science. Students will explore various data structures, including arrays, linked lists, stacks, queues, trees, graphs, and hash tables, and learn how to analyze their time and space complexity. The course extensively explores the design and analysis of algorithms, encompassing various topics such as sorting, searching, and graph traversal. Emphasis is placed on understanding algorithmic paradigms and their applications. Through programming assignments and theoretical exercises, students will gain practical experience in implementing algorithms and solving real-world problems. This course serves as a foundation for algorithmic thinking and prepares students for advanced computer science topics.

Course Learning Outcomes:

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

1. Compare between linear and nonlinear data structures.
2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
3. Analyse various searching and sorting algorithms and apply it to solve particular problem.
4. Determine a suitable data structure and algorithm to solve a real-world problem.

Prerequisite:

- Basic knowledge of C programming and basic mathematical concepts

Course Content

Unit No	Description	Hrs
1	Introduction to Data Structures: Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types, Complexity Analysis	05
2	Linear Data Structures: Stack: Definition, Representation and Applications of Stack. Queue: Definitions, Representation and Applications of Linear Queue, Circular Queue, and Priority Queue.	06
3	Linked Lists:	07



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	Definition, Representation, Operations and Applications of singly linked list, doubly linked list, circular linked list, Application of linked list- Stack & queue, Introduction to Sparse matrix, representation of sparse matrix using linked list.	
4	Searching, Sorting and Hashing Techniques: Linear search, Binary search, Bubble sort, insertion sort, Merge sort, Quick sort, Selection sort, Radix sort, Heap sort, Complexity of algorithms Hashing: Definition, Hash functions, Overflow, Collision, Open Hashing, closed hashing, Rehashing Techniques.	07
5	Trees: Basic Technology, Binary Tree, Traversal methods, Binary search tree, AVL Tree, B tree, B+ tree, Heaps - operations and their applications.	06
6	Graphs: Basic concepts of graph theory, Storage representation, Operations on graphs, Traversing a graph, Shortest path algorithm.	05

References:

Text Books

- Seymour Lipschutz, Data Structures, McGraw-Hill (Schaum's Outlines Series).

Reference Books

- Alfred V. Aho, John E. Hopcroft, and J. D. Ullman, Data Structures and Algorithms, Addison-Wesley.
- Ashok N. Kamthane, Introduction to Data Structures in C, Pearson Education.





Class: S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: RAMD2021	Course Name: Sensors and Actuators	3	-	-	3

Course Description:

The goal of this course is to give senior and graduate students in engineering a hands-on introduction to the fundamental technology and practical applications of sensors. Various sensors, including capacitive, inductive, ultrasonic, accelerometers, image sensors and others will be covered in the course. Instrumentation techniques incorporating computer control, sampling, and data collection and analysis are reviewed in the context of real-world scenarios. There will be weekly laboratory assignments where students will have hands on experience with various sensors.

The course is based around a custom board equipped with various sensors, such as a high-speed camera, touch sensor, humidity sensor, temperature sensor, pressure sensor, accelerometer and position sensor. Additional peripheral sensors using the PMOD interface standard can also be attached to the sensor board. The board interfaces with these sensors via an FPGA device and it can also communicate with a PC via USB 3.0 interface. Students will use Verilog language to program the FPGA and communicate with various sensors and PC.

Course Learning Outcomes:

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

1. Explore the functions, characteristics, and operating principles of different sensors, transducers, and actuators.
2. Examine the process and techniques involved in calibrating sensors and transducers for optimal performance.
3. Evaluate and justify the choice of material and manufacturing methods used in the design of specific sensors.
4. Select the most appropriate sensors, transducers, and actuators based on the requirements of a given application.

Prerequisite:

A basic course on Automotive engineering and Electrical machines is recommended as pre-requisites for this course.

Course Content

Unit No	Description	Hrs
1	Sensors: Difference between sensor, transmitter and transducer - Primary	06



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	measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signals: Pneumatic signal; Hydraulic signal; Electronic Signal. Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, Strain Gauges, Resistance thermometer, Thermistor, Hot-wire anemometer, Resistance Hygrometer, Photo-resistive sensor.	
2	Inductive & Capacitive Transducer: Inductive transducers: - Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer, Capacitive transducers: - Principle of operation, construction details, characteristics of Capacitive transducers – different types & signal conditioning- Applications: - capacitor microphone, capacitive pressure sensor, proximity sensor	06
3	Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self testing & self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.	06
4	Micro Sensors and Micro Actuators: Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles	06
5	Sensor Materials and Processing Techniques: Materials for sensors: Silicon, Plastics, metals, ceramics, glasses, nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, Bulk silicon micro machining, Surface silicon micro machining, LIGA process	06
6	Actuators: Definition, types and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.	06





References:

Text Books

- D. V. S. Murthy, Transducers and Instrumentation, PHI.
- D. Patranabis, Sensors and Transducers, PHI.
- S. Gupta and J. P. Gupta, PC Interfacing for Data Acquisition and Process Control, Instrument Society of America.
- Gary Johnson, LabVIEW Graphical Programming, McGraw Hill.
- D. Patranabis, Sensors and Transducers, Wheeler Publishing.
- Sergej Fatikow and Ulrich Rembold, Microsystem Technology and Microbotics, Springer-Verlag.
- Jacob Fraden, Handbook of Modern Sensors: Physics, Designs, and Applications, Springer.

Reference Books

- Arun K. Ghosh, Introduction to Measurements and Instrumentation, PHI.
- A. D. Helfrick and W. D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI.
- Hermann K. P. Neubert, Instrument Transducers, Oxford University Press.



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Class: S. Y. B. Tech. Civil	Semester-IV	L	T	P	Credits
Course Code: CE2185	Course Name: Concrete Technology Laboratory	-	--	2	1

Course Description:

Concrete Technology Laboratory is one of the core laboratory courses offered at fourth semester of S. Y. B. Tech. Civil undergraduate program. The course comprises of six parts. The first two parts focus on determination of properties of various ingredients of concrete. The third part deals with application of mix design concepts of concrete mixes to produce concretes of required workability, strength and durability. The fourth part consists in performing various tests on produced concrete when it is in plastic stage. The testing of hardened concrete specimen and /or elements of structure to determine their strength and durability properties is covered in fifth and sixth parts respectively. This also includes non-destructive, semi destructive and destructive tests on hardened concrete specimen. This laboratory course will help students to gain hands on experience in performing various tests on concrete specimen as well as elements of concrete structures following standard guidelines and evaluate the quality of concrete.

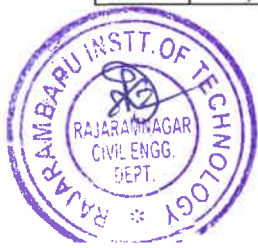
Prerequisite: The prerequisite for this course is to have the basic knowledge of different materials or ingredients of concrete.

Course Outcomes:

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

1. Perform laboratory tests on cement and aggregates to evaluate their properties in accordance with relevant Indian Standards.
2. Design concrete mixes using the IS Code method and assess the workability of fresh concrete using standard test methods with and without chemical admixtures.
3. Evaluate its quality of hardened concrete using destructive and non-destructive testing methods.
4. Prepare a technical report by analyzing materials, production processes, quality control practices, and construction activities observed during a visit to a concrete construction site and concrete production plant.

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	Tests on Cement a) Fineness, Sp. Gravity, Consistency, Initial and Final setting time, Soundness test b) Compressive Strength Test	4
2.	Tests on Fine and Coarse Aggregates a) Fine Aggt: Sieve Analysis, Sp. Gravity, Water Absorption, Moisture	4





	Content, bulking of sand, silt content b) Coarse Aggt.: Sieve Analysis, Sp. Gravity, Water Absorption, Moisture Content, Flakiness and Elongation Index	
3.	Concrete Mix Design: IS Code method of mix design	2
4.	Tests on Fresh Concrete: Workability Tests: Slump, Flow, VeBe Consistometer (with and without chemical admixtures)	4
5.	Tests on Hardened Concrete: Compressive Strength on Cube & Cylinder, Flexural Test, Split Tensile Strength Test.	4
6.	Non-Destructive Tests: Rebound Hammer, Ultrasonic Pulse Velocity.	2
7	Visit to a concrete construction site and Plant. Concrete construction site and RMC plant.	4

References –

Codes of Practice:

- Bureau of Indian Standards IS: 10262-2019. Indian standard code of practice for recommended Guidelines of Concrete Mix Design plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 456: 2000. Indian standard code of practice for plain and reinforced concrete. New Delhi, BIS.
- Bureau of Indian Standards IS 1199: 1959. Indian standard code of methods of sampling and analysis of concrete. New Delhi, BIS.
- Bureau of Indian Standard (1970) IS: 383-1970. Indian standard specification for coarse and fine aggregates from natural sources for Concrete. New Delhi, BIS.
- Handbook on Concrete Mixes SP 23: 1982, 2001.

Text Books:

- Gambhir, M.L. (2005). Concrete Technology, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.

Reference Books:

- Mehta, P. K. and Monteiro, P.J. M. (2006). Concrete Microstructure, Properties and Materials. Third Edition, Mc Graw Hill Publications, NY.
- Santhakumar, A.R. (2009). Concrete Technology, Published by Oxford University Press, New Delhi.
- Shetty, M.S. (2008). Concrete Technology, Multicolor Illustrative Edition, S. Chand & Company Ltd., New Delhi.





Class: S. Y. B. Tech. Civil	Semester-IV
Course Code: CE2381	Course Name: Highway Materials Testing Laboratory

L	T	P	Credits
-	-	2	1

Course Description

The objective of this Engineering laboratory course is to determine the properties of materials used in road construction. Experiments include tests for impact, abrasion, and shape test for coarse aggregate and tests for penetration, ductility, viscosity, softening point and flash and fire point for bitumen. The students will be able to infer the suitability of these materials for construction of road. This laboratory course will help the students to understand the theoretical concepts learned in the transportation engineering course.

Course Outcomes:

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

1. Perform quality control tests on aggregate, bitumen and soil.
2. Suggest suitable material for road construction.
3. Perform quality control tests on bituminous pavement.

Prerequisites: Nil

Laboratory Content		
Expt. No.	Name of Experiment	Hrs.
1.	To determine aggregate impact value of aggregates used in road construction	02
2.	To determine crushing value of aggregates.	02
3.	To determine abrasion value of aggregates by Los Angeles Abrasion Test	02
4.	To determine specific gravity and water absorption of aggregates used in road construction	02
5.	To determine penetration value and softening point of bitumen	02
6.	To determine flash and fire point of bitumen	02
7.	To determine viscosity of bitumen	02
8.	To determine ductility test on bitumen	02
9.	To estimate binder content in bituminous mixture by centrifugal extraction method	02
10.	To determine skid resistance of road pavement	02
11.	To find bearing capacity of soil by Dynamic Cone Penetration Test	02
12.	To determine California Bearing Ratio CBR of soil	02

References

Text Book:

- Khanna, S.K., Justo C.E.G. and A Veeraragavan Highway Engineering, New Chand and Brothers.
- Yang, H. Huang, Pavement Analysis and Design, Pearson Education.

Codes of Practice:



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- IRC 37 (2018), Guidelines for the Design of Flexible Pavements, Indian Roads Congress, 4th Edition.
- IRC 58 (2015), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, Indian Roads Congress.





Class: S. Y. B. Tech Civil	Semester-IV	L	T	P	Credits
Course Code: CE2421	Course Name: Building Planning and Design Laboratory	--	--	4	2

Course Description:

The Building Planning and Design Laboratory course is designed to develop students' skills in building planning and architectural drafting using CAD tools. The course enables students to prepare municipal submission drawings and working drawings of residential buildings. It also provides knowledge and practice in preparing 3-D elevations of buildings using suitable software applications. The course imparts understanding of building construction practices, building components, and principles of building planning through site visits and preparation of technical reports. In addition, students learn to prepare site plans and floor plans of public buildings.

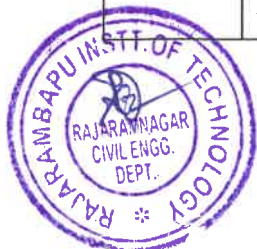
Course Learning Outcomes:

After successfully completing the course, student will able to:

1. Prepare municipal submission and working drawings of residential buildings using CAD tools.
2. Prepare 3-D elevations of residential buildings using suitable software.
3. Explain public building construction practices, building components, and principles of building planning through site visits and preparation of technical reports.
4. Design public building plans and prepare detailed drawings using CAD tools.

Prerequisite: Engineering Graphics and AutoCAD software.

Expt. No.	Name of Experiment	Hrs.
1.	Planning and design of a residential building (minimum 150 sq.m. area). using CAD tools. (Individual Project). Prepare following drawings : 1. Municipal Submission drawing. (08) 2. Working Drawings: a. Detailed Furniture layout plan (04) b. Water supply & drainage plan (04) c. Electrical layout plan (04) d. Centre line plan (04)	24
2.	Preparation of 3-D views/elevations of the planned residential building from all four sides using any suitable software.	08
3.	Two site visits to public buildings and technical report based on the visit.	08



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	Educational Visits: 1. Ongoing Construction Site 2. Completed Public Building Site	
4.	Preparation of site plan and floor plans of any two public buildings using CAD tools.	08

References –

References Books: -

- V. B. Sikka, “A Course in Civil Engineering Drawing”, S. K. Kataria and Sons. Mehta, Scarborough, Armpriest, Building Construction, Pearson Education
- W.B Macay, “Building Construction”, Pearson Education
- S.Mantri, “The A to Z of Practical Building Construction and its Management”, Satya Prakashan.
- C.M. Kale, M.G. Shah, S.Y. Patki, “Building Drawing And Planning With An Integrated Approach To BuiltEnvironment”, Tata McGraw-Hill Education Pvt. Ltd.

Text Books: -

- S. P. Arora, S. P. Bindra, “A Text Book of Building Construction”, Dhanpat Rai Publications
- Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, “Building Construction”, Laxmi Publications.
- S. C. Rangwala, “Building Construction”, Charotar Publishing House Pvt. Limited

Codes of Practice :-

- Unified Development Control and Promotion Regulations:2019 (UDCPR: 2019) for Maharashtra State.
- NBC 2016, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 – 1989, Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi.





Class: S. Y. B. Tech. Civil	Semester: IV	L	T	P	Credits
Course Code : CE2165	Course Name: Fluid Mechanics Laboratory	-	-	02	1

Course Description:

Fluid Mechanics is a core civil engineering course that deals with the study of fluid properties, fluid behaviour at rest and in motion, hydrostatic forces, flow through pipes and open channels, dimensional analysis, and hydraulic machines such as pumps. The course helps students understand and apply fluid flow principles in engineering applications.

Course Learning Outcomes:

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

1. Operate fluid mechanics laboratory instruments for pressure and flow measurements.
2. Perform experiments to verify the fundamental principles of fluid mechanics.
3. Determine flow characteristics and head losses in pipes and hydraulic systems.
4. Evaluate hydraulic parameters using flow measuring devices such as orifices, notches, and Venturimeters.
5. Analyze the performance characteristics of hydraulic pumps and fluid flow systems.

Prerequisite: Fluid Mechanics

Course Content		
Unit No.	Description	Hrs
01	Study and use of pressure measuring devices.	02
02	Verification of Bernoulli's theorem.	02
03	Determination of metacentric height for stability of floating bodies.	02
04	Determination of coefficient of discharge using Venturimeter.	02
05	Identification of flow types using Reynolds apparatus.	02
06	Determination of major head losses in pipe flow.	02
07	Determination of minor head losses due to pipe fittings.	02
08	Determination of coefficient of contraction, velocity, and discharge using an orifice.	02
09	Determination of equivalent pipe diameter for pipes in series and parallel.	02
10	Determination of coefficient of discharge for V-notch and rectangular notch.	02
11	Measurement of flow velocity using wind tunnel apparatus.	02
12	Study of hydraulic pumps and their performance characteristics.	02



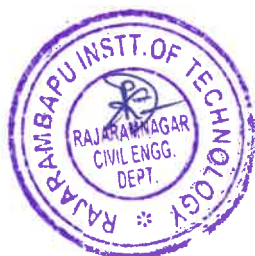


Text Book:

- Modi and Seth, "Hydraulics and Fluid mechanics including Hydraulic Machines" A. D. Computers, New Delhi.
- R. K. Bansal, "Fluid Mechanics" Lakshmi Publications Pvt. Ltd.

Reference Books:

- S. Nagarathanam, "Fluid Mechanics" Khanna Publication, Delhi.
- R. S. Khurmi, "Fluid Mechanics" S. Chand & Company Ltd. New Delhi.
- R. S. Rajput, "Hydraulic & Hydraulic Mechanics" S. Chand & Company Ltd. New Delhi.
- Jagdish Lal, "Fluid Mechanics and hydraulics" Metropolitan Book Co-Ltd.
- Yunus A. Cengel John M. Oimbala, "Fluid Mechanics (SI Units)", Tata McGraw Hill.
- John F. Douglas, Janul and M. Gasiosek and John A. Swaffield "Fluid Mechanics" by Pearson Education Asia".





Class: S. Y. B. Tech Civil	Semester - IV	L	T	P	Credits
Course Code: CE2441	Course Name: Massive Open Online Course (MOOC)- I	-	-	-	01

Course Description:

Massive Open Online Courses (MOOCs) are introduced in the undergraduate Civil Engineering curriculum to expose students to advanced, multidisciplinary, and industry-oriented learning opportunities beyond the traditional classroom. These courses, offered by reputed online platforms such as NPTEL, SWAYAM, Coursera, edX, NASSCOM and others, enable students to gain global perspectives, strengthen core technical knowledge, and explore emerging areas like sustainability, smart infrastructure, construction technology, data analytics, and environmental engineering. By integrating MOOCs, students can learn at their own pace, access high-quality resources, and enhance lifelong learning skills in alignment with the National Education Policy (NEP-2020).

Course Learning Outcomes:

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

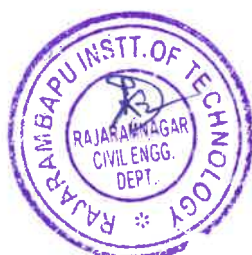
1. Demonstrate the ability to learn independently using online platforms and apply acquired knowledge to civil engineering domains.
2. Develop enhanced conceptual and practical understanding in specialized/emerging areas of civil engineering.
3. Integrate multidisciplinary and global perspectives into engineering problem-solving and project execution.
4. Apply digital literacy and self-paced learning strategies to pursue lifelong learning in line with professional and societal needs.

Note:

1. Student will get the credits of respective course in following conditions,
In case of course selected from NPTEL/SWAYAM/NASSCOM platforms, students have to complete the timely assignments, pass the exam and secure the certificate.
2. While selecting online course, following points must be taken care of,
 - a. Selected course must be approved by Departmental Programme Committee (DPC).
 - b. Duration of each online course must be of at least FOUR weeks for NPTEL/SWAYAM & minimum 12 to 20 hours for NASSCOM.

References-

1. NPTEL (National Programme on Technology Enhanced Learning)
<https://nptel.ac.in>
2. SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)
<https://swayam.gov.in>
3. MOOCs on NASSCOM
www.nasscom.in



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S. Y. B. Tech. Syllabus

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Department of Civil Engineering

Class: - S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : SH2645	Course Name : German Language - Level IV	-	-	2	1

Course Description: This course exposes a learner to LSRW skills of German language. The course takes a student's German language skills to advanced level with situational conversations. The course helps learners in creating cross-cultural sensitization and adaptability skills. Here, a student prepares himself for German language examination.

Course Outcomes:

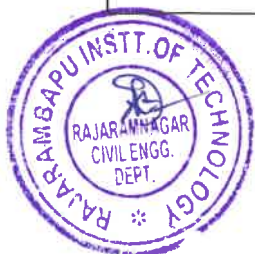
After successful completion of the course, students will be able to,

1. Demonstrate the ability to use German vocabulary and expressions in daily life familiar communicative situations.
2. Apply German grammatical structures, including the imperative, modal verbs (dürfen and sollen), the pronoun man, and W-questions accurately in spoken and written communication.
3. Interpret and respond to simple German conversations, reading passages, and audio texts of everyday situations to extract relevant information.
4. Communicate effectively in German by writing short texts using appropriate vocabulary and grammar.
5. Demonstrate integrated German language proficiency by applying listening, speaking, reading, and writing skills to successfully perform in real-life contexts.

Prerequisite: A Student, who is going to enroll for this course, should have following German language abilities:

1. Adequate knowledge of basic grammar of German language.
2. Intermediate level vocabulary of German language.
3. Communicate moderately using German language.

Course Content		
Experiment No	Description	Hrs
1.	Body parts and Krankheiten(diseases) and home remedies	02
2.	Grammar- Imperative for du ,ihr, Sie	02
3.	Health tips and conversation at clinic Modal verbs - dürfen & sollen	02
4.	Professions related to health	02
5.	Vocabulary of vacation and activities in vacation	02



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6.	Writing a postcard Grammar- Pronoun - man	02
7.	Topic- Weather Reading texts related to vacation and formation of “W” questions	02
8.	Grammar revision for the entire book	02
9.	Explaining the pattern of the exam and explanation of each skill's exam requirement	02
10.	Practice for Skill “Writing” and “Speaking”	02
11.	Practice for skill “Reading” and “Listening”	02
12.	Solving exam set 1 Speaking practice	02
13.	Solving exam set 2 speaking practice	02

References -

1. Studio D – A 1, Cornelsen Verlag, Goyal Publishing House, New Delhi.
2. Tangram aktuell A 1, Goyal Publishing House, New Delhi.
3. Lagune A 1, Goyal Publishing House, New Delhi.
4. Netzwerk A 1, Goyal Publishing House, New Delhi.

The extra notes will be provided to the students to complete the required syllabus.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.





Class: - S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : SH2625	Course Name : Japanese Language - Level IV	-	-	2	1

Course Description: This course is designed to introduce students to the everyday language of Japan. Lessons are organized around natural conversational topics, leading students from fundamental to advanced aspects of grammar to readings in simple texts.

Course Outcomes:

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

- 1) To be able to make basic conversations in various situations.
- 2) To recognize the sentence patterns.
- 3) To improve Japanese Language proficiency.
- 4) To give students insights about the communication required for living in Japan.
- 5) To expose students to the Japanese work ethics required in their professional careers.

Prerequisite: A Student, who is going to enroll for this course, should have following Japanese language abilities:

- 1) Knowledge of basic grammar of Japanese Language.
- 2) Communicate moderately using Japanese Language.

Course Content		
Experiment No	Description	Hrs
1	How to make た forms of the verbs.	02
2	To express “have the experience of “ using た forms of the verbs.	02
3	To express two or more than two actions in one list using た forms of the verbs.	02
4	Polite forms & plain forms (Style of speech)	02
5	Conversation in plain forms & polite forms.	02
6	To express ideas or judgements.	02
7	Report speech.	02
8	To express recommendation, suggestion.	02
9	How to seek agreement or confirmation from the listener.	02
10	Noun modification.	02
11	Describing an appointment, errand.	02



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12	Rules while using とき	02
13	Verbs used for giving & receiving of things (polite & plain forms)	02
14	Conditional forms of verbs, adjectives & nouns.	02
15	Subject of subordinate clause.	02

***Note:** Words written phonetically using the Latin alphabet (*romaji*) will be only used in the very initial stage to aid learning pronunciations.

References -

1. Minna No Nihongo I (3A Corporation, Japan), Publications: Goyal publishers.
 2. Nihongo shouhou, Publication: JALTAP
- Other reference material, practice papers & CDs for listening practice.
The extra notes will be provided to the students as per the requirement of the syllabus.

Evaluation Scheme: ISE – 100 Marks (Minimum Passing: 50%)

Evaluation Method: In every session students will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.

