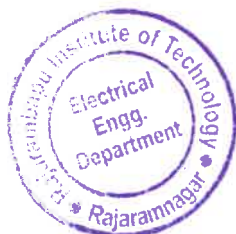




K.E. Society's
Rajarambapu Institute of Technology, Rajaramnagar
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Curriculum Structure and Evaluation Scheme
To be implemented for 2025-29 & 2026-30 Batch
Department of Electrical Engineering

B.Tech. in Electrical Engineering with Multidisciplinary Minor





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Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-29 & 2026-30 Batch

Department of Electrical Engineering

Class: S. Y. B. Tech

Semester: III

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW-SL	Total Hr.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max	Min. for passing	Max.	Min. for passing	
EE2015	DC Machines and Transformer	3	-	-	54	90	3	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
EE2151	Electrical Circuit Analysis	3	1	-	72	120	4	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
EE2111	Mathematics for Electrical Engineers	3	-	-	54	90	3	ISE	20	40	40	----	----
								UT1	15			----	----
								UT2	15			----	----
								ESE	50			40	----
EE2131	Power Transmission and Distribution Systems	3	-	-	54	90	3	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	--
EE2515	DC Machines and Transformer Lab	-	-	2	6	30	1	ISE	----	----	----	50	50
								ESE	----			50	50
EE263	Python Programming Lab	-	-	2	6	30	1	ISE	----	----	----	50	50
								ESE	--			--	50
EE2611	Electrical Maintenance and Troubleshooting	-	-	2	6	30	1	ISE	----	----		100	50
	Professional Skills Development and Foreign Languages	-	-	2	6	30	1	ISE	-	-	-	100	50
	TOTAL	16	1	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 Electrical Engineering

Sr. No.	Subject Name		Course Code
1.	Professional Skills Development and Foreign Languages	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.		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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Curriculum Structure and Evaluation Scheme
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Department of Electrical Engineering

Class: S. Y. B. Tech

Semester: IV

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW-SL	Total Hr.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max	Min. for passing	Max	Min. for passing	
EE2065	Analog and Digital Electronics	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE2025	AC Machines	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE2141	Electrical Measurement and Instrumentation	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE2085	Signals and Systems	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
	Multidisciplinary Minor-II	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE218	AI for Electrical Engineers	2	-	-	36	60	2	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE2525	AC Machines Lab	-	-	2	6	30	1	ISE	---	---	---	50	50
								ESE	--			--	50
EE2545	Analog and Digital Electronics Lab	-	-	2	6	30	1	ISE	---	---	---	50	50
								ESE	---			--	50
EE2621	Electrical Measurement and Instrumentation Lab	-	-	2	6	30	1	ISE	---	---	--	100	50
EE2701	MOOCS-I**	-	-	-	30	30	1	ISE	---	----		100	50
EE272	AI for Electrical Engineers Lab	-	-	2	6	30	1	ISE	---	----		100	50
	Professional Skills Development and Foreign Languages	-	-	2	6	30	1	ISE	-	-	--	100	50
	TOTAL	17	-	10	366	690	23						
	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 : 23

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.

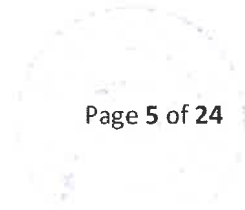
Note:** MOOCS-I course certification marks will be carried out for the credits





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Department of Electrical Engineering

Sr. No.	Subject Name		Course Code
1.	Professional Skills Development and Foreign Languages	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 IV	SH2645
6.		Japanese Language – Level IV	SH2625





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Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-29 & 2026-30 Batch
 Department of Electrical Engineering

Class: T. Y. B. Tech

Semester: V

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW-SL	Total Hr.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max	Min. for Passing	Max	Min. for passing	
EE3035	Power System Analysis	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE3131	Feedback Control System	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE3151	Microcontroller & Its Applications	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
	Program Elective -I	2	-	-	36	60	2	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
	Open Elective-I	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
	Multidisciplinary Minor-III	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
	Multidisciplinary Minor-IV	1	-	2	24	60	2	ISE	--	--	--	100	50
SH3036	Scholastic Aptitude-I	2*					Audit	ISE	100	50 (P/NP)	--	--	--
EE3611	Feedback Control System Lab	-	-	2	6	30	1	ISE	--	--	--	50	50
								ESE	--	--	--	50	50
EE3631	Microcontroller Lab	-	-	2	6	30	1	ISE	---	---	--	50	50
								ESE	---	---	--	50	50
EE3591	Advanced Software Lab	-	-	2	6	30	1	ISE	---	---	--	100	50
EE3651	Industrial Training	-	-	-	30	30	1	ISE	---	---	---	100	50
EE3691	Mini Project-I	-	-	6	18	90	3	ISE	---	---	--	50	50
								ESE	---	---	--	50	50
EE3671	MOOCS-II**	-	-	-	30	30	1	ISE	---	---	---	100	50
	TOTAL	18+2* = 20*	-	14	426	810	27						
	TOTAL CONTACT HOURS	34*											

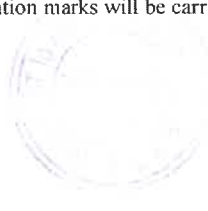
ISE: In Semester Evaluation, UT-I: Unit Test-I, UT-II: Unit Test-II, ESE: End Semester Exam, P = Pass, NP = Not Pass, TW: Term Work, SL: Self Learning

Total Contact Hours/week : 34*

Total Credits : 27

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

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





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Curriculum Structure and Evaluation Scheme
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Department of Electrical Engineering

Program Elective-I

Sr. No	Course Code	Domain	Course
1	EE3095	Power and Energy Systems	Energy Storages Technologies
2	EE3115		Restructured Power System
3	EE3135	Drives and Control	Digital Signal Processing
4	EE3155		Electrical Utilization and Traction

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	Civil Engineering
6	OE3651	Distributed Systems	Computer Science and Information Technology
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	Robotics & Automation
12	OE3531	Factory Automation	Mechatronics Engineering
13	OE3551	Cyber Physical System	Mechatronics Engineering
16	OE3571	Internet of Things	Electronics & Telecommunication Engineering
17	OE3591	Drone Technology	Electronics & Telecommunication Engineering
18	OE3511	Hydrogen Fuel Cell Technology	Mechanical Engineering





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Curriculum Structure and Evaluation Scheme
 To be implemented for 2025-29 & 2026-30 Batch
 Department of Electrical Engineering

Class: T. Y. B. Tech

Semester: VI

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW-SL	Total Hr.	Credits	Scheme	Theory (%Marks)		Practical (%Marks)		
									Max	Min. for passing	Max	Min. for passing	
EE322	Power System Protection	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE3045	Power Electronics	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
EE3161	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)	--	--	--
EE3545	Power Electronics Lab	-	-	2	6	30	1	ISE	--	--	--	50	50
								ESE	--	--	--	50	50
EE3601	Automation and Control Lab	-	-	2	6	30	1	ISE	---	---	---	100	50
EE3641	Power System Protection Lab	-	-	2	6	30	1	ISE	--	--	--	50	50
								ESE	--	--	--	50	50
EE3661	Minor Project	-	-	12	36	180	6	ISE	--	---	---	50	50
								ESE	--	--	--	50	50
	TOTAL	17+2* = 19*	-	18	360	780	26						
	TOTAL CONTACT HOURS	37*											

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

Total Contact Hours/week : 37*

Total Credits : 26

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





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Department of Electrical Engineering

Program Elective – II

Sr. No.	Course Code	Discipline	Course
1	EE3065	Power and Energy Systems	Electrical Energy Conservation and Auditing
2	EE3181		Battery Management Systems
3	EE3105	Drives and Control	Advanced Control Systems
4	EE3125		Application of Microcontrollers in Electrical Engineering

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	Computer Science & Engineering (Artificial Intelligence and Machine Learning)
4	OE3481	Information Technology Foundation Program	Computer Science and Engineering
5	OE3661	AI for Cybersecurity	Computer Science and Engineering
6	OE3085	Materials Management	Civil Engineering
7	OE3501	Operations Research	Civil Engineering
8	OE3581	Plumbing (Water and Sanitation)	Civil Engineering
9	OE3402	Cyber Security	Computer Science and Information Technology
10	OE3641	AI for Manufacturing	Computer Science and Information Technology
11	OE3285	Supply Chain Management	Mechanical Engineering
12	OE3325	Entrepreneurship Development	Mechanical Engineering
13	OE3025	Reliability Engineering	Robotics & Automation
14	OE3621	Flexible Manufacturing System	Robotics & Automation
15	OE3521	Image Processing	Electronics & Telecommunication Engineering
16	OE3541	Fuzzy Logic & Neural Network	Electronics & Telecommunication Engineering
17	OE3701	AI for Sustainability	Electronics & Telecommunication Engineering



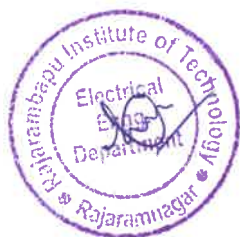


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Curriculum Structure and Evaluation Scheme
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Department of Electrical Engineering

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



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 Department of Electrical Engineering

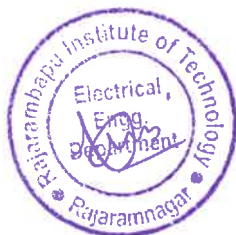
Class: Final Year B. Tech

Semester: VII

Final Year Elective															
Course Code	Course	Teaching Scheme						Credits	Scheme	Evaluation Scheme					
		L	T	P						Theory (%Marks)			Practical (%Marks)		
										Max.	Min. for passing		Max.	Min. for passing	
EE4111	Solar and Wind Energy Systems	2	-	-	36	60	2	ISE	20	40	40	---	---		
								MSE	30			---	---		
								ESE	50			---	---		
EE4131	Electrical Vehicle	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---	---		
								ESE	50			---	---		
EE4035	Electrical Drives	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---	---		
								ESE	50			---	---		
EE4191	Control System Design	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		
EE4731	Solar and Wind Energy Systems Lab	-	-	2	6	30	1	ISE	--	---	----	100	50		
EE4751	Electrical Vehicle and Drives Lab	-	-	2	6	30	1	ISE	--	---	----	50	50		
								ESE	--	---	----	50	50		
	TOTAL	17	-	6	324	600	20								
	TOTAL CONTACT HOURS	23													

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

Total Contact Hours/week : 23
Total Credits : 20





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Program Elective-III

Sr. No.	Course Code	Discipline	Course
1	EE4055	Power and Energy Systems	Power System Dynamics and Control
2	EE4075		HVDC Transmission Systems
3	EE4095	Drives and Control	Nonlinear Control Systems
4	EE4291		Power System Operation and Control

Program Elective-IV Theory

Sr. No.	Course Code	Discipline	Course
1	EE4135	Power and Energy Systems	High Voltage Engineering
2	EE4155		Power Quality and Harmonics
3	EE4115	Drives and Control	FACTS Controllers
4	EE4175		Smart Grids

Program Elective-IV Lab

Sr. No.	Course Code	Discipline	Course
1	EE4651	Power and Energy Systems	High Voltage Engineering Lab
2	EE4671		Power Quality and Harmonics Lab
3	EE4691	Drives and Control	FACTS Controllers Lab
4	EE4711		Smart Grids Lab



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Curriculum Structure and Evaluation Scheme
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 Department of Electrical Engineering

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 Hr.	Credits	Scheme	Theory (%Marks)			Practical (%Marks)	
									Max.	Min. for passing		Max.	Min. for passing
OE4383	Finance for Engineers (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
OE4363	Engineering Management & Economics (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
IP4025	Industry Internship & Project	-	-	-	360	360	12	ISE	---	----		50	50
								ESE	---	---		50	50
	TOTAL	-	-	-	-	-	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.





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 Department of Electrical Engineering

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 Hr.	Credits	Scheme	Theory (%Marks)			Practical (%Marks)	
									Max.	Min. for passing		Max.	Min. for passing
OE4383	Finance for Engineers (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
OE4363	Engineering Management & Economics (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
RE4045	Research Internship	-	-	-	360	360	12	ISE	---	---		50	50
								ESE	---	---		50	50
	TOTAL	-	-	-	-	-	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.



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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	-	-	36	60	2	ISE	25	40	40	-	-
								ESE	75	40		-	-
ED4045	Commercial Aspects of the Project (Online Course)	2	-	-	36	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	-	-	-	-	-	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.

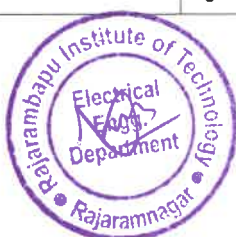
4] Students who opt for an entrepreneurial internship need to undergo a one-month internship at an outside reputed organization or firm



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

Multidisciplinary Minor Baskets 25-29					
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	



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Electronics System Design	1	ECMD2011	Electronics Devices and Applications	III	Electronics & Telecommunication Engineering
	2	ECMD2021	Electronics Communication Systems	IV	
	3	ECMD3011	Advanced Communication Systems	V	
	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	

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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 Intelligence	1	AIMD2011	Object Oriented Programming	III	Computer Science & 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 Electrical Engineering with Double Minor (Multidisciplinary and Specialization Minor)



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



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



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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 Electrical Engineering-Honors with Research and Multidisciplinary Minor degree Student need to earn total 188 Credits which consist 169 credits of regular Multidisciplinary Minor courses and 18 credits of Research courses.

Class: Final Year B. Tech

Semester: VII

Course Code	Course	Teaching Scheme						Evaluation Scheme					
		L	T	P	TW-SL	Total Hr.	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	-	-	-	-	-	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 Hr.	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	-	-	-	-	-	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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Class:- S.Y. B. Tech.	Semester- III
Course Code: EE2015	Course Name: DC Machines and Transformer

L	T	P	Credits
3	--	--	3

Course Description:

The course focuses on understanding the basic principles, operation, performance, control, testing, and maintenance of DC machines and transformers. These are widely used in power generation, transmission, distribution, utilization systems, and traction applications. The knowledge and skills gained help students in advanced subjects like power system operation and control, switchgear and protection, and support careers as electrical supervisors, testing engineers, and procurement engineers.

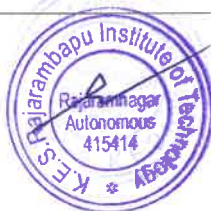
Course Learning Outcomes:

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

1. Explain working and operation of single-phase and three-phase transformers.
2. Analyze performance with different applications of single-phase and three-phase transformers.
3. Evaluate the performance of the DC Machine.
4. Interpret characteristics of DC machines.
5. Identify a suitable DC Machine and transformer for industrial applications.

Prerequisite: Basic Electrical Engineering, Engineering mathematics and Engineering Physics.

Course Content		
Unit No	Description	Hrs
1	Single Phase Transformers: Single-phase Transformer-EMF equation, equivalent circuit refer to either sides, transformer on different loads, phasor diagram, voltage regulation, losses, efficiency, maximum efficiency, all day efficiency, energy efficiency, performance characteristics, testing.	06
2	Three Phase Transformers: Construction, working principle, connections, factors affecting the choice of connection, voltage phasor diagram, vector groups, open delta or V-V connection, performance characteristics.	06
3	Applications, Standards and Troubleshooting of Transformers: Applications of various transformers, Scott connections, auto transformers, troubleshooting of various transformers and, study of relevant Indian Standard Specifications, transformer cooling, parallel operation of transformer, testing.	06





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4	D.C. Machine: Electromechanical Energy conversion- Principle of energy conversion, Magnetic system, Construction details, working principle, back EMF, generated EMF, types of DC Machines, armature reaction, effect of armature reaction, commutation, magnetizing and demagnetizing ampere turns, torque equation, speed equation.	06
5	Characteristics and Testing of DC Machine: Open circuit characteristics of DC generator, DC motor: break test, Swinburne test, Hopkinson's test, losses and efficiency, types of starters, speed control and braking methods of DC Motors,	06
6	Special purpose machines and Trouble Shooting of DC Machines: Permanent Magnet DC Motor (PMDC), Brushless DC Motor (BLDC), Steeper Motor, Servo Motor, SRM, Universal motor. Applications of various, DC motors, various equipment's used to diagnose fault, troubleshooting of various DC motors and study of relevant Indian Standard Specifications.	06

References -

Text Books:

- Ashfaq Hussain, Electric Machines, Dhanpat rai & Co. Ltd.
- B. L. Theraja, A. K. Theraja, Electrical Technology, S. Chand Publications, AC and DC Machines.

Reference Books:

- Bimbhra.P.S, Electrical Machinery, Khanna Publishers, IL Kosow, Electrical Machines & Transformers, Prentice Hall of India.
- Kothari.D.P and Nagrath.I.J., Electrical Machines, Tata McGraw Hill Publishing Co.Ltd, New Delhi.
- Hill Stephen, Chapman.J, Electric Machinery Fundamentals, McGraw Hill Book Co., New Delhi.





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Class: - S. Y. B. Tech.	Semester- III
Course Code: EE2151	Course Name: Electrical Circuit Analysis

L	T	P	Credits
3	1	-	4

Course Description:

This course introduces the fundamental principles of electrical circuit theory used in engineering analysis and research applications. It covers network topology, graph theory, mesh and nodal analysis, source transformations, and network theorems for systematic circuit analysis. The course addresses DC and AC circuits under steady-state and transient conditions, including time and frequency domain responses. Topics include three-phase systems (balanced and unbalanced), resonance in RLC circuits, power calculations, two-port network parameters, switching behaviour of circuits, and basic analog filter design.

Course Learning Outcomes:

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

1. Apply graph theory and network theorems techniques to solve AC and DC circuits.
2. Analyze three-phase systems and resonant circuits in electrical circuits.
3. Model and analyze two-port networks using different parameter representations.
4. Analyze transient response of first and second order circuits under switching conditions.
5. Design and analyze basic analog filters for practical applications.

Prerequisite: Basic Electrical Engineering, Engineering Mathematics.

Course Content		
Unit No	Description	Hrs
1	Network Topology: Graph Theory, Incidence Matrix, Fundamental Loop Matrix, Fundamental Cut set Matrix, Mesh and Nodal Analysis, Star-Delta Transformation, source transformation, Duality.	06
2	Network Theorems: Superposition, Thevenin's, Norton's, Maximum power transfer, Tellegen's Theorem (AC and DC). Time and Frequency domain analysis of circuits for step, ramp, exponential and damped exponential inputs.	06





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3	Three Phase System and Resonance: Introduction to Balanced and Unbalanced Three phase systems, Analysis of three phase systems, calculation of real and reactive powers. Resonant Circuits: Analysis of simple series RLC and parallel RLC circuits under resonances. Resonant frequency, Bandwidth and Quality factor at resonance.	06
4	Two Port Network: Open circuit impedance, Short circuit admittance and Transmission parameters and their evaluation (Z, Y, H, ABCD). Relationship among these different parameters, Network functions for two port network.	06
5	Transient Analysis: Review of ordinary linear non-homogeneous first and second order differential equations with constant coefficients. Transient analysis of dc circuits by classical method for unit step input only. Behavior of circuit elements under switching action. Evaluation of initial conditions.	06
6	Elements of Filter Design: Low-Pass, high pass, band-pass and band stop filters; Butter worth and Chebyshev approximations; Design of 1st order and 2nd order low-pass filters; Application of filters in power systems.	06

References -

Text Books:

- Charles K. Alexander and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education
- Ravish R. Singh, Network Theory: Analysis and Synthesis, McGraw Hill Education (India) Pvt. Ltd.

Reference Books:

- Thomas L. Floyd, Principles of Electric Circuits, Pearson Prentice Hall.
- William H. Hayt, Jack E. Kemmerly, Engineering Circuit Analysis, McGraw Hill International.
- A. Sudhakar and Shyam Mohan S Palli, Circuits and Networks: Analysis and Synthesis, McGraw Hill.





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Class:- S. Y. B. Tech.	Semester-III	L	T	P	Credits
Course Code : EE2111	Course Name : Mathematics for Electrical Engineers	3	-	-	3

Course Description:

Engineering Mathematics - III is offered at the third semester of second year of four-year engineering degree course. This course intends to build the competency in the students to apply the concepts learnt in respective modules to various engineering problems. It contains six units which accomplish the fundamentals of mathematics required for Engineers.

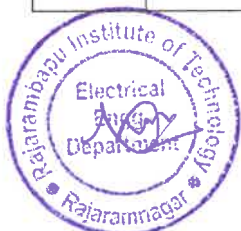
Course Learning Outcomes:

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

1. Solve Linear Differential equations related to engineering application in electrical Engineering.
2. Find and represent periodic functions using Fourier series.
3. Apply rules of vector differential calculus to evaluate gradient, divergence and conservative vector field.
4. Apply Laplace transform and Z-transform by using properties to various functions to solve electrical engineering problems.
5. Identify an appropriate probability distribution and use its properties to calculate probabilities

Prerequisite: Higher Secondary Mathematics, Engineering Mathematics-I & II

Course Content		
Unit No.	Description	Hrs
1	Linear Differential Equations and Its Applications: Introduction & Definition of Linear Differential Equations, Complementary Function (CF) – Constant Coefficient Method, Particular Integral (PI) – Various Cases, Complete Solution of LDE, Application to RL and RC Circuits, Application to RLC Circuits & Problem Solving.	06
2	Fourier Series: Euler's formula and basic concepts of Fourier Series including Dirichlet's conditions and Fourier coefficients, Fourier Series for even functions (cosine series), Fourier Series for odd functions (sine series), Fourier Series for arbitrary period $2L$, Half range Fourier cosine and sine series, Application of Fourier analysis in voltage and current waveforms Euler's Formula & Basic Concepts of Fourier Series, Even Functions in Fourier Series, Odd Functions in Fourier Series, Fourier Series for Arbitrary Period Half Range Fourier Series, Application of Fourier Analysis of Voltage & Current Waveforms.	06



3	Vector Analysis and its Interpretation: Scalar and vector point functions, Differentiation of vectors, Gradient and directional derivative, Divergence and solenoidal vector fields., Curl and irrotational vector fields, Applications of Coulomb's Law and Gauss's Law	06
4	Laplace Transform and Its Applications: Definition of Laplace Transform and conditions for existence, Laplace transforms of standard functions including exponential, trigonometric and unit step functions, Properties of Laplace Transform such as linearity, shifting, differentiation and integration, Inverse Laplace Transform using partial fractions and basic convolution concept, Laplace Transform of periodic functions and related formula, Applications of Laplace Transform to solve ordinary differential equations and electrical circuits (RL, RC, RLC)	06
5	Z-Transform: Definition of Z-Transform and region of convergence, Z-transform of standard functions such as unit step, exponential, sine and cosine sequences, Properties of Z-Transform including linearity, shifting and multiplication by n Inverse Z-Transform using partial fraction and power series methods, Application of Z-Transform to solve linear difference equations, Use of Z-Transform in electrical engineering problems and discrete-time system analysis.	06
6	Probability Distributions: Random variable and its probability distribution, Discrete probability distributions and Continuous probability distributions, Binomial distribution (mean, variance, applications), Poisson distribution (mean, variance, applications), Normal distribution and its properties. Application in communication systems to find error rate and probability of error	06

References -

Textbook:

- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
- N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi

Reference Books:

- Erwin Kreyszig, Advanced engineering mathematics, 9th edition, Wiley.
- Raman B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
- S. S. Sastry, Introductory Methods of Numerical Analysis.
- Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing house
- P. N. Wartikar and I.N. Wartikar, A Text book of Applied Mathematics, Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune.





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Class:-S. Y. B. Tech.	Semester- III	L	T	P	Credits
Course Code: EE2131	Course Name: Power Transmission and Distribution System	3	-	-	3

Course Description:

The power system comprises of generation, transmission and distribution of electric power. This course covers economics of power generation, different types of tariffs, various parameters associated with transmission and distribution in terms of overhead and underground systems through use of different types of cables. Moreover, this course covers importance of power factor in power system and minimization of voltage drop in distribution system.

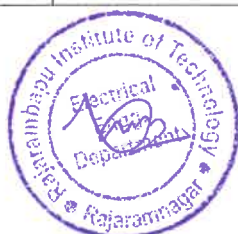
Course Learning Outcomes:

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

1. Estimate impact of various parameters on economics of generation.
2. Calculate different transmission line parameters
3. Select different components of overhead transmission lines and cables
4. Explain various phenomena occurring in power system
5. Identify importance of power factor and choose distribution system with minimum power loss.

Prerequisite: Basic Electrical Engineering, Basic Mathematics and Physics.

Course Content		
Unit No	Description	Hrs
1	Economics of Power Generation : Structure of power system, major equipment in power station, types of loads, load curves and selection of generating units, important terms and factors, Economics of power generation, different types of tariffs used by utilities.	06
2	Mechanical design of overhead lines: Main components of overhead lines, different conductor materials, different insulators, string efficiency, methods of improving string efficiency, Corona and factors affecting corona, sag in overhead lines.	06
3	Electrical Design of overhead lines: Resistance of a transmission line, inductance of a single/three phase lines, capacitance of a single/three phase lines. Skin, proximity and Ferranti effects in power system	06
4	Electrical Underground Cables: Underground cables types, Construction of single core and 3 core cables, Insulation Resistance, Potential Gradient, Capacitance of Single-core and 3 core cables, Grading of cables	06





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5	Supply systems: AC and DC transmission systems and its comparison. Different systems of power transmission, comparison of conductor material required in AC and DC system. Economics of power transmission.	06
6	Distribution System: Classification of distribution system, distributors fed at one / both end with equal and unequal voltages, Power loss calculations. AC distribution system and its voltage/ power loss calculation.	06

References -

Text Books:

- V.K Mehta, Principles of Power Systems, S. Chand
- Ashfaq Husain, Electrical Power System, CBS Publication

Reference Books:

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





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

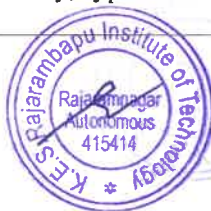
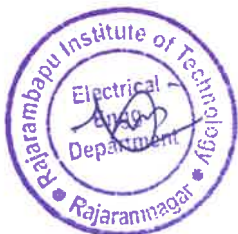
Course Outcomes:

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



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 and Sons.
- 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 Built Environment", Tata McGraw-Hill Education Pvt. Ltd.

Text Books: -

- S. P. Arora, S. P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications
- B. C. Punmia, "A Text Book 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.





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Class: - S.Y. B. Tech.	Semester - III	L	T	P	Credits
Course Code: CSMD2011	Course Name: Introduction to Data Structures	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. 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.	Description	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:

- "Data Structures using C, A Practical Approach for Beginners" by Amol M. Jagtap & Ajit S. Mali
- Data structures -- Seymour Lipschutz (MGH) Schaum's Outlines.
- Introduction to Data Structures in C – Ashok N. Kamthane (Pearson Education).

Reference Books:

- Data structures and Algorithms -- Alfred V. Aho, John E. Hopcroft, J. D. Ullman (Addison- Wesley Series)
- Data Structure using C -- ISRD Group (TMH) 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.

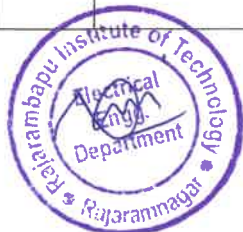
Course Learning Outcomes:

After successful completion of the 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.

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

Course Content		
Unit No	Description	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





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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 technology, Numerical on thermal power generation.	06
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 Publication.
- Rao, S. and Parulekar, B.B., Energy Technology: Non-Conventional, Renewable and Conventional, Khanna Publishers.

Reference Books:

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





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Class : S. Y. B. Tech.	Semester : III	L	T	P	Credits
Course Code : ECMD2011	Course Name : Electronics Devices and Applications	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 Learning Outcomes:

After successful completion of the 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.	Description	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





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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, Decoder.	06
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:

- Boylestad, Robert & Louis, Nashelsky, "Electronics Devices and Circuit Theory", Pearson, 11th Edition, 2015
- Ramakant Gayakwad, Op-Amps and Linear Integrated Circuits, PHI, 4th Edition, 2007
- A. Anand Kumar, "Fundamentals of Digital Circuits", PHI, 4th Edition, 2019

Reference Books:

- Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, 3rd, Tata McGraw Hill, 2002
- R. P. Jain, Modern Digital Electronics, Tata McGraw Hill, 4th Edition, 2017



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 Learning Outcomes:

After successful completion of the 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	Description	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 array, 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



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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

References -

Text Books:

- G. S. Baluja, "Data Structure Through C: A Practical Approach", Dhanpat Rai Publications.
- S. Tanenbaum, Y. Langsam, M. J. Augenstein, "Data Structure using C", (PHI).

Reference Books:

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





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

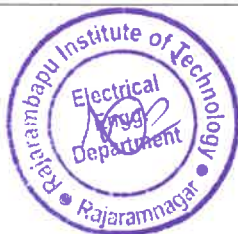
Course Learning Outcomes:

After successful completion of the 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	Description	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.



Class: S. Y. B. Tech.	Semester: III	L	T	P	Credits
Course Code: MEMD205	Course Name: I. C. Engine	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 Learning Outcomes:

After successful completion of the 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	Description	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





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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
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	L	T	P	Credits
Course Code: MCMD2011	Course Name: Fundamentals of Mechatronics	3	-	--	3

Course Description:

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

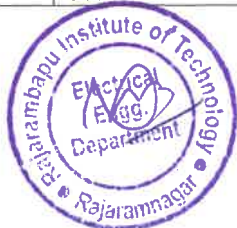
Course Learning Outcomes:

After successful completion of the 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.	Description	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 -

Textbooks:

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

Reference Books:

- Introduction to Mechatronics & Measurement System, David G. Alciatore, Michael B. Histan, 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.

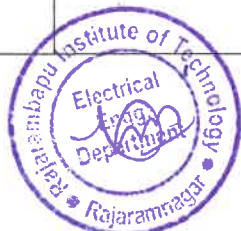
Course Learning Outcomes:

The course should enable the students 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	Description	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
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





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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, Osborne
- Charles Dierbach, "Introduction to Computer Science Using Python", Wiley India
- ReemaThareja, "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	L	T	P	Credits
Course Code: RAMD2011	Course Name: Fundamentals of Robotics & Automation	3	-	--	3

Course Outcomes:

After successful completion of the 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.	Description	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
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



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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", 2nd Edition, McGraw Hill Publication TMH.
- S. K. Saha, "Introduction to Robotics", 2nd Edition, TMH, 2014.
- 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. 2005.
- Fu K.S, "Robotics", McGraw Hill, 2004.
- Niku SB, "Introduction to Robotics – Analysis, Control, Applications", 3rd Edition, John Wiley & Sons Ltd., 2020.

NPTEL Course on Robotics:

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





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Class:- S.Y. B. Tech. (All Branches)	Semester- III	L	T	P	Credits
Course Code : SH2175	Course Name: Environmental Science	1	-	2	2

Course Description:

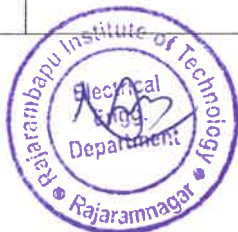
The syllabus of Environmental Science provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment 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





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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 (Causes, sources, effects & control measures), Hazardous waste management, Plastic waste management, E-waste management. Disaster management and risk analysis.	04
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.



Class:- S.Y. B. Tech.	Semester- III	L	T	P	Credits
Course Code: EE2515	Course Name: DC Machines and Transformer Lab	--	--	2	1

Course Description:

This laboratory course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance and testing of DC Machines. The course orient student to understand the theoretical and practical dimensions. In this lab course, students will be familiar with the use of different equipment's and safety precautions on work place.

Course Learning Outcomes:

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

1. Perform polarity and O.C. S.C. test on the Transformer.
2. Interpret the load characteristics of the Transformer.
3. Demonstrate speed control characteristics of DC Machines.
4. Identify characteristics of various machines along with their efficiencies.
5. Analyze various parameters of the DC machines.

Any 10 Exp from given list.

Expt. No.	Description	Hrs
1	To perform polarity test of a Single-Phase transformer.	02
2	To draw an Equivalent circuit of a Single-Phase transformer by Open Circuit (O. C.) and Short Circuit (S. C.) Test	02
3	To calculate the efficiency of a Single-Phase Transformer by direct loading	02
4	To perform the parallel operation of Single-Phase transformers.	02
5	To plot the load characteristics of a Three-Phase transformer by direct loading.	02
6	To plot magnetizing characteristics of a self-excited and separately excited DC shunt generator.	02
7	Speed control of self-excited DC shunt motor by field, armature control method.	02
8	Speed control of separately excited DC shunt motor by field, armature and voltage control method.	02
9	To plot the performance characteristics of DC Motor by break load test.	02
10	To check the performance of DC Motor by conducting the Swinburne Test.	02
11	To check performance of two identical DC Machines by Hopkinson's (regenerative) Test.	02
12	To study the load characteristics of the shunt, cumulative, and differential compound motor.	02



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Class:- S. Y. B. Tech.	Semester- III	L	T	P	Credits
Course Code : EE263	Course Name : Python Programming Lab	-	-	2	1

Course Description:

This laboratory course will introduce students to Python programming and its applications in solving electrical engineering problems. Students will develop programs using Python fundamentals, data structures, numerical computing libraries, and data visualization tools. The course will emphasize computational analysis of electrical circuits, electrical machines, and power systems through practical programming exercises. It will also prepare students to use Python for engineering analysis, simulations, data processing, and future interdisciplinary applications.

Course Learning Outcomes:

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

1. Develop Python programs using programming constructs, functions, data structures, and file handling.
2. Apply NumPy, Pandas, and Matplotlib for numerical computation, data analysis, and visualization.
3. Analyze electrical circuits and engineering problems using Python programming.
4. Develop Python applications for transformer, transmission line, and power system analysis.
5. Design Python-based solutions for engineering analysis, simulation, and data processing.

Prerequisite: Fundamentals of C Programming, Engineering Mathematics, and Basic Electrical Engineering.

Course Content

Exp. No	Description	Hrs
1	Introduction to Python programming environment	02
2	Introduction to Python: variables, data types, input/output and operators	02
3	Implementation of decision-making and looping statements	02
4	Develop a program to perform operations on dictionaries and sets	02
5	Develop a program to visualize engineering data using matplotlib	02
6	Develop a program for electrical parameter analysis	
7	Analysis of RL and RC circuit transient response	02
8	Simulation of frequency response of RLC circuits	02
9	Development of an electrical power and energy calculator	02
10	Performance analysis of single-phase transformer	02
11	Performance analysis of short and medium transmission lines	02
12	Analysis and visualization of electrical measurement data	02





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Class:- S. Y. B. Tech.	Semester- III	L	T	P	Credits
Course Code: EE2611	Course Name: Electrical Maintenance and Troubleshooting	--	--	2	1

Course Description:

This course covers the fundamentals and techniques of troubleshooting and maintenance of electrical equipment and connections. Electrical Power system consists of a number of transformers, circuit breakers and other equipment which require installation, commissioning and regular maintenance to prevent permanent breakdown. Many times an engineering graduates has to carry out/supervise installation, commissioning and maintenance of various electrical equipment in power stations, substations and industry. This course will enable the engineering graduates to understand the concepts, principles and acquire basic skills of installation, commissioning and maintenance of electrical equipment in power stations, substations and industry.

Course Learning Outcomes:

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

1. Demonstrate safe practice to prevent electrical accidents while handling electrical tools/equipment.
2. Use tools/instruments for installation and to generate technical reports.
3. Conduct various tests as per IS on electrical equipment/machines.
4. Prepare maintenance schedule of different equipment/machines.
5. Develop trouble shooting chart for various electrical equipment, machines & domestic appliances.

Prerequisite: Basic Electrical Engineering.

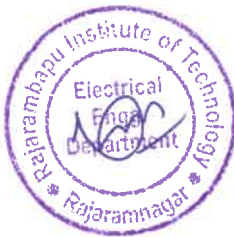
Expt. No.	Description	Hrs
1	Introduction to electrical instruments used in maintenance and troubleshooting.	02
2	Demonstration of the action to be taken during an electrical accident.	02
3	Undertake Mook drill Operation Using fire extinguisher and demonstration of Fire extinguishing system.	02
4	Measure insulation resistance of winding/cables/electrical equipment.	02
5	Prepare plate/pipe/rod earthing and conduct earth testing as per IS.	02
6	Troubleshooting of ceiling fan & fluorescent and LED tube light.	02
7	Prepare plate/pipe earthing as per IS.	02





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8	Perform various tests on insulating oil.	02
9	Cutting copper and aluminum cable and crimping lug to them from 4mm ² to 25mm ² cross section.	02
10	Troubleshooting DC generator, repair and test it to run.	02
11	Study battery charger and make charging of lead acid battery.	02
12	Prepare maintenance schedule of induction motor & power transformer.	02





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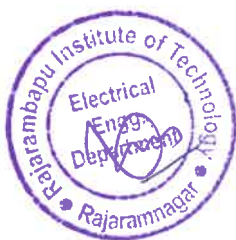
Choice Based Professional Skills Development and Foreign Languages Programme
for
Second Year B. Tech.
(Sem. III)

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. Japanese Language - Level III (SH2715)

***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)*



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:

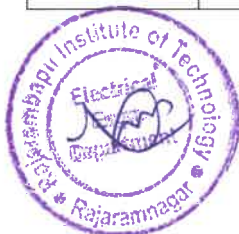
- After successful completion of the course, students will be able to,
1. Demonstrate self-management skills through co-curricular activities.
 2. Explain the traits of a leadership through real life examples.
 3. Exhibit the ability to work effectively in team.
 4. Apply decision making techniques in 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.



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 , 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	02
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



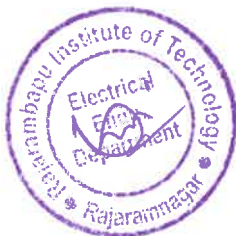
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References -

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.





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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.

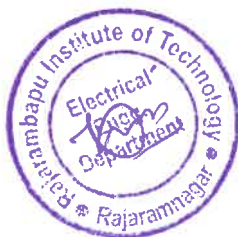
Course Outcomes:

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



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



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12.	Investor Pitch Tool: a) Introduction c) Does and Don'ts e) Problem g) Traction i) Competition k) Financials	b) Helpful Tips about preparation, pitching and content sharing d) Introduction f) Solution/Product/Service h) Market Opportunities/ Size j) Go To Market Strategies l) Team	02
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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.



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,

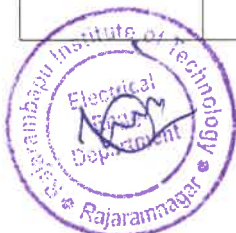
1. Develop skills to build self-esteem and positive attitude.
2. Develop interpersonal skills characterized by effective communication
3. Define nonverbal clues during interpersonal dialogue.
4. Demonstrate responsiveness towards time, stress, and health issues.
5. Interpret the non-verbal behaviour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

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

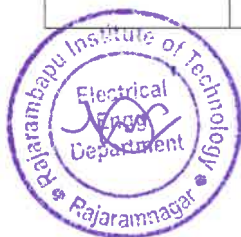
1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

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
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





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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.





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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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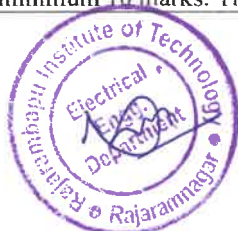
5.	Present perfect tense with helping verb haben and sein. Difference between these two verbs and related exercises	02
6.	Vocabulary of clothes and conversation while buying the clothes	02
7.	Grammar- 'W' questions related to clothes(welche und diese) Exercises related to welche und diese in nominative 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:

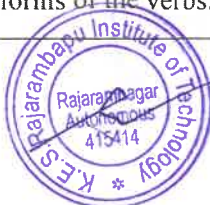
After successful completion of the course, students will be able to,

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 て 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 て 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.





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Class:- S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: EE2065	Course Name: Analog and Digital Electronics	3	-	-	3

Course Description:

The course has been designed to introduce fundamental principles of analog and digital electronics. This course focuses on construction, working & characteristics of electronic devices such as Diode, Zener Diode, BJT and FET. Also, it contains number system, boolean algebra, combinational circuits and sequential logic circuits. The students completing this course will understand basic analog and digital electronics, including semiconductor properties, operational amplifiers, combinational and sequential logic and analog-to-digital digital-to-analog conversion techniques.

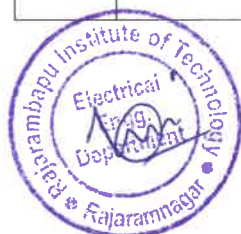
Course Learning Outcomes:

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

1. Interpret characteristics of diodes, transistors, and MOSFET.
2. Analyze various analog circuits.
3. Design operational amplifier-based circuits.
4. Describe the fundamental concepts and techniques used in digital electronics.
5. Design combinational and sequential logic circuits.

Prerequisite: Mathematics, Physics, and Boolean Algebra.

Course Content		
Unit No	Description	Hrs
1	Diode & Its Applications: P-N junction diode, I-V characteristics of a diode, half-wave and full-wave rectifiers, Clipper and clamper circuits, zener diode, mathematical modeling of diode.	06
2	BJT & MOSFET: BJT- Construction & operation of transistor, BJT configuration, I-V characteristics of a BJT, biasing circuits, BJT as a switch, BJT as an amplifier: mathematical modeling of BJT. MOSFET- Construction & operation of MOSFET, drain & transfer characteristics, biasing circuits, MOSFET as a switch.	06



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3	Operational Amplifiers & its Applications: Ideal op-amp. Linear amp- Idealized analysis of op-amp circuits, inverting and non-inverting amplifier, Integrator & differential amplifiers, adders, subtractor, V to I converters. Nonlinear amp-Comparator, Zero Crossing Detector, Schmitt trigger, Square & triangular-wave generators	06
4	Fundamentals of Digital System & Logic Families: Digital signals, number systems, number system conversion, boolean algebra, binary arithmetic. 1's and 2's complements arithmetic, codes, digital logic families, logic gates.	06
5	Combinational Logic Circuits: Standard representation for logic functions SOP & POS form, K-map representation, minimization of logic functions using K-map, Adders, Subtractors, comparator, Multiplexer, De-Multiplexer, encoder/decoder, code converter.	06
6	Sequential Logic Circuits: Sequential- 1-bit memory, latch, S-R flip-flop, J-K flip-flop, T flip-flop, D flip-flops, Master slave J-K flip flop, characteristic equation and application of flip-flop, serial to parallel converter, parallel to serial converter, universal shift register.	06

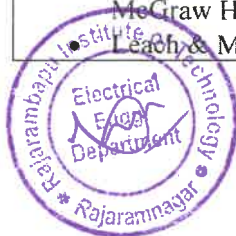
References -

Text Books:

- Robert L. Boylestad, Louis Nashelsky, Electronic devices & circuit theory, Pearson.
- Ramakant Gaikwad, OP-AMP and linear integrated circuits, PHI.
- R. P. Jain, Modern Digital Electronics, Tata McGraw Hill

Reference Books:

- Donald Neamen, Electronic Circuits: Analysis and Design, McGraw Hill
- Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, McGraw Hill.
- Leach & Malvino, Digital Principles & Application", McGraw Hill.





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Class:- S. Y. B. Tech.	Semester-IV
Course Code : EE2025	Course Name : AC Machines

L	T	P	Credits
3	--	--	3

Course Description:

This course builds a solid foundation in A.C. machines, covering principles of operation, performance analysis, testing, and applications of synchronous and asynchronous machines. Students gain practical knowledge of machine characteristics, ratings, and steady-state equivalent circuits, enabling effective operation, control, and evaluation under varying conditions.

Course Learning Outcomes:

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

1. Analyze the performance of single-phase and three-phase induction motors under varying operating conditions.
2. Evaluate the characteristics of three-phase induction motors to determine efficiency, losses, and suitability for industrial applications.
3. Justify appropriate selection of single-phase and three-phase induction motors for specific industrial requirements.
4. Evaluate winding parameters of synchronous generators and their impact on voltage regulation and system performance.
5. Analyze the performance characteristics and testing methods of synchronous machines for improved efficiency and reliability..

Prerequisite: Basic Electrical Engineering, Engineering mathematics and Engineering physics

Course Content		
Unit No.	Description	Hrs.
1	Three Phase Induction Motor: Construction, types, production rotating field, working principle, torque-slip curves, equivalent circuit, starters, deep bar and double cage induction motor, effects of harmonics on 3 phase induction motor, speed control methods.	06
2	Application and Testing of Three phase Induction Motor: Industrial applications of three phase induction motors, No load Blocked rotor test, Circle diagram double cage induction motor, preventive maintenance of three phase induction motor	06
3	Single Phase Induction Motor: Double revolving field theory, starting & running performance of 1-phase induction motor, equivalent circuit of 1phase induction motor, Types of single phase motors, principle and operation of split phase, resistance start, capacitor start and capacitor start & run induction motor, shaded pole induction motor, fractional horse power motors.	06





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4	Synchronous Generator: Construction, types, applications, working principle, equation of induced EMF, pitch factor and distribution factor, MMF of distributed windings, torque equation, efficiency, armature reaction and its compensation, effect of change in excitation, effect of change in torque and speed, Hunting of synchronous machines and its prevention.	06
5	Performance and testing of Synchronous Generator: Determination of voltage regulation by Synchronous impedance method, MMF method, ZPF method, Synchronization: importance and methods, parallel operation, load sharing between parallel connected	06
6	Synchronous Motor: Methods of starting of synchronous motors, different torques in synchronous motor, stability, synchronous condenser, synchronous phase modifiers, V-curves and inverted V-curves of synchronous motors.	06

References -

Text Books:

- Ashfaq Husain, Electric Machines, Dhanpat Rai & Co
- S.K Sahdev, Electrical Machines, Cambridge University Press.

Reference Books:

- P. S. Bimbhra, Electrical Machinery, Khanna Publishers
- Charles I. Hubert, Electric Machines: Theory, Operating Applications, and Controls, Pearson publication





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Class:- S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : EE2141	Course Name : Electrical Measurement and Instrumentation	3	--	--	3

Course Description:

This course deals with the working of instruments used for measurement of various electrical quantities. It introduces various measurement techniques available for measurement of power, energy and deals with various types of signal generators, oscilloscopes, computer controlled measurement and test systems, instrumentation of non- electrical quantities and characteristics of measuring devices. Also, it deals with different industrial process controllers and signal condition devices used in industries.

Course Learning Outcomes:

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

1. Analyze different electrical measuring instrument.
2. Identify the various parameters in electrical measuring instruments.
3. Design measuring schemes for various electronic instrument applications.
4. Select appropriate transducer for various measuring applications.
5. Describe different non-electrical measuring instruments.

Prerequisite: Basic Electrical Engineering, Engineering Physics, Electrical Circuit Analysis.

Course Content		
Unit No	Description	Hrs
1	Basic Concept of Measuring Instruments Characteristics of measuring instruments, International Standards, Primary Standards, secondary Standards, Working Standards., Types of Errors, Analog indicating instruments –Moving Coil, and Moving Iron, Multi range ammeter and voltmeter, Synchroscope.	06
2	Measurement of Electrical parameters Dynamometer wattmeter, power factor measurement, power measurement in single phase circuit, active and reactive power measurement in three phase circuit using wattmeter, Construction and working principle of single and three phase energy meter, Error and their compensation, Power Analyzer, Methods of measurement of low, medium and high range resistance, measurement of inductance, capacitance and frequency measurement.	06



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3	Electronic Instruments Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multi-meter, Basic concept of CRO, Measurement of voltage, current, frequency & phase by oscilloscope, Frequency limitation of CRO, sampling and storage oscilloscopes. Instrumentation amplifiers.	06
4	Instrument Transformers Construction and working principle of Current Transformer (CT) and Potential Transformer (PT), phasor diagram, transformation ratio and phase angle error, classes of C.T and P.T., application of C.T. and P.T., capacitive potential transformer, Potentiometers.	06
5	Instrumentation Systems and Transducers Specifications of instruments, their static and dynamic characteristics of measuring devices. Transducers: Definition, various types of transducers, selection factors and applications of transducers, Resistance type: potentiometer, strain gauge; inductive type: LVDT, RVDT; temperature transducers, capacitive type: piezo-electric transducers, speed resolver, encoders, Hall effect transducers, types and applications.	06
6	Measurement of Non-Electrical Quantities Pressure sensing elements: manometers, bourdon tube, diaphragm, bellows, Pirani gauge; Flow sensing type: head meters (orifice, venture), area meters, rotameters, electromagnetic flow meter, coriolis flow meter, ultrasonic flow meter; Temperature sensing type: thermistors, thermocouple; Analytical sensors: pH measurement.	06

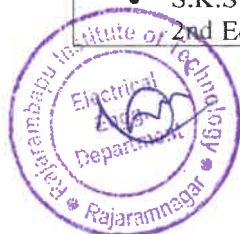
References -

Text Books:

- K. Sawhney. Electrical & Electronic Measurement & Instruments. Dhanpat Rai & Co. Publications.
- R.K.Rajput. Electrical and Electronic Measurements and instrumentation. S. Chand

Reference Books:

- Rangan, Mani, Sharma. Instrumentation Devices & Systems, Tata McGraw-Hill Education.
- Johnson. Process Control Instrumentation Technology, Pearson/Prentice Hall, 8th Edition.
- S.K.Singh. Industrial Instrumentation and Control, Tata McGraw- Hill Education, 2nd Edition.





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Class: - S. Y. B. Tech.	Semester- IV
Course Code: EE2085	Course Name: Signals and Systems

L	T	P	Credits
3	-	-	3

Course Description:

This course covers standard test signals and classifications of continuous-time and discrete-time systems. It introduces mathematical tools for analysis and characterization of signals and LTI systems using time-domain methods such as convolution and differential equations. Frequency-domain representations using Fourier series and Fourier transform are discussed. The course also introduces Laplace and Z-transforms, sampling theory, and basic signal conditioning concepts, forming essential prerequisites for Control Systems and Digital Signal Processing courses.

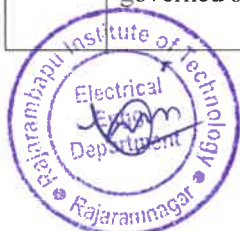
Course Learning Outcomes:

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

1. Represent and analyze continuous-time and discrete-time signals mathematically.
2. Classify systems and analyze their properties and behavior.
3. Compute Fourier series and Fourier transform for signal analysis in frequency domain.
4. Apply Laplace and Z-transforms to analyze and solve system equations.
5. Apply sampling principles and basic signal conditioning concepts in signal processing applications.

Prerequisite: Linear ordinary differential equations; Fundamentals of calculus; Basics of electrical engineering.

Course Content		
Unit No	Description	Hrs
1	Signals in Natural Domain: Introduction, standard test signals, classifications, real-time examples. Basic mathematical operations on dependent and independent signals, Even and Odd signals, Energy and Power signals.	06
2	Systems: Introduction to systems, Classifications, Continuous LTI systems and their properties. Time domain representation of LTI systems. LTI systems governed by differential/difference equations. Convolutions and properties.	06



3	Signals in Frequency Domain: Introduction to Fourier series, trigonometric, polar, and exponential Fourier series, properties of Fourier series, spectrum of periodic signals. Introduction to Fourier Transform, Properties of Fourier Transform: linearity, time shifting, frequency shifting, scaling, convolution, Parseval's theorem.	06
4	Discrete Signals in Frequency Domain: Introduction to discrete Fourier series, Discrete Time Fourier Transform and Properties and DTFT spectrum, Relationship between DTFT and DFT	06
5	Laplace and Z-Transform: Introduction to Laplace transform - Region of Convergence, properties, inverse. Z-transform - Region of Convergence, properties, inverse. Applications of Laplace and Z-transform to electrical systems.	06
6	Signal Conditioning and Sampling: Signal conditioning circuits, Zero-crossing detection methods. Sampling theorem, sampling-reconstruction of signals, concept of aliasing. Introduction to Digital Signal Processing (DSP), use of signal processing in power analyzers and other applications.	06

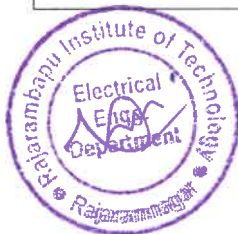
References -

Text Books:

- P. Lathi, Linear Systems and Signals, Oxford University Press
- Nagoorkani, Signals and Systems, Tata McGraw-Hill

Reference Books:

- V. Oppenheim, A. Willsky and S H Nawab, Signals and Systems, Pearson
- Simon Haykin, Signals and Systems, Wiley Publication
- P. Rameshbabu and R. Anandnatarajan, Signals and Systems, SCITECH





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 Department of Electrical Engineering

Class: S. Y. B. Tech.	Semester-IV
Course Code: CEMD2021	Course Name: Building Estimation and Valuation

L	T	P	Credits
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 Outcomes:

After successful completion of the course, the student 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, RCC, brick and stone masonry, plastering, flooring.	06
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





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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 –

References Books: -

- B. N. Dutta, “Estimating and Costing in Civil Engineering”, USB Publishers, Distributors Pvt. Ltd. Delhi-110 002.
- M. Chakroborty, “Estimating, Costing, Specification and Valuation in Civil Engineering”, USB Publishers, Bhabananda Road, Kolkata-700026.
- B. S. Patil, “Civil Engineering Contracts and Estimates”, Universities Press Private Ltd. Hyderguda, Hyderabad. 500029, (A.P), India.
- S. C. Rangwala, “Elements of Estimating and Costing”, Charotar Publishing House - opposite Amul dairy, court Road Anand. 388001.India

I. S. Codes:-

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





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Class: - S. Y. B. Tech	Semester- IV
Course Code: CSMD204	Course Name: Fundamentals of Database Systems

L	T	P	Credits
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 student 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 and B tree indexing, Hashing: Static and Dynamic.	06
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

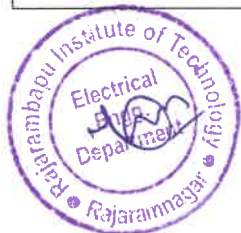
References –

Text Books:

- Silberschatz, Henry F. Korth, and S. Sudharshan, “Database System Concepts”, Tata McGraw Hill.
- 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/Addison wesley.





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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
5	Supply systems: AC and DC transmission systems and comparison. Overhead and underground system, Construction of cables and types. Introduction to Power Quality and Harmonics	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





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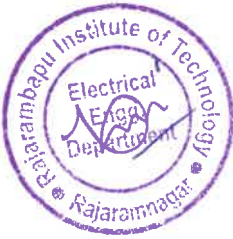
References -

Text Books:

- V.K Mehta, Principles of Power Systems, S. Chand
- Ashfaq Husain, Electrical Power System, CBS Publication

Reference Books:

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





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Class:- S.Y. B.Tech.	Semester- IV
Course Code : ECMD2021	Course Name : Electronics Communication Systems

L	T	P	Credits
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.

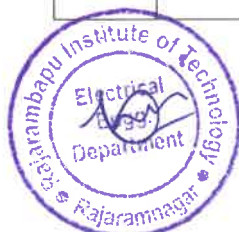
Course Learning Outcomes:

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-coherent reception, BPSK, DPSK, QPSK, 16-QAM, MSK, Waveforms and Comparison of digital modulation	06





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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 & Analog Communication Systems, Wiley India
- RP Singh, S D Sapre, Communication System-Analog & Digital, Tata Mc-Graw Hill
- Kennedy, Davis, Electronics Communication Systems, Tata McGraw Hill

Reference Books:

- Bernard Sklar, Digital Communication-Fundamentals and Applications, Pearson Education
- Tomasi, Electronic Communication Systems Pearson Education.
- Taub, Schilling, Principles of communication systems, Tata McGraw Hill.
- Louis E Frenzel, Communication Electronics Principles & Applications, Tata McGraw Hill





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Class:- S.Y. B. Tech	Semester-IV
Course Code : CIMD2021	Course Name : Computer Algorithms

L	T	P	Credits
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.

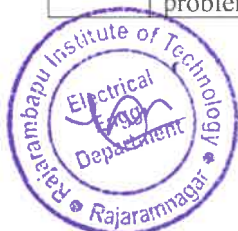
Course Learning Outcomes:

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





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5.	Backtracking General method, n-Queens problem, Subset sum problem, Graph coloring problem, Travelling sales person problem.	06
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

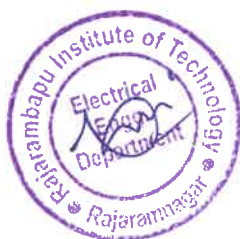
References -

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, student 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, 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	06





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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 Limited
- Don Norman, "The Design of Everyday Things", Basic Books Publication
- Stephen Anderson, "Seductive Interaction Design: Creating Playful, Fun, and Effective User Experiences", New Riders Publication
- 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 Publication





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Class: S. Y. B. Tech	Semester: IV
Course Code: MEMD206	Course Name: Automotive Drivetrain

L	T	P	Credits
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
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 publisher’s distributors.
- Dr. N. K. Giri, “Automobile Engineering”, Khanna Publishers.
- S Srinivasan, “Automotive Mechanics” Tata McGraw Hill Publication.
- K K Ramalingam, “Automobile Engineering” SCITECH publication.
- R. K. Rajput, “Automobile Engineering” Laxmi Publications.
- G. B. S. Narang, “Automobile Engineering,” Khanna Publishers.

Reference Books:

- Heinz Heisler, “Advanced Vehicle Technology”, Elsevier
- Chhikara, “Automobile Engineering”, Vol. II, Published by Satya Prakashan.
- Motor Vehicle; Newton, K., Steeds, W., Garrett, T. K., published by society of automobile engineering.
- Automobile Engineering; William H. Crouse, William Harry Crouse Tata McGraw-Hill Education.
- Motor Vehicle science volume 1; P. W. Ketts.
- Automotive Engines Theory & Servicing by J D Harderman/C D Mitchell Pierson Education





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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.

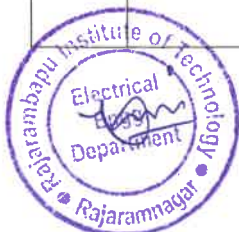
Course Learning Outcomes:

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, 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.	06
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

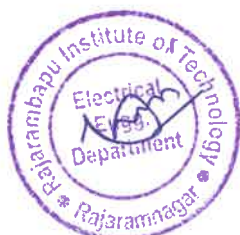
References -

Textbooks: Fluid Power, Anthony Esposito, Prentice Hall Publications.

- Industrial Hydraulics and Pneumatics, Stewart
- Industrial Hydraulics and Pneumatics, H.P. Garg.
- Oil Hydraulic Systems: Principles and Maintenance by S. R. Mujumdar.

Reference Books:

- Industrial Hydraulics, Vickers Handbook.
- Hydraulics-Basic level TP501 handbook by FESTO.





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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:

The course should enable the students 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. Analyze 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, Knowledge of 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: 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.	07





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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

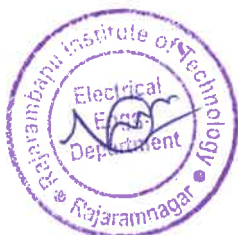
References -

Text Books:

- Data structures -- Seymour Lipschutz (MGH) Schaum's Outlines.

Reference Books:

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





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Class: S. Y. B. Tech.	Semester: IV	L	T	P	Credits
Course Code: RAMD2021	Course: 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.

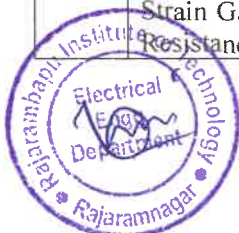
Course Outcomes:

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

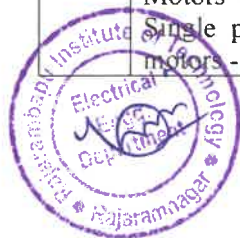
1. Explore the functions, characteristics, and operating principles of different sensors, transducers, and actuators.
2. Examine the process and techniques involved in calibrating sensors and transducers for optimal performance.
3. Evaluate and justify the choice of material and manufacturing methods 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 measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: 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.	06



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, Selftesting & 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





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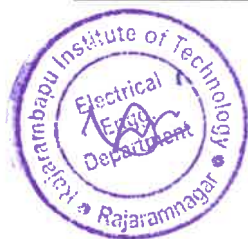
References –

Text Book:

- DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013
- D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013.
- S. Gupta, J.P. Gupta, PC interfacing for Data Acquisition & Process Control, 2nd ED, Instrument Society of America, 1994.
- Gary Johnson, Lab VIEW Graphical Programming II Edition, McGraw Hill 1997.
- Patranabis. D, Sensors and Transducers, Wheeler publisher, 1994.
- Sergej Fatikow and Ulrich Rembold, Microsystem Technology and Microbotics, First edition, Springer –Verlag Newyork, Inc, 1997.
- Jacob Fraden, Hand Book of Modern Sensors: Physics, Designs and Application, Fourth edition, Springer, 2010.

Reference Books:

- Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012.
- A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation & Measurement Techniques, PHI – 2001
- Hermann K.P. Neubert, “Instrument Transducers” 2nd Edition 2012, Oxford University Press.





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Class:- S.Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: EE218	Course Name : AI for Electrical Engineers	2	-	-	2

Course Description:

This course introduces the fundamentals of Artificial Intelligence, Fuzzy Logic, and Machine Learning with a focus on their applications in electrical engineering systems. It covers AI-based techniques for fault diagnosis, condition monitoring, and forecasting in transformers, electrical machines, and power systems.

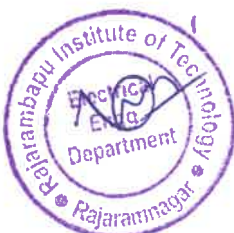
Course Learning Outcomes:

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

1. Explain the basic concepts of Fuzzy Logic, AI, ML and Deep Learning.
2. Apply ML algorithms and data preprocessing techniques to engineering datasets.
3. Analyse transformer and machine faults using AI-based diagnostic methods.
4. Evaluate AI applications in smart grids, energy optimization, and EV systems.
5. Identify suitable AI/ML techniques for solving practical electrical engineering problems

Prerequisite: Basic knowledge of electrical engineering fundamentals, mathematics (linear algebra, probability, and statistics), and introductory programming in MATLAB or Python.

Course Content		
Unit No	Description	Hrs
1	Fundamentals of Fuzzy Logic and Fuzzy Systems: Basics of Fuzzy Logic and Fuzzy Sets, Crisp vs Fuzzy systems, Membership functions and linguistic variables, Fuzzy rule base and inference system, Defuzzification methods.	04
2	Foundations of Artificial Intelligence: Introduction to Artificial Intelligence, History and evolution of AI, Fuzzy logic vs Machine Learning vs Deep Learning, Types of AI (Narrow, General, Super AI), Advantages and limitations of AI.	04
3	Fundamentals of Machine Learning and Data Handling: Types of Machine Learning: Supervised, Unsupervised, Reinforcement, Model training and testing, Data collection and preprocessing, Feature selection and normalization, Basic ML algorithms: Linear Regression, KNN, SVM, Decision Tree.	04
4	AI in Transformers Fault Diagnosis: Transformer incipient faults, Dissolved Gas Analysis (DGA) basics, ML-based transformer fault diagnosis, Practical case studies.	04
5	AI in Electrical Machines Fault Diagnosis: Types of faults in electrical machines, Motor Current Signature Analysis (MCSA), AI-based fault detection using different ML Models.	04





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6	AI in Smart Grids and Energy Systems: AI applications in smart grids, V2G and G2V AI Systems, Battery Health Monitoring, Future trends in AI-based energy systems.	04
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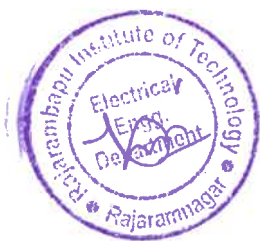
References -

Text Books:

- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson.
- Ethem Alpaydin, Introduction to Machine Learning, MIT Press.
- Timothy J. Ross, Fuzzy Logic with Engineering Applications, Wiley.

Reference Books:

- Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow, O'Reilly Media.
- Zita Vale and João Santana, Artificial Intelligence Techniques in Power Systems, CRC Press.
- S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI Learning.





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Class:- S. Y. B. Tech.	Semester-IV	L	T	P	Credits
Course Code: EE2525	Course Name: AC Machines Lab	--	--	2	1

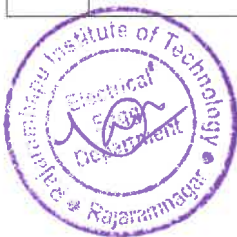
Course Description: This laboratory course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance and testing of AC Machines. The course will orient student to understand the theoretical and practical dimensions. In this lab course, students will be familiar with the use of different equipment's and safety precautions on work place.

Course Learning Outcomes:

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

1. Evaluate parameters of AC machines (Asynchronous and Synchronous)
2. Plot the performance characteristics of various AC machines
3. Demonstrate speed control characteristics of AC Machines.
4. Analyze the parameters and predict the efficiency of the AC machines.
5. Analyze the voltage regulation of Synchronous Generator.

Exp. No.	Description	Hrs.
1	Performance characteristics of 3-phase IM by load test.	02
2	Equivalent circuit parameters of 3-phase IM by no load and blocked rotor test.	02
3	Performances of three phase IM by circle/Locus diagram.	02
4	Speed control of 3-phase wound IM by pole changing method.	02
5	To Study of different starters of 3- ph. IM	02
6	Determination of equivalent circuit parameters of 1-phase IM	02
7	Voltage regulation of 3-phase alternator by direct load test	02
8	Voltage regulation of 3-phase alternator by EMF method	02
9	Voltage regulation of 3-phase alternator by MMF method	02
10	To plot the V-Curves of synchronous motor	02





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Class:- S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code : EE2545	Course Name : Analog and Digital Electronics Lab	--	--	2	1

Course Description:

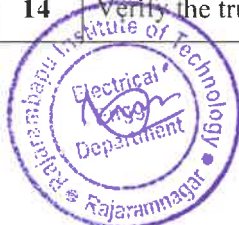
This laboratory course emphasizes imparting the practical knowledge and understanding of basic principles, characteristics, performance, and testing of analog and digital circuits. This course also develops the capacity to analyze and interpret different electronic circuits like diode circuits, BJT amplifiers, Op-Amp circuits, analog to digital (AD) & digital to analog (DA) conversion. In this lab course, students will be familiar with the use of different electronics devices.

Course Learning Outcomes:

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

1. Illustrate input-output response of analog electronic.
2. Build diode circuits like rectifier, clipper & clamper.
3. Design various applications of Op-Amp.
4. Design sequential and combinational circuits.
5. Simulate and validate Analog and Digital circuits using simulation tools.

Expt. No.	Description	Hrs
1	Plot V-I characteristics of P-N junction diode.	02
2	Build & test of Half wave & Full wave rectifier.	02
3	Build & analyze various types of clipper circuits and clamper circuits.	02
4	Plot input & output characteristics of transistor.	02
5	Design transistor as switch.	02
6	Design inverting and non-inverting configurations of Op-Amp.	02
7	Build & test comparator circuit.	02
8	Verify truth table of various logic gates.	02
9	Implementation of different logic gates using universal gates	02
10	Implementation of Half adder & full adder	02
11	Implementation of Half subtractor & full subtractor	02
12	Implementation of Code converters & comparator circuit	02
13	Implementation of BCD to 7-segment decoders	02
14	Verify the truth table of various flip-flops.	02



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Class:-S. Y. B. Tech.	Semester- IV	L	T	P	Credits
Course Code: EE2621	Course Name: Electrical Measurement and Instrumentation Lab	--	--	2	1

Course Description:

This course provides the basic techniques to measure electrical and non – electrical parameters using electrical measuring and instrumentation techniques.

Course Learning Outcomes:

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

1. Determine the measurement of electrical parameters using various measurement techniques.
2. Examine AC bridges for the measurement of inductance, capacitance and frequency.
3. Identify different measuring instruments for the measurement of various electrical and non-electrical parameters.
4. Demonstrate various digital measuring instruments.
5. Draw the characteristics of solar panel, earth resistance and temperature transducers..

Exp. No.	Description	Hrs
1	Measurement of three phase active power by single wattmeter method	02
2	Measurement of three phase active, and reactive power and power factor by two wattmeter method	02
3	Calibration of single phase and three phase Energy meter	02
4	Measurement of resistance using Wheatstone bridge	02
5	Measurement of inductance and capacitance by using AC bridges	02
6	Measurement of displacement using LVDT	02
7	Measurement of displacement using strain gauge based displacement transducer	02
8	Measurement of power and energy using power analyzer	02
9	To study of Digital Storage Oscilloscope.	02
10	To study of Digital Multimeter.	02
11	To study of Wave and Spectrum Analyzer	02
12	To study net metering for rooftop based solar PV	02





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Class: S. Y. B. Tech.	Semester - IV	L	T	P	Credits
Course Code: EE2701	Course Name: MOOCS-I	-	-	-	1

Course Description:

Online courses offered through platforms like NPTEL, SWAYAM, and NASSCOM provide opportunities to deepen the understanding of advanced electronics concepts and technologies to Electrical Engineering students. These courses focus on critical domains such as circuit design, electrical machines, power systems, control systems and emerging fields like electrical vehicles. They blend theoretical foundations with practical applications, enabling students to strengthen problem-solving skills, engage with modern tools, and prepare for industry-oriented challenges, enabling lifelong learning. The objective of this course is to emphasize the development of skills and attitudes that enable continuous learning & adaption to new situations.

Course Learning Outcomes:

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

1. Explain advanced principles, methods, and technologies in various areas of electrical engineering.
2. Analyze electrical engineering problems using mathematical and engineering fundamentals.
3. Design solutions for electrical-based systems using modern engineering tools and platforms.
4. Apply programming and simulation techniques to develop and test electrical circuits and systems.
5. Demonstrate the ability to engage in independent and self-directed learning

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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Class: S. Y. B. Tech	Semester- IV	L	T	P	Credits
Course Code: EE272	Course Name: AI for Electrical Engineers Lab	-	-	2	1

Course Description:

This laboratory course provides hands-on experience in applying AI, machine learning, and fuzzy logic techniques to practical electrical engineering problems. Students perform data preprocessing, visualization, fault diagnosis, and forecasting tasks for transformers, electrical machines, and power systems using MATLAB/Python.

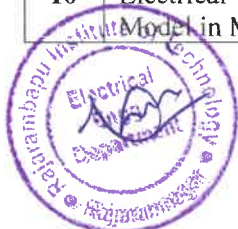
Course Learning Outcomes:

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

1. Use MATLAB/Python tools for basic AI and ML applications.
2. Perform data preprocessing and visualization for electrical datasets.
3. Implement simple ML algorithms for fault detection and prediction.
4. Apply ML techniques for load and energy forecasting problems.
5. Analyze results and interpret ML model performance.

Prerequisite: Basic knowledge of electrical engineering fundamentals, elementary mathematics and statistics, and basic programming skills in MATLAB or Python. Familiarity with power systems and electrical machines is desirable.

Exp. No.	Description	Hrs.
1	Design of a Simple Fuzzy Logic Controller for Fan Speed Control using MATLAB/Python	02
2	Design of a Fuzzy Logic-Based Water Level and Pump Control System using MATLAB/Python	02
3	Implementation of Fuzzy Logic based AND, OR, and NOT Operations using MATLAB/Python.	02
4	Development of a Simple Fuzzy Logic System for Transformer Fault Classification using MATLAB/Python	02
5	Data Visualization, Statistical Analysis, and Preprocessing of Electrical/Power System Datasets using MATLAB/Python	02
6	Transformer Fault Classification using KNN with Accuracy Comparison for Different K Values	02
7	Electrical Fault Diagnosis using Decision Tree Algorithm in MATLAB/Python	02
8	SVM-Based Transformer Fault Detection using DGA Input Data in MATLAB/Python	02
9	Induction Motor Fault Detection using ML with Confusion Matrix Evaluation	02
10	Electrical Energy Consumption Prediction using Regression-Based ML Model in MATLAB/Python	02





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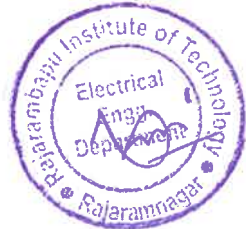
Choice Based Professional Skills Development and Foreign Languages Programme
for
Second Year B. Tech.
(Sem. IV)

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 IV (SH2645)
6. 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	L	T	P	Credits
Course Code : SH2635	Course Name : Professional Leadership Skills	-	-	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:

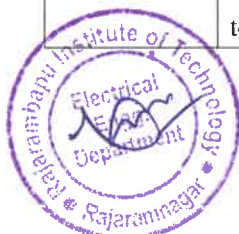
- After successful completion of the course, students will be able to,
6. Demonstrate self-management skills through co-curricular activities.
 7. Explain the traits of a leadership through real life examples.
 8. Exhibit the ability to work effectively in team.
 9. Apply decision making techniques in formal meetings.
 10. 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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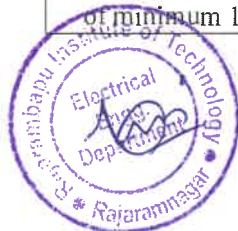
6.	Team Formation and Leading a Team – II: Case Studies of Teams and Student Presentations	02
7.	Business Meetings and Decision Making – I: Preparing for the Meeting, Role of Chairperson and Participants in Meetings	02
8.	Business Meetings and Decision Making – II: Mock Meetings, Decision Making Case 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:

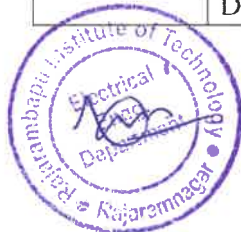
1. Adequate knowledge of basic grammar of English language.
2. Intermediate level vocabulary of English language.
3. Communicate moderately using English language.

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



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3.	Setting and Achieving Goals – Defining your own goals in life , 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	02
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





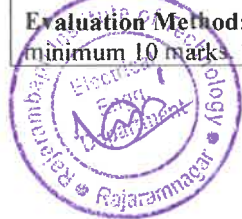
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References -

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. Gopaldaswamy 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.





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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.

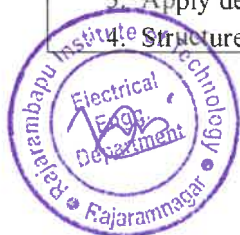
Course Outcomes:

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:

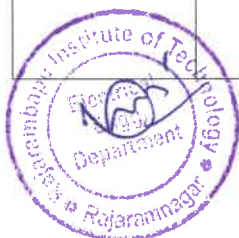
1. Creativity and Innovativeness
2. Problem identification
3. Apply design thinking approach to develop working prototype
4. Structured approach to problem solving





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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. <u>Step-by step</u> 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: C. Definition of a Business Model D. The 9 Building Blocks: 10. Customer 11. Value Propositions 12. Channels, distribution, 13. Customer relationships 14. Revenue 15. Key Resources 16. Key Activities 17. Key Partnerships 18. Cost Structure	02
8.	Design Thinking (Part I): Customer Insights, Ideation, Visual Thinking.	02
9.	Design Thinking (Part II): D. Prototyping. E. Storytelling. F. 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: f) Economic Aspects g) Technical Aspects h) Financial Aspects i) Production Aspects j) Managerial Aspects	02



12.	Investor Pitch Tool:	02
	m) Introduction n) Helpful Tips about preparation, pitching and content sharing o) Does and Don'ts p) Introduction q) Problem r) Solution/Product/Service s) Traction t) Market Opportunities/ Size u) Competition v) Go To Market Strategies w) Financials x) 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.



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.

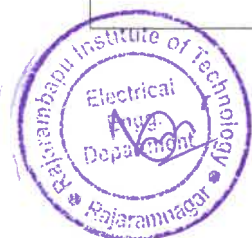
Minimum 12 sessions will be conducted from the following list.

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



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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
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, 7Cs 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





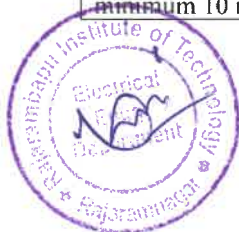
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References -

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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- IV	L	T	P	Credits
Course Code : SH 2645	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:

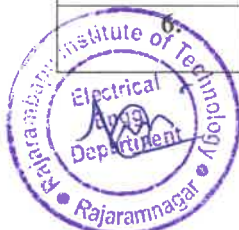
After successful completion of the course, students will be able to,

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
	Writing a postcard Grammar- Pronoun - man	02



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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.

