



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 Mechatronics Engineering

Rev: MC Course Structure/RIT/00/2025-29

B. Tech. in Mechatronics Engineering with Multidisciplinary Minor





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 Department of Mechatronics Engineering
 Rev: MC Course Structure/RIT/00/2025-29

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	
MC2011	Engineering Mathematics for Mechatronics Engineering	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
MC2031	Analog and Digital Electronics	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
MC2052	Industrial Fluid Power	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
MC2072	Engineering Mechanics	2	-	-	36	60	2	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
	Multi-Disciplinary Minor-I	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			---	---
MC2511	Analog and Digital Electronics Lab	-	-	2	06	30	1	ISE	----	----		50	50
								ESE	----			50	50
MC2531	Industrial Fluid Power Lab	-	-	2	06	30	1	ISE	----	----		50	50
								ESE	----			50	50
MC2572	Machine Drawing and CAD Modelling Lab	-	-	2	06	30	1	ISE	---	----		50	50
								ESE	----			50	50
MC2592	Engineering Mechanics Lab	-	-	2	06	30	1	ISE	---	----		100	50
MC2593	Python Programming Lab	-	-	2	06	30	1	ISE	---	----		50	50
								ESE	----			50	50
	Professional Skills Development and Foreign Languages-I	-	-	2	06	30	1	ISE	----	---		100	50
	TOTAL	14	-	12	288	600	20						
	TOTAL CONTACT HOURS	26											

ISE=In Semester Evaluation, UT=Unit Test Examination, ESE=End Semester Examination, TW: Term Work, SL: Self-Learning P=Pass, NP=Not Pass. **Total Contact Hours/week: 26; Total Credits: 20**





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Professional Skills Development and Foreign Languages-

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



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	
MC2021	Strength of Materials	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
MC2042	Microcontrollers and Embedded Systems	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
MC2061	Kinematics & Dynamics of Machines	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
MC2082	Materials and Manufacturing Technologies	3	-	-	54	90	3	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
MC214	Electrical Actuators and Drives	2	-	-	36	60	2	ISE	20	40	40	---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50			40	---
	Multi-Disciplinary Minor-II	3	-	-	54	90	3	ISE	20	40		---	---
								UT1	15			---	---
								UT2	15			---	---
								ESE	50		40		---
SH2175	Environmental Science	1	-	2	24	60	2	ISE	50	40	40	---	---
								ESE	50			40	---
MC2501	Microcontrollers and Embedded Systems Lab	-	-	2	06	30	1	ISE	---	---		50	50
MC2543	Workshop Practices	-	-	2	06	30	1	ESE	---	---		50	50
								ISE	---	---		50	50
MC262	Robot Operating System Lab	-	-	2	06	30	1	ISE	---	----		100	50
MC264	Future Skill Course -I *	-	-	-	30	30	1	ISE	---	----		100	50
	Professional Skill Development and Foreign Language	-	-	2	06	30	1	ISE	--	---		100	50
	TOTAL	18	-	10	384	720	24						
	TOTAL CONTACT HOURS	28											

ISE=In Semester Evaluation, UT=Unit Test Examination, ESE=End Semester Examination. TW: Term Work, SL: Self-Learning. **Total Contact Hours/week : 28 Total Credits : 24**

*Students should opt following course: Introduction on Generative AI – Artificial intelligence and Machine Learning (15hr.). **Note 1.** Students are required to undergo industrial/ field training of minimum two weeks in the vacation of Semester-IV, and its evaluation will be carried out in the Semester-V. **Note 2.** ISE of Environment Science course will be the project on application of technology in environmental concerns. If student fails in ISE (i.e. project), he/she will not be eligible for ESE of the course.



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Professional Skills Development and Foreign Languages-

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



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	for
MC3012	Industrial Automation	2	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
MC3032	Measurement, Sensors and Interfaces	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
MC3152	System Dynamics and Control	2*	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Program Elective Course-I	2**	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Open Elective -I	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Multi-Disciplinary Minor-III	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Multi-Disciplinary Minor-IV	2	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
MC3511	Industrial Automation Lab	-	-	2	06	30	1	ISE	---	---	---	50	50	
								ESE	---	---	---	50	50	
MC3532	Measurement, Sensors and Interfaces Lab	-	-	2	06	30	1	ISE	---	---	---	50	50	
								ESE	---	---	---	50	50	
MC3553	System Dynamics and Control Lab		-	2	06	30	1	ISE	---	---	---	100	50	
SH3036	Scholastic Aptitude-I	2*	-	-	-	-	Audit	ISE	100	50(P/NP)	--	--		
MC357	MOOCS NPTEL/ SWAYAM Courses	-	-	-	30	30	1	ISE	---	---	---	100	50	
MC361	Industrial Training	-	-	-	30	30	1	ISE	---	---	---	100	50	
MC363	Mini Project	-	-	6	18	90	3	ISE	---	---	---	100	50	
	TOTAL	17	-	12	402	750	25							
	TOTAL CONTACT HOURS	29												

ISE=In Semester Evaluation, UT=Unit Test Examination, ESE=End Semester Examination, TW: Term Work, SL: Self-Learning. P-Pass, NP-Not Pass; **Total Contact Hours/week : 29 ; Total Credits : 25**

*Note: Student should complete five days (30hrs.) of scholastic aptitude training program, organised by the institute.

**Note: Extra One lecture should be added to the timetable.



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Program Elective-I

Sr. No	Course Code	Course Name	Domain
1.	MC3091	Condition Monitoring	Design & Manufacturing
2.	MC3111	Battery And Fuel Cell Technology	Advanced Mobility System
3.	MC3131	Industrial Organization and Management	Design & Manufacturing
4.	MC3093	Industrial Signal Processing	Intelligent Systems

Open Elective –I 2025-29

Sr. No.	Course Code	Open Elective Course 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
14	OE3571	Internet of Things	Electronics & Telecommunication Engineering
15	OE3591	Drone Technology	Electronics & Telecommunication Engineering
16	OE3511	Hydrogen Fuel Cell Technology	Mechanical 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		
MC3021	Machine Design	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
MC3241	Image Processing	2	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
MC3061	Research Methodology	2	-	-	36	60	2	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Program Elective-II	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Open Elective-II	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
	Multi-Disciplinary Minor-V	3	-	-	54	90	3	ISE	20	40	40	---	---	
								UT1	15			---	---	
								UT2	15			---	---	
								ESE	50			40	---	---
MC370	Industrial Robotics Simulation Lab	-	-	2	06	30	1	ISE	---	---	---	50	50	
								ESE	--			--	50	50
MC3601	Image Processing Lab	-	-	2	06	30	1	ISE	---	---	---	50	50	
								ESE	---			---	50	50
SH3066	Scholastic Aptitude-II	2*	-	-	-	-	Audit	ISE	100	50 (P/NP)		--	--	
MC364	Future Skill Course -II**	-	-	-	-	30	1	ISE	---	----		100	50	
MC366	Minor Project	-	-	12	144	180	6	ISE	----	----		100	50	
MC368	Seminar	-	-	-	-	-	Audit	ISE	100	50(P/NP)		--	--	
	TOTAL	16	-	16	444	750	25							
	TOTAL CONTACT HOURS	32												

ISE=In Semester Evaluation, UT=Unit Test Examination, ESE=End Semester Examination. TW: Term Work, SL: Self-Learning P=Pass, NP=Not Pass **Total Contact Hours/week : 32 Total Credits: 25**

***Note:** Student should complete five days (30hrs.) of scholastic aptitude training program, organised by the institute.

**** Students should opt following course:** RPA Design and Development (12hr.). (RPA-Robotic Process Automation)

Program Elective - II

Sr. No.	Course Code	Course	Domain
1.	MC3081	Finite Element Methods	Design & Manufacturing
3.	MC3121	Additive Manufacturing	Design & Manufacturing
4.	MC324	Digital Twin	Intelligent Systems
5.	MC3181	Wireless Sensor Network	Automation
6.	MC3201	Microelectromechanical Systems	Automation
7.	MC326	Fuzzy Logic & Neural Networks	Intelligent Systems
8.	MC328	Advanced Material Sciences for Intelligent Engineering Systems	Intelligent Systems

Open Elective –II

Open Elective II 2025-29			
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
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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Rev: MC Course Structure/RIT/00/2025-29

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. passing	for	Max.	Min. passing	for		
MC4011	Design of Mechatronics System	2	-	-	36	60	2	ISE	20	40	40	---	---		
								MSE	30			---			
								ESE	50			---			
MC4031	Machine Learning for Mechatronics	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---			
								ESE	50			---			
MC4051	Industrial Robotics	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---			
								ESE	50			---			
	Program Elective Course-III	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---			
								ESE	50			---			
	Program Elective Course-IV	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---			
								ESE	50			---			
MC421	Industrial Electronics	3	-	-	54	90	3	ISE	20	40	40	---	---		
								MSE	30			---			
								ESE	50			---			
MC4591	Industrial Electronics Lab	-	-	2	06	30	1	ISE	--	---	---	50	50		
								ESE	--			50	50		
MC4571	DCS Lab	-	-	2	06	30	1	ISE	--	---	---	50	50		
								ESE	--			50	50		
MC4511	Industrial Robotics Lab	-	-	2	06	30	1	ISE	--	---	---	50	50		
								ESE	--			50	50		
	Program Elective-IV Lab	-	-	2	06	30	1	ISE	--	---	---	50	50		
								ESE	--			50	50		
	TOTAL	17	-	08	330	630	21								
	TOTAL CONTACT HOURS	25													

ISE=In Semester Evaluation, MSE=Mid Semester Examination, ESE=End Semester Examination, TW: Term Work, SL: Self-Learning **Total Contact Hours/week: 25, Total Credits: 21**





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Program Elective-III

Sr. No.	Course Code	Course Name	Domain
1.	MC4091	Basics of Cloud Computing	Intelligent Systems
2.	MC4111	Machine Tool Design	Design & Manufacturing
3.	MC4151	Hybrid and Electric Vehicle	Advanced Mobility System
4.	MC4171	Industrial Engineering	Design & Manufacturing
5.	MC4191	Emerging Smart Materials for Mechatronics Applications	Design & Manufacturing

Program Elective-IV

Sr. No.	Course Code	Course	Domain
1.	MC4231	Computer Network and Cyber Security	Intelligent System
2.	MC433	Unmanned Aerial Vehicles	Advanced Mobility System
3.	MC4072	Building Automation	Automation

Program Elective-IV Lab

Sr. No.	Course Code	Course	Domain
1.	MC4551	Computer Network and Cyber Security Lab	Intelligent System
2.	MC467	Unmanned Aerial Vehicles Lab	Advanced Mobility System
3.	MC469	Building Automation Lab	Automation





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

Class: Final Year B. Tech.

Semester: VIII

		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
OE4382	Finance for Engineers (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
OE4362	Engineering Management & Economics (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40		---	---
IP4024	Industry Internship & Project	-	-	-	360	360	12	ISE	---	----		50	50
								ESE	---	---		50	50
	TOTAL		-	-	432	480	16						

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

Total Contact Hours/week : --

Total Credits : 16

Note:

1] Weekly Contact hours are not mentioned as the student is expected to be in the industry regularly for 20 weeks. However, students need to report to the Institute mentors as and when required.

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

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





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Model II: Research Internship (RI)

Class: Final Year B. Tech.

Semester: VIII

		Teaching Scheme						Evaluation Scheme					
Course Code	Course	L	T	P	TW+SL	Total Hr.	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
									Max.	Min. for passing	40	Max.	Min. for passing
OE4382	Finance for Engineers (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40	---	---	
OE4362	Engineering Management & Economics (Online Course)	2	-	-	36	60	2	ISE	25	40	40	---	---
								ESE	75	40	---	---	
RE4044	Research Internship	-	-	-	360	360	12	ISE	---	----		50	50
								ESE	---	---		50	50
	TOTAL		-	-	432	480	16						

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

Total Contact Hours/week : -

Total Credits : 16

Note:

- 1] Weekly Contact hours are not mentioned as students are expected to be in an outside research organization regularly for 20 weeks. However, students need to report to the Institute mentors as and when required.
- 2] For the online course, lecture videos of each unit will be made available through the college platform to the students. For each unit there will be separate assignments. Students need to submit all assignments within a specified time.

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

- 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.





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Class: Final Year B. Tech.

Semester: VIII

Course Code	Course	Teaching Scheme						Credits	Evaluation Scheme					
		L	T	P	TW+SL	Total Hr.	Scheme		Theory (Marks %)			Practical (Marks %)		
									Max	Min. for passing		Max	Min. for passing	
ED4104	Project Management (Online Course)	2	-	-	36	60	2	ISE	25	40	40	-	-	
								ESE	75	40		-	-	
ED4044	Commercial Aspects of the Project (Online Course)	2	-	-	36	60	2	ISE	25	40	40	-	-	
								ESE	75	40		-	-	
ED4064	Entrepreneurship Development Program (EDP)	-	-	-	30	30	1	ISE	---	--	--	100	50	
ED4084	Entrepreneurial Internship	-	-	-	330	330	11	ISE	--	--	--	50	50	
								ESE				50		
	Total	-	-	-	432	480	16							

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

Total Contact Hours/week : 04

Total Credits : 16

Note:

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

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

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

3] A one-week Entrepreneurship Development Program (EDP) will be conducted after completion of the 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 2025-29					
MDM Basket Name	Sr. No	Course Code	Course Name	Sem ester	Offered by Department
Construction Engineering	1	CEMD2011	Building Construction and Planning	III	Civil Engineering
	2	CEMD2021	Building Estimation and Valuation	IV	
	3	CEMD3011	Infrastructure Engineering	V	
	4	CEMD3031	Smart Cities and Sustainable Development	V	
	5	CEMD3021	Environmental Engineering	VI	
Software Programming	1	CSMD2011	Introduction to Data Structures	III	Computer Science & Engineering
	2	CSMD204	Fundamentals of Database Systems	IV	
	3	CSMD305	Software Testing	V	
	4	CSMD3031	Object-oriented Programming in Python	V	
	5	CSMD3021	Artificial Intelligence	VI	
Electrical Power System	1	EEMD2011	Electrical Power Generation	III	Electrical Engineering
	2	EEMD2021	Power System	IV	
	3	EEMD3011	Electrical Machines	V	
	4	EEMD3051	Electrical Technology	V	
	5	EEMD3021	Smart Grid	VI	
Electronics System Design	1	ECMD2011	Electronics Devices and Applications	III	Electronics & Telecommunication Engineering
	2	ECMD2021	Electronics Communication Systems	IV	
	3	ECMD3011	Advanced Communication Systems	V	



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	4	ECMD3031	Electronic Product Design	V	
	5	ECMD3021	Industrial Electronics	VI	
Software Development	1	CIMD2011	Data Structures	III	Computer Science & Information Technology
	2	CIMD2021	Computer Algorithms	IV	
	3	CIMD3011	Introduction to DBMS	V	
	4	CIMD3031	OOP using Java	V	
	5	CIMD3021	Software Engineering	VI	
Product Design and Development	1	MEMD2031	Design Thinking	III	Mechanical Engineering
	2	MEMD2041	Behavioral Engineering and Design	IV	
	3	MEMD3051	Product Design Tools and Techniques	V	
	4	MEMD3071	Design and Prototyping	V	
	5	MEMD3041	Marketing and Business Fundamentals for New Products	VI	
Automobile Engineering	1	MEMD205	I. C. Engine	III	Mechanical Engineering
	2	MEMD206	Automotive Drivetrain	IV	
	3	MEMD309	Automotive Chassis Systems	V	
	4	MEMD311	Automotive Engineering Laboratory	V	
	5	MEMD306	Electric Vehicles	VI	
Mechatronics Engineering	1	MCMD2011	Fundamentals of Mechatronics	III	Mechatronics Engineering
	2	MCMD2021	Industrial Fluid Power	IV	
	3	MCMD3011	Sensor and Instrumentation	V	
	4	MCMD3031	Industrial Automation	V	
	5	MCMD3021	Industrial Robotics	VI	
Artificial 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	





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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 Mechatronics Engineering with Double Minor (Multidisciplinary and Specialization Minor)





B.Tech. in Mechatronics 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	MCDM3XXX
2	IV	DM – II	MCDM4XXX
3	V	DM – III	MCDM5XXX
4	VI	DM – IV	MCDM 6XXX
5	VII	DM – V	MCDM 7XXX
6	VIII	DM – VI	MCDM 8XXX

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 occur.
6. Platform and course selection must be as per the recommendation of BOS of the department.
7. Student will get the credits of respective DM course in following conditions,
 - d. In case of course selected from NPTEL platform, student have to complete the timely assignments, PASS the exam and secure the certificate.
 - e. 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,
 - f. Selected course must be of basic or fundamental level.
 - g. 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)
 - h. 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 Mechatronics Engineering with Honor and Multidisciplinary Minor



B.Tech. in Mechatronics 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	MCH3XXX
2	IV	Honor - II	MCH4XXX
3	V	Honor - III	MCH5XXX
4	VI	Honor - IV	MCH6XXX
5	VII	Honor - V	MCH7XXX
6	VIII	Honor - VI	MCH8XXX

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,
 - d. In case of course selected from NPTEL platform, student have to complete the timely assignments, PASS the exam and secure the certificate.
 - e. 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,
 - f. Selected course must be of advanced level and not basic or fundamental level.
 - g. 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)
- 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 Mechatronics Engineering-Honors with Research and Multidisciplinary Minor





Honors with Research and Multidisciplinary Minor

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

Class: Final Year B. Tech.

Semester: VII

		Teaching Scheme						Evaluation Scheme					
Course Code	Course	L	T	P	TW+SL	Total Hr.	credits	Scheme	Theory (Marks %)			Practical (Marks %)	
									Max.	Min. for passing		Max.	Min. for passing
REH401	Intellectual Property Rights (IPR)	-	-	-	60	60	2	ISE	50	40	40	---	---
								ESE	50	40		---	---
REH403	Research project (Synopsis) phase - I	-	-	-	60	60	2	ISE				50	50
								ESE				50	50
REH405	Research Specific core course - I (Online NPTEL course)	-	-	-	90	90	3	ISE	50	40	40		
								ESE	50	40			
	TOTAL	-	-	-	210	210	7						

ISE = In Semester Evaluation, ESE = End Semester Examination, 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





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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
REH402	Research project phase - II	-	-	-	330	330	11	ISE			50	50
								ESE			50	
	TOTAL	-	-	-	330	330	11					

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



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Class: S. Y. B. Tech	Semester – III	L	T	P	Credits
Course Code: MC2011	Course Name: Engineering Mathematics for Mechatronics Engineering	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.

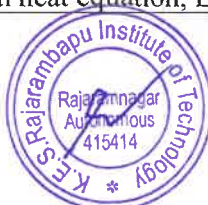
Course Learning Outcomes:

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

1. Illustrate curve fitting concepts in Mechatronics related problems.
2. Compute problems on probability distribution by using different formulae.
3. Evaluate differential equation using appropriate concept.
4. Analyze the problem and apply the concept of partial differential equations.
5. Evaluate Laplace & inverse Laplace transform of function and solve ordinary differential equations and linear time invariant systems.
6. Develop Fourier series of periodic functions.

Prerequisite: Engineering Mathematics-I and Engineering Mathematics-II

Course Content		
Unit No	Description	Hrs
1.	Statistics: Coefficient of correlation by Karl Pearson's method, lines of regression, fitting of curve (Straight line and Parabola) by least square method.	06
2.	Probability: Probability of Random Variable, Discrete and Continuous Probability Distributions, Binomial, Poisson and Normal Distributions,	06
3.	Linear Differential Equations: Definition, complete solution of Linear Differential Equation with constant coefficients. (All Types to find Particular Integral & General type) Solution of Linear Differential Equation with Variable coefficients. (Cauchy Linear differential equation, Legendre's Linear differential equation)	06
4.	Partial Differential Equations Solution to linear homogeneous & nonhomogeneous partial differential equation of higher order, Method of separation of variable, application to one dimensional heat equation, Two-dimensional heat equation, Laplace equation.	06



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5.	Laplace Transforms Definition of Laplace transform, Laplace transform of standard functions, properties of Laplace transform, Definition of inverse Laplace transform, Properties of inverse Laplace transform, convolution theorem, Application to solve ordinary differential equation with one dependent variable.	06
6.	Fourier Series Definition, Dirichlets condition, Fourier expansion of given function, Fourier half range sine series, and Fourier half range cosine series, Application of Fourier Series (Periodically Forced Oscillation).	06

Reference Books:

Textbook:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 41th edition

Reference Books:

1. Erwin Kreyszig, Advanced engineering mathematics, 9th edition, Wiley, 2011.
2. Raman B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
3. N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar, A Textbook of Engineering Mathematics, Laxmi Publications, New Delhi, 6th edition, 2004.
4. Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing house, 4th edition, 2002.
5. P. N. Wartikar and J. N. Wartikar, A Textbook of Applied Mathematics, Vol. I, Vol. II, VidyarthiGrihaPrakashan, Pune. 9th Revised edition, October 1984, Reprints: September 2005.



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Class: S.Y. B. Tech.	Semester: III	L	T	P	Credits
Course Code: MC2031	Course Name: Analog and Digital Electronics	3	-	--	3

Course Description:

The course introduces characteristics and applications of analog and digital circuits. It will give a basis for understanding and constructing simple systems of analog and digital electronic circuit elements. The students will understand basic analog and digital electronics, including semiconductor properties, construction, operational amplifiers, combinational and sequential logic.

Course Learning Outcomes:

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

1. Explain working principles of electronic devices
2. Illustrate applications of analog and digital electronic circuits.
3. Analyze various analog and digital circuits.
4. Design applications using electronic devices and circuits.

Prerequisite: Fundamental concepts of Mathematics, Physics and Boolean Algebra.

Course Content		
Unit No.	Description	Hrs.
1.	PN Junction Diode & Bipolar Junction Transistors: PN Junction Diode and its characteristics, Diode applications: Voltage Multiplier, Clipper and Clamper Circuits, Rectifiers: Half-wave, Full-wave, NPN Bipolar Junction Transistor, V-I Characteristics, Transistor as a Switch.	06
2.	FET (Field Effect Transistor): JFET, VI Characteristics of JFET, MOSFET, VI Characteristics of MOSFET, applications.	06
3.	OP AMP Circuits and Its Applications: Basics of OPAMP, characteristics of OPAMP, OPAMP as Inverting amplifier, non-inverting amplifier, summing amplifier, Difference amplifier, Integrator, Differentiator, Comparator, Zero Crossing Detector.	06
4.	Boolean Algebra and Logic Gates: Logic Gates, Basic Theorems, Properties of Boolean Algebra, minimization using rules of Boolean Algebra, realization of Boolean equations using gates, SOP and POS forms, Canonical and standard form, Min and Max terms, Minimization of logical functions using K-map.	06



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5.	Combinational and Sequential Logic: Adders, Subtractors, Multiplexers, Demultiplexers, Magnitude Comparator, Flip-flops (SR, JK, T, D), Synchronous and Asynchronous Counters, Shift Registers.	06
6.	Applications: Voltage Regulator, DC Power Supply, Schmitt Trigger, Instrumentation Amplifier, BCD to 7 segment display, Traffic Light Controller, Priority Encoder.	06

References -

Textbooks:

1. R. L Boylestad, L. Nashlesky, "Electronic Devices and Circuits Theory", Pearson Education.
2. Donald Neaman, "Electronic Circuit Analysis and Design", Tata McGraw Hill,
3. R.P Jain, "Modern digital electronics", Tata McGraw Hill Publication,

Reference Books:

1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson.
2. Anand Kumar, "Fundamentals of digital circuits", PHI Publication.
3. Wakerly, "Digital Design Principles and Practices", Pearson Education.
4. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, John Wiley & Sons Inc.

NPTEL/SWAYAM Course:

1. Digital Circuits, By Prof. Santanu Chattopadhyay, IIT Kharagpur.
https://onlinecourses.nptel.ac.in/noc23_ee115/
2. Analog Electronic Circuit, By Prof. Shouribrata Chatterjee, IIT Delhi.
https://onlinecourses.nptel.ac.in/noc23_ee106/
3. Semiconductor Devices and Circuits, By Prof. Sanjiv Sambandan, IISc Bangalore.
https://onlinecourses.nptel.ac.in/noc23_ee91/
4. Analog Electronic Circuits, By Prof. Pradip Mandal, IIT Kharagpur.
https://onlinecourses.nptel.ac.in/noc20_ee45/preview



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Class: S.Y. B. Tech.	Semester: III	L	T	P	Credits
Course Code: MC2052	Course Name: Industrial Fluid Power	3	-	--	3

Course Description:

This course introduces the fundamentals of hydraulic and pneumatic systems used in industrial automation and fluid power applications. Students learn the structure, working principles, and functions of essential components such as cylinders, valves, pumps, motors, actuators, and control elements. It also covers the design and integration of electrohydraulic and electro-pneumatic troubleshooting systems for automation applications. Practical exposure to circuit implementation, troubleshooting, maintenance, and performance evaluation enables students to develop the skills required to design, operate, and maintain reliable fluid power systems in modern industries.

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. Integrate fluid power systems with electrohydraulic and electro-pneumatic troubleshooting systems for industrial applications.
5. Implement fluid power systems for industrial automation, including troubleshooting and maintenance.

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).	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, Rodless, Telescopic - Construction and application, Cushioning mechanism, Mounting of actuators, Rotary actuators -	06



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	Gear, Vane and Piston motors.	
3.	HYDRAULIC VALVES, ACCUMULATORS AND CIRCUITS Directional control valve, 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.	APPLICATIONS OF FLUID POWER Fluid Power in Robotics and Mobile Automation, Fluid Power Simulation and Modeling, Smart Fluid Power Systems and IoT Integration, Case Studies of Fluid Power Applications in Industry, Future Trends in Fluid Power Technology.	06

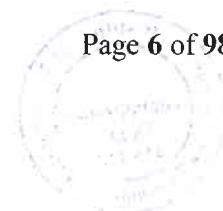
References -

Textbooks:

1. Fluid Power, Anthony Esposito, Prentice Hall Publications.
2. Industrial Hydraulics and Pneumatics, Stewart
3. Industrial Hydraulics and Pneumatics, H.P. Garg.
4. Oil Hydraulic Systems: Principles and Maintenance by S. R. Mujumdar.
5. Jagadeesha T., Thammaiah Gowda, Fluid Power: Generation, Transmission and Control, Wiley.

Reference Books:

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



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Class: S.Y. B. Tech.	Semester: III
Course Code: MC2072	Course Name: Engineering Mechanics

L	T	P	Credits
2	-	-	2

Course Description:

Engineering Mechanics focuses on the analysis of static bodies. The course helps the students to understand facts, concepts, principles and techniques of scientific investigation in the field of engineering. It develops thinking, analytical ability and imaginative skill of student. It is an introductory course which supports study of many other advanced courses like analysis and design of various structures..

Course Learning Outcomes:

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

1. Determine the resultant forces in coplanar force systems acting on engineering bodies
2. Apply the principles of equilibrium and friction to engineering problems involving beams and rigid bodies.
3. Analyze simple trusses using the method of joints and method of sections for member force analysis.
4. Determine the centroid and moment of inertia of composite plane lamina for engineering applications

Prerequisite: Engineering Mathematics, Engineering Physics.

Course Content		
Unit No.	Description	Hrs.
01	Fundamentals of Mechanics and force systems: Force and classification of force systems. Resultant of parallel, concurrent and non-concurrent coplanar forces.	04
02	Equilibrium of force system: Free body diagram, conditions of equilibrium, types of loads, types of beams, types of supports and reactions. Analysis of simple and compound beams using conditions of equilibrium	04
03	Friction: Introduction to Laws of friction, Surface friction for bodies on horizontal and inclined planes.	04
04	Analysis of trusses: Analysis of simple truss, Method of joints, Method of sections.	04
05	Centroid: Centroid of plane and composite lamina.	04
06	Moment of Inertia: Moment of Inertia of plane and composite lamina.	04



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References:

Text Books:

- Bhavikatti S. S., Rajashekarappa, “Engineering Mechanics”, New age International publication (India) Pvt. Ltd. New Delhi,
- Ramamrutham S., “Engineering Mechanics”, Dhanpat Rai Publishing Company Ltd., New Delhi.

Reference Books:

- S. Junnarkar, “Elements of Applied Mechanics”, Charotar Publishing House (India) Pvt. Ltd., Anand (Gujarat)
- Ferdinand. Beer and E. Russell Johnson, “Vector Mechanics for Engineers (Statics and Dynamics)”, McGraw Hill Publication, New York.
- Ferdinand L. Singer, “Engineering Mechanics (Statics and Dynamics)” Publications (India) Pvt. Ltd. Noida.
- Timoshenko and Young, “Engineering Mechanics (Statics and Dynamics)”, McGraw Hill Publication, New York. .



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

L	T	P	Credits
3	-	-	3

Course Description:

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

Course Outcomes:

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

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

Prerequisite: Basic knowledge of engineering graphics.

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



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

References –

References Books: -

- V. B. Sikka, "A Course in Civil Engineering Drawing", S. K. Kataria 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:

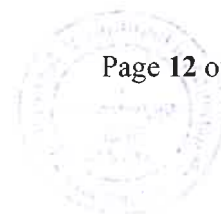
1. Describe the characteristics of various data structures such as stacks, queues, trees, and graphs.
2. Explain the operations and applications of linear data structures.
3. Compare linear and non-linear data structures with respect to their structure, operations, and applications.
4. Determine and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

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



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Course Content		
Unit No.	Description	Hrs.
01.	Introduction to Data Structures: Primitive and non-primitive data structures, Operations on data structures, Algorithms, Abstract Data Types (ADT).	06
02.	Stack: Definition & Concepts, Operations on Stack, Applications of Stack, Polish expressions, Reverse Polish Expression and conversions, Recursion.	06
03.	Queue: Queue and its sequential representation, Simple Queue, Circular Queue, Double Ended Queue, Priority Queue, Applications of Queue.	06
04.	Linked List: Definition and structure of singly linked list, doubly linked list and circular linked list. Operations: creation, traversal, insertion, deletion.	06
05.	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
06.	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.		



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Class:- S.Y.B. Tech.	Semester- III	L	T	P	Credits
Course Code: EEMD2011	Course Name : Electrical Power Generation	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.
5. Explain working principle with layout, need, and advantages of alternate electrical energy resources.

Prerequisite:

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

Course Content		
Unit No	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

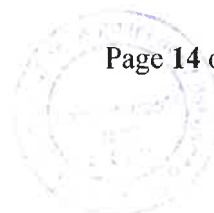
References -

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 : Second Year B. Tech.	Semester : III
Course Code : ECMD2011	Course Name : Electronics Devices and Applications

L	T	P	Credits
3	-	--	3

Course Description:

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

Course 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



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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	07



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	Definition, Terminologies, Representation, Operations, Singly linked list, Doubly linked list, Circular linked list, Stack using linked list, Queue using linked list.	
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:- Second Year B. Tech.	Semester- III
Course Code : MEMD2031	Course Name : Design Thinking

L	T	P	Credits
3	-	-	3

Course Description:

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

Course 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
3	Identifying Customer Needs	06



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	Understanding customer needs, Voice of the customer, gathering customer needs, organizing and prioritizing needs, Product mission statement, establishing product function.	
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.



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Class: S. Y. B. Tech	Semester: III	L	T	P	Credits
Course Code: MEMD205	Course Name: I. C. Engines	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.	6.00
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.	6.00
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.	6.00
4	Fuel Systems in I. C. Engines	6.00



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	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.	
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.	6.00
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.	6.00

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:

1. Mechatronics System Design, Devdas Shetty & Richard A. Kolk, PWS Publishing Company (Thomson Learning Inc.).
2. Mechatronics: A Multidisciplinary Approach, William Bolton, Pearson Education.
3. A Textbook of Mechatronics, R.K. Rajput, S. Chand & Company Private Limited
4. 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.



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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:

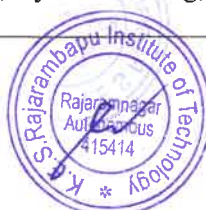
The course should enable the students to:

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



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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 -

- CO1. Differentiate various robotic configurations and performance metrics.
- CO2. Compare various end effectors, sensors, and drive systems in robotic applications.
- CO3. Illustrate kinematic and dynamic principles applied to robotic systems.
- CO4. Outline robot programming solutions for diverse applications.
- CO5. Distinguish various types and aspects of automation.
- CO6. 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, Hooke's 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
4.	Robot Programming and Its Applications:	06



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	Lead-through Programming, Walk-through Programming, Use of Teach pendants - Capabilities and limitations. Textual 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.	
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:

1. Mittal R K & Nagrath, "Robotics and Control", 2nd Edition, McGraw Hill Publication TMH.
2. S. K. Saha, "Introduction to Robotics", 2nd Edition, TMH, 2014.
3. 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:

1. John J Craig, "Introduction to Robotics", Pearson Edu. 2005.
2. Fu K.S, "Robotics", McGraw Hill, 2004.
3. Niku SB, "Introduction to Robotics – Analysis, Control, Applications", 3rd Edition, John Wiley & Sons Ltd., 2020.

NPTEL Course on Robotics:

1. https://onlinecourses.nptel.ac.in/noc19_me74/preview
2. https://onlinecourses.nptel.ac.in/noc20_de11/preview



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Class: - S.Y. B.Tech.	Semester-III	L	T	P	Credits
Course Code: MC2511	Course Name: Analog and Digital Electronics Lab	-	-	2	1

Course Description:

Analog and Digital Electronics Lab course focuses on working principles of electronic devices, Operational amplifiers, Logic gates. This course also develops an ability to analyse and design various applications of electronic devices.

Course Learning Outcomes:

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

1. Analyze electronic circuits as per requirements.
2. Conduct an experiment to observe response.
3. Calculate different parameters from experimental results and plot the response.
4. Interpret results of experiment and compare with measured values.
5. Improve the ability to communicate effectively through written lab journals.

Prerequisite: Basic knowledge of active and passive components, Multimeter, Breadboard, CRO.

Course Content		
Expt. No.	Title of the Experiment	Hrs.
1.	Study characteristics of PN junction diode.	02
2.	Analyze types of clipper circuits.	02
3.	Analyze types of clamper circuits.	02
4.	Design of half wave rectifier	02
5.	Design of full wave rectifier.	02
6.	Design inverting and non-inverting amplifier using OP-AMP.	02
7.	Verify the truth tables of all basic gates.	02
8.	Design and verify half-adder & half-subtractor using logic gates.	02
9.	Verify the truth table of SR, JK, T and D flip-flops using NAND & NOR gate.	02
10.	Verify the truth table of synchronous and asynchronous counter.	02
11.	Verify the truth table of serial-in parallel-out shift register.	02

**References –
Textbooks:**



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1. R. L. Boylestad, L. Nashlesky, "Electronic Devices and Circuits Theory", Pearson Education.
2. Donald Neaman, "Electronic Circuit Analysis and Design", Tata McGraw Hill, (3rd Edition).
3. R.P. Jain, "Modern digital electronics", Tata McGraw Hill Publication, (3rd Edition).

Reference Books:

1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson.
2. Anand Kumar, "Fundamentals of digital circuits", PHI Publication.



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Class: - S.Y. B.Tech.	Semester-III	L	T	P	Credits
Course Code: MC2531	Course Name: Industrial Fluid Power Lab	-	-	2	1

Course Description: Hydraulic and pneumatic operated machines and equipment are widely used in various industries due to their versatility and adaptability to automation. Mechanical engineering technologists are required to maintain such systems in different segments of industries. This competency needs the knowledge of construction and working of different components of hydraulic and pneumatic systems. This course will give the students the basic skills and knowledge to use and maintain different types of hydraulic systems and pneumatic systems.

Course Learning Outcomes:

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

1. Demonstrate & identify various components of Hydraulics & Pneumatic System along with standard symbols.
2. Design & analyze basic hydraulic and pneumatic circuits using training kits.
3. Design & analyze electrohydraulic and electropneumatic circuits using training kits.
4. Use Automation Studio software to design & simulate the fluid power circuits.

Prerequisite: Basic knowledge of fundamentals of fluid power and electrical systems.

Course Content		
Expt. No.	Title of the Experiment	Hrs.
1.	Identify the components and Draw ISO symbols used in hydraulic and pneumatic system.	02
2.	Construct and actuate hydraulic circuit for SAC, DAC and Hydro motor for the given purpose.	02
3.	Construct and actuate Meter-in, Meter-out Hydraulic circuit for the given purpose.	02
4.	Construct and actuate hydraulic circuit for the given sequencing of operations.	02
5.	Construct and actuate Pneumatic circuit for SAC, DAC and Air motor for the given purpose.	02
6.	Construct and actuate speed control Pneumatic circuits for the given purpose.	02
7.	Construct and actuate indirect (pilot) control Pneumatic circuit for the given purpose.	02
8.	Construct and actuate Pneumatic circuit for the given sequencing of operations.	02



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9.	Construct and actuate Pneumatic circuit for the given Logic functions (AND/OR/TIME DELAY).	02
10.	Construct and actuate Electro-Pneumatic circuit/PLC controlled circuit for given application.	02

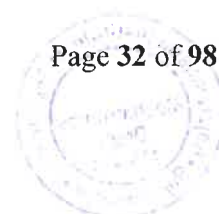
References –

Textbooks:

1. Fluid Power, Anthony Esposito, Prentice Hall Publications.
2. Industrial Hydraulics and Pneumatics, Stewart
3. Industrial Hydraulics and Pneumatics, H.P. Garg.
4. Oil Hydraulic Systems: Principles and Maintenance by S. R. Mujumdar.

Reference Books:

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



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Class: - S.Y. B. Tech.	Semester-IV	L	T	P	Credits
Course Code: MC2572	Course Name: Machine Drawing and CAD Modeling Lab	-	-	2	1

Course Description:

This course enables students to create 2D, 3D models, Assembly, bill of material and drafting of any mechanical component. Students learn CATIA CAD modelling software in which they are taught different commands for sketching, modelling, and assembly. Also, they taught to select drawing units, apply constraints. After assembly, students can create a bill of material and evaluate 2D drafting in different views.

Course Learning Outcomes:

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

1. List and draw different standard parts like fasteners and keys.
2. Inspect Limit, fits and tolerances from sketches of machine parts.
3. Model machine parts using CAD software.
4. Assemble machine Parts by using CAD tool.
5. Generate detailed drawing views.
6. Create surface features using surface tools.

Prerequisite: Basic study of engineering drawing, machine drawing is required.

Course Content		
Experiment No	Description	Hrs
1.	Introduction to Thread Forms, fasteners, keys, joints, and couplings (2D Drawing of any two parts)	02
2.	Limits, Fits and Tolerances: Introduction, Fundamental tolerances, Deviations, Methods of placing limit dimensions, machining symbols, types of fits with symbols and applications, geometrical tolerances on drawings.	02
3.	Free Hand Sketching: Sketching of different shapes, Machine Components.	02
4.	Introduction to CAD and CATIA Introduction and Overview of CATIA, CAD/CAM/CAE Product Cycle, Environment of CATIA, Introduction to Menu Bars, Modules	02
5.	SKETCHER MODE Profile, Predefined profile, Circle, Spline, Conic, Line, Axis, Point, Corner, Chamfer, Transformation.	02
6.	Constraint- Geometrical constraint. Tools- Sketch solving status. Sketch tool, Views, Standard options etc.	02
7.	PART DESIGN-I 3D Reference Elements (Point, Line, Plane), Pad, Pocket, Shaft, Groove, Hole, Rib, Slot, Splitter, Loft, Remove Loft	02



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8.	PART DESIGN-II Fillet, Chamfer, Draft, Shell, Thickness, Thread/ Tap, filleted pocket, Transformation feature- Patterning, Scaling, Mirror	02
9.	ASSEMBLY DESIGN-I Insert Component, Product, Part, Existing component, replace component, recording, Generate numbering. Manipulation, Snap, Smart move, Explode, stop manipulation on clashes etc.	02
10.	Generative Drafting Front View, Auxiliary View, Projection Views, unfolded view, Section Views, Detail View, Broken View, Clipping view, View creation wizard etc. Dimension generation, Balloon generation etc. Positioning Views, Modifying Views etc., Dimension properties, Addition of tolerance etc., Frame creation, frame modification, Addition of Bill of material etc.	02

References -

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishes
2. Various books by Sham Tickoo, book title, publication



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Class: - S. Y. B. Tech.	Semester: III	L	T	P	Credits
Course Code : MC2592	Course Name : Engineering Mechanics Laboratory	-	-	2	1

Course Description:

Engineering Mechanics Laboratory provides practical exposure to the fundamental principles of engineering mechanics through experiments on force systems, equilibrium, friction, support reactions, trusses, and centroid of plane lamina. The course develops students' ability to conduct experiments, analyze and interpret results, and validate theoretical concepts, thereby strengthening their analytical and problem-solving skills for advanced mechatronics engineering courses.

Course Learning Outcomes:

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

1. Analyze the laws of polygon of forces, Lami's theorem, and the principle of moments.
2. Determine the support reactions and coefficient of friction for engineering systems through laboratory experiments.
3. Analyze simple trusses using analytical and graphical methods and interpret the experimental results.
4. Analyze the theoretical and experimental results for the centroid of a plane lamina.

Prerequisite: Engineering Mathematics and Engineering Physics

Course Content

Experiment No	Description	Hrs
1.	Verify the law of polygon of forces using a universal force table.	02
2.	Verify the principle of moments by establishing the relationship between force, moment, and lever arm.	02
3.	Determine the support reactions of a simply supported beam using a parallel force apparatus.	02
4.	Determine the support reactions of a compound beam.	02
5.	Verify the equilibrium of connected bodies	02
6.	Verify Lami's theorem	02
7.	Determine the coefficient of friction using an inclined plane friction apparatus.	02
8.	Analyze a simple truss using the method of joints.	02
9.	Analyze a simple truss using the graphical method.	02
10.	Determine the centroid of a plane lamina and compare it with the theoretical value.	02



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References -

Text Books:

- Bhavikatti S. S., Rajashekarappa, “Engineering Mechanics”, New age International publication (India) Pvt. Ltd. New Delhi,
- Ramamrutham S., “Engineering Mechanics”, Dhanpat Rai Publishing Company Ltd., New Delhi.

Reference Books:

- S. Junnarkar, “Elements of Applied Mechanics”, Charotar Publishing House (India) Pvt. Ltd., Anand
- Timoshenko and Young, “Engineering Mechanics (Statics and Dynamics)”, McGraw Hill Publication, New York.



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Class: - S.Y. B. Tech.	Semester- III	L	T	P	Credits
Course Code: MC2593	Course Name: Python Programming Lab.	--	-	2	1

Course Description:

This course is designed to provide students with a comprehensive understanding of the Python programming language, which is widely recognized for its versatility and ease of use. The course discusses the fundamental principles of Object-Oriented Programming, as well as in-depth data and information processing techniques. Students will solve problems, explore real-world software development challenges, and create practical and contemporary applications.

Course Learning Outcomes:

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

1. To understand the basic concepts of scripting and the contributions of scripting language.
2. Ability to explore python data structures like Lists, Tuples, Sets and dictionaries.
3. Ability to create practical and contemporary applications using Functions, Modules and Regular Expressions.

Prerequisite: Knowledge on Problem Solving Through Computer Programming.

Course Content		
Expt. No.	Description	Hrs.
1	Introduction to python programming: Versions, Installation, working etc.	02
2	Demonstrate fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)	02
3	Demonstrate various methods of String, List and tuple.	02
4	Demonstrate various methods of sets and dictionary.	02
5	Demonstrate the Conditional statements in Python with suitable examples. (If statement, if else statement, if – elif – else statement)	02
6	Demonstrate the Iterative statements in Python with suitable examples. (While loop, for loop)	02
7	Demonstrate the Break, Pass and Continue statements in Python with suitable examples.	02
8	Demonstrate various functions in the python. (In Built, User Define)	02
9	Demonstrate the File Handling: Data streams, Access modes, Read/Write/Seek	02
10	OOP: Classes, Objects	02



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References –

Textbooks-

1. Exploring Python, Timothy Budd, Mc Graw Hill Publication, ISBN:9780073523378.
2. Beginning Python, Peter C. Norton, Alex Samuel, Dave Aitel, Eric Foster-Johnson, Leonard Richardson, Jason Diamond, Aleatha Parker, Michael Roberts, ISBN: 978- 0-7645-9654-4.

Reference Books

1. Python: Create - Modify - Reuse, James O. Knowlton, Wrox Publication, ISBN: 978- 0-470- 25932-0.
2. 470- 25932-0.
3. Professional Python Frameworks: Web 2.0 Programming, Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0.



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

L	T	P	Credits
-	-	2	1

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

Course Outcomes:

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

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

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

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

Minimum 12 sessions will be conducted from the following list.

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



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



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References -

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

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

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



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

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

Course Outcomes:

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

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

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

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

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



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

References -

1. Spiritual Wisdom in Day-to-day life – Blogs by Mr. Pralhad Wamanrao Pai
2. Towards the goal of beautiful life – Book by Satguru Shri Wamanrao G. Pai
3. Power of your subconscious mind – Dr. M. H. H. H.



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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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DEPARTMENT OF MECHATRONICS ENGINEERING

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

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

Course Outcomes:

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

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

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

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



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



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g) Traction	h) Market Opportunities/ Size	
i) Competition	j) Go To Market Strategies	
k) Financials	l) Team	

References -

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

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

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



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

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

Course Outcomes:

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

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

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

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

Minimum 12 sessions will be conducted from the following list.

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



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

References -

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

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



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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 : SH 2735	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
5.	Present perfect tense with helping verb haben and sein. Difference between these two verbs and related exercises	02



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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: MC2021	Course Name: Strength of Materials	3	--	--	3

Course Description:

Strength of Materials is more concerned with the internal forces and associated changes in the geometry of the components involved. Of particular importance are the properties of the materials used, the strength of which will determine whether the components fail by breaking in service, and the stiffness of which will determine whether the amount of deformation they suffer is acceptable. Therefore, the subject Strength of materials is central to the whole activity of engineering design. Usually, the objectives in analysis here will be the determination of the stresses, strains, and deflections produced by loads. Theoretical analysis and experimental results have equal roles in this field.

Course Learning Outcomes:

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

1. Determine different types of stresses and strains induced in any machine component.
2. Develop shear force and bending moment diagram for different types of beams.
3. Determine stress distribution for various cross sections of beam.
4. Estimate the deflection of beams by analytical and graphical method.
5. Analyze axially loaded column for different end conditions.

Prerequisite: Knowledge of Applied Mathematics and Engineering Mathematics.

Course Content		
Unit No	Description	Hrs
1.	Simple stresses and strains- Concept of stress and strain (linear, lateral, shear and volumetric), Hooke's law. Elastic constants and their relationship. Stress -strain diagrams, Stresses, strains and deformation in determinate homogeneous and composite bars under concentrated loads, stress concentration, Poisson's Ratio thermal stresses.	06
2.	Shear force and bending moment diagrams- Concept and definition of shear force and Bending Moment in beams due to concentrated load, UDL, uniformly varying loads and couples in determinate beams. Relation between SF, BM and intensity of loading, construction of SF and BM diagrams for beams.	06
3.	Stresses due to Bending- Stresses due to bending: Theory of simple bending, concept and assumptions, Derivation of Flexure formula. Bending stress distribution diagram for various cross sections of a beam.	06
4.	Slope and Deflection of Beams-	06



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	Concept and definition, relation between B.M., slope and deflection by double integration method and Moment area method for Simply Supported and cantilever beams.	
5.	Principal stresses and Torsion of Shaft- 5.1 Principal stresses: Normal and shear stresses on any oblique planes and concept of principal stress and Principal planes by analytical and graphical methods (Mohr's circle of stress 2-D) 5.2 Torsion of shaft: Derivation of torsion formulae, stresses and deformation in determinate shafts of hollow, solid, and varying circular cross section subjected to twisting moments	06
6.	Axially Loaded columns and strain energy method- Concept of critical load and buckling, derivation of Euler's formulae for buckling load with hinged ends, concept of equivalent length for various end conditions. Rankine's formulae, safe load on column, Limitation of Euler's formulae.	06

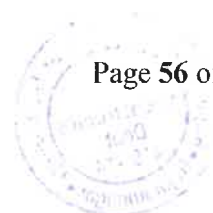
References:

Textbooks:

1. Ramamurthum, Strength of Materials, Dhanpat Rai and Sons, New Delhi.
2. R.K. Rajput, strength of Material, Laxmi Publication, New Delhi.

Reference Books:

1. G.H. Rider, Strength of Material, Mac Millan India Ltd.
2. Ferdinand P Beer and E.R. Johnston JR. John DeWolf, Mechanics of Materials, McGraw Hill Book company.
3. Gere & Timoshenko, Mechanics of Material, CSB Publisher.
4. Timoshenko and Young, Elements of Strength of Materials, East-West Press. Pvt. Limited, New Delhi.
5. Hibbler, Mechanics of Materials, Pearson Education Publication.



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Class: S.Y. B. Tech.	Semester: IV	L	T	P	Credits
Course Code: MC2042	Course Name: Microcontrollers and Embedded systems	3	-	-	3

Course Description:

In this course, the fundamentals of embedded system hardware and firmware design are explored. Issues such as embedded processor selection, hardware/firmware partitioning, development tools, firmware architecture, firmware design and firmware debugging will be discussed. The microcontroller architecture, peripheral programming and applications are discussed.

Course Learning Outcomes:

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

1. Explain the fundamentals of embedded systems.
2. Write embedded C programs for chip and off chip peripherals.
3. Interpret peripherals with microcontroller.
4. Design the embedded system using microcontroller.

Prerequisite: Knowledge of C language Programming.

Course Content		
Unit No.	Description	Hrs
01	Introduction to Embedded systems Embedded systems and general-purpose computer systems, microprocessors and microcontrollers, digital signal processors, RISC and CISC controllers, big endian and little-endian processors, application specific ICs, programmable logic devices, COTS, sensors and actuators, communication interfaces, embedded firmware, other system components, PCB and passive components.	06
02	Programming embedded systems- Programming languages, structure of embedded program language overview, structure of a C program, identifiers, name spaces and scope, for and while loops, infinite loops, if and switch statements, embedded C data types, I/O port programming, bit manipulation, logic operations in C, modulus and shifting, macros.	06
03	Embedded hardware-memories- Memory map, I/O map, Interrupt map, types of memories, RAM, ROM and flash memory interfacing and memory testing, CRC.	06
04	Peripheral programming- Control status registers, device drivers, timers, watchdog timers, ADC signal conditioning, digital signal processing, RTOS, selection process.	06
05	Peripheral Interfacing and programming	06



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	Programming timers, microcontroller interrupts programming, PWM, DC motor, stepper motor, servo motor programming, LCD, keyboard, ADC Programming, DAC Interfacing, Sensor interfacing and signal conditioning, EPROM Read/write, microcontroller connection to RS232, serial communication protocols UART, SPI, I2C programming in C.	
06	Design and development of embedded systems Embedded system development environment-IDE, cross compilation, disassembler/decompiles, simulator, emulator and debugging, embedded product development lifecycle, recent trends in embedded industry, PCB design, component mounting and testing, case studies using microcontroller.	06

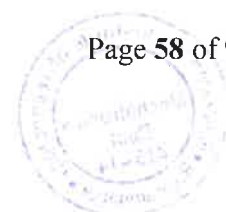
References:

Textbooks:

1. C programming for PIC microcontroller; demystifying coding with embedded programming by Hubert Henryward.
2. PIC microcontroller projects handson by Anbazhagan K.
3. Programming STM32 microcontroller circuit by Anbazhagan K.
4. Embedded systems with ARM CORTEX-M microcontrollers in assembly language and c fourth edition by Dr Yifeng Zhu

Reference Books:

1. Linux device driver development: everything you need to start with device driver development for Linux kernel and embedded linux by John Madiou, Packt publishing.
2. Embedded systems architecture: design and write software for embedded devices to build safe and connected systems by Daniele Lacamera, Packet publishing ltd.
3. Embedded systems architecture: a comprehensive guide for engineers and programmers by Tammy Noergaard, Elsevier.



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DEPARTMENT OF MECHATRONICS ENGINEERING

Class: S.Y. B. Tech.	Semester: IV
Course Code: MC2061	Course Name: Kinematics & Dynamics of Machines

L	T	P	Credits
3	-	--	3

Course Description:

Kinematics & Dynamics of machines course deals with study of machines & mechanisms considering relative motions and forces causing the motions. The subject under consideration is concerned with kinematics part i.e., study of machines & mechanisms without considering the forces causing motions in these. The major focus is on determination of displacement, velocity & acceleration of different links of the mechanisms using different methods like Graphical method, analytical methods etc. This is required further for kinetic analysis of the mechanisms. Apart from above, generation of cam profile, study of belts, ropes, chains, toothed wheels, and gear train are the major contents of the syllabus.

Course Learning Outcomes:

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

1. Perform the mobility analysis of mechanism.
2. Determine kinematic analysis (Velocity, acceleration) for a given mechanism using analytically and graphically method
3. Construct different types of cam profile for a given condition
4. Apply appropriate power transmission method for mechanical system
5. Apply different techniques to balance the rotary and reciprocating systems
6. Evaluate and analyze the parameters affecting on stability of spinning and rotating bodies.

Prerequisite: Fundamental concepts of Engineering Mechanics, Graphical Analysis, Vectors representation.

Course Content		
Unit No.	Description	Hrs.
1.	Fundamentals of kinematics and Mechanisms Kinematic links pairs, and chains, Machine & Structure, Constrained motions, Joints, Mechanism, and degree of freedoms, Kutzbach criterion Gruebler's criterion, Inversion: definition, types of Inversions of four bar chain, Slider crank chain, double slider crank chain and its inversions.	06
2.	Analysis of Mechanism Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity acceleration analysis, instantaneous centers, Forces on mechanism, Velocity and acceleration analysis by Klein's Construction Method, Coriolis component of acceleration.	06
3.	Cams Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, uniform acceleration, simple harmonic and cycloidal motions, Analysis of standard motions to the follower, Determination of cam	06



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	profiles for given follower motion, Analysis of cams with specified contours cams and circular arc cam, Tangent cam, jumping of follower.	
4.	Mechanical Power Transmission: Belts: Types of belts & rope drives, Velocity Ratio, calculation of length & power transmitted Belt tension ratio, sleep & creep of belt. Chain drive: Classification, length, angular speed ratio, classification of chains. Toothed Gears: Geometry of motion, Gear geometry, Types of profiles Involute & Cycloidal, theory of Spur, Helical and Spiral gears, Interference in involute tooth gears, path of contact, arc of contact, contact ratio. Gear trains.	06
5.	Balancing Static and dynamic balancing, balancing of single and several masses rotating in same and different planes, primary and secondary balancing of reciprocating masses, Balancing of single and multi-cylinder engines,	06
6.	Gyroscope Principle of Gyroscope, Gyroscopic couple, spinning & precessional motion, Gyroscopic couple, and its effect on – (i) Aero plane. (ii) Ship (iii) Two-Wheeler (iv) Four-Wheeler. Governors: Types of governors, Terms used in governors, Performance of governors.	06

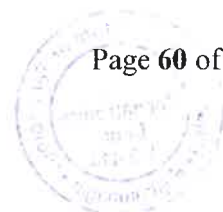
References -

Textbooks:

1. Charles E. Wilson and J. Peter Sadler, Kinematics and Dynamics of Machinery, Pearson Education Inc.
2. Ratan S.S., Theory of Machines, Tata McGraw Hill New Delhi.
3. P.L. Ballany, Theory of Machines & Mechanism, Khanna Publication, New Delhi.
4. V.P. Singh, Theory of Machines, Dhanpat Rai and Sons.
5. Phakatkar, Theory of Machines I and II, Nirali Publication, Pune.
6. Dr. R.K. Bansal, Theory of machines, Laxmi Publication.

Reference Books:

1. Thomas Bevan, Theory of Machines, CBS Publishers, New Delhi.
2. Shigley, Theory of Machines and Mechanism, McGraw Hill, New York.
3. J.S. Rao and R.V. Dukipatti, Theory of Machines and Mechanism, New Age Int. Publications Ltd. New Delhi.
4. Shah and Jadhawani, Theory of Machines, Dhanpat Rai & Sons.
5. Abdullah Shariff, Theory of Machines, McGraw Hill, New Delhi.



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Class: S.Y. B. Tech.	Semester: IV	L	T	P	Credits
Course Code: MC2082	Course Name: Materials and Manufacturing Technologies	3	-	--	3

Course Description

This course introduces engineering materials and manufacturing technologies used in modern mechanical and mechatronic systems. Students develop an understanding of material selection, conventional and advanced manufacturing processes, machine tools, CNC technology, and non-traditional machining. The course emphasizes the relationship between material properties, product design, manufacturing economics, quality, sustainability, and automation. Through practical case studies and industrial applications, students gain the ability to select appropriate materials and manufacturing processes for engineering components while considering productivity, cost, precision, and environmental impact.

Course Learning Outcomes:

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

1. Explain the classification, properties, and engineering applications of materials, and evaluate their suitability for manufacturing different engineering components.
2. Select appropriate engineering materials and material processing techniques by considering mechanical properties, heat treatment and engineering design requirements.
3. Analyze casting and joining processes for manufacturing engineering components by considering process capability, quality, productivity, and sustainability.
4. Analyze forming processes used to produce various engineering components.
5. Select suitable machining processes, cutting tools, machining parameters, and machine tools to manufacture engineering components with the required dimensional accuracy, surface integrity, and productivity.
6. Evaluate conventional and non-conventional manufacturing processes for producing engineering components based on material characteristics, geometric complexity, dimensional accuracy, surface finish, and economic considerations.

Course Content		
Unit No	Description	H rs.
1	Fundamentals of Engineering Materials Classification of Engineering Materials, Atomic Structure and Crystal Structure, Crystal Defects and Imperfections, Mechanical, Physical, Thermal and Electrical Properties, Ferrous Materials, Non-Ferrous Materials, Engineering Applications of Metallic Materials, Structure–Property Relationship, Engineering Stress–Strain Behaviour, Material Selection Criteria	06
2	Advanced Engineering Materials and Material Processing Engineering Polymers, Ceramics, Composite Materials, Powder Metallurgy, Iron–Carbon Equilibrium Diagram (Conceptual), Heat Treatment of Steels, Surface Engineering, Material Selection for Engineering Components	06



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3	Casting and Joining Processes Casting- Pattern Design, Moulding, Gating and Riser Systems, Solidification, Casting Defects, Special Casting Processes Joining- Arc Welding, TIG Welding, MIG Welding, Resistance Welding, Brazing, Soldering	06
4	Forming Processes a) Introduction, types and importance of Rolling, Forging, Extrusion, Wire, rod and pipe drawing, Sheet Metal Working. b) Introduction to plastics, blow molding, injection molding, extrusion, calendaring, and thermos-forming.	06
5	Machine Tools and Machining Processes Mechanics of Metal Cutting, Cutting Tool Geometry, Cutting Fluids, Lathe, Drilling, Milling, Grinding, Broaching, Shapers, Planers	06
6	Non-traditional Machining Processes Selection of Advanced Manufacturing Processes, Comparative Analysis of Conventional and Non-Conventional Processes Electro Discharge Machining (EDM), Wire EDM, Electrochemical Machining (ECM), Ultrasonic Machining (USM), Laser Beam Machining (LBM), Abrasive Water Jet Machining (AWJM), Plasma Arc Machining, Industrial Applications	06

References -

Textbooks:

1. Serope Kalpakjian and Steven R. Schmid, Manufacturing Engineering and Technology, 8th Edition, Pearson, 2020.
2. P. N. Rao, Manufacturing Technology, Volume I: Foundry, Forming and Welding, 6th Edition, McGraw Hill Education, 2021.
3. P. N. Rao, Manufacturing Technology, Volume II: Metal Cutting and Machine Tools, 5th Edition, McGraw Hill Education, 2020.
4. William D. Callister Jr. and David G. Rethwisch, Materials Science and Engineering: An Introduction, 10th Edition, Wiley, 2018.
5. V. Raghavan, Materials Science and Engineering, 7th Edition, PHI Learning, 2018.
6. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, Wiley, 2023.

Reference Books:

1. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, Wiley, 2023.
2. Degarmo, Black and Kohser, Materials and Processes in Manufacturing, 14th Edition, Wiley, 2020.
3. John A. Schey, Introduction to Manufacturing Processes, 3rd Edition, McGraw-Hill, 2000.
4. ASM Handbook, Volume 15: Casting, ASM International, 2008.
5. ASM Handbook, Volume 6: Welding, Brazing and Soldering, ASM International, 2011.
6. W. A. J. Chapman, Workshop Technology, Volumes I, II and III, 5th Revised Edition, CBS Publishers, 2017.
7. R. S. Khurmi and J. K. Gupta, A Textbook of Workshop Technology (Manufacturing Processes), 15th Edition, S. Chand, 2021.



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Class: - S.Y B. Tech	Semester-IV	L	T	P	Credits
Course Code: MC214	Course Name: Electrical Actuators and Drives	3	-	--	3

Course Description:

Electrical Actuators and Drives is a core course that introduces the principles, construction, characteristics, and control of electrical actuators and drive systems used in mechatronic applications. The course covers electromagnetic actuators, DC and AC motors, stepper and servo motors, drive systems, motor control techniques, and their applications in industrial automation and robotics. Students gain knowledge of actuator selection, drive characteristics, and speed control methods for modern mechatronic systems.

Course Learning Outcomes:

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

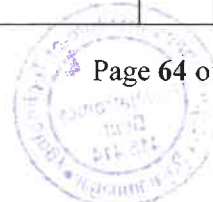
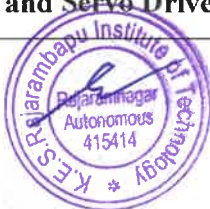
1. Explain the construction, working principles, and characteristics of electrical actuators and motors.
2. Analyze the performance of DC and AC motor drive systems.
3. Select appropriate electrical actuators and drives for various mechatronic applications.
4. Apply speed and position control techniques for electrical drive systems.
5. Design simple electrical drive solutions for industrial and mechatronic applications.

Prerequisite:

Basic Electrical Engineering, Engineering Physics.

Course Content

Unit No	Description	Hrs
1.	Unit I – Fundamentals of Electrical Actuators and Machines Introduction to Electrical Actuators, Classification of Electrical Actuators, Construction and Working of DC Machines, Single-Phase and Three-Phase Induction Motors, Synchronous Motors, Characteristics of Electrical Machines, Starting and Braking Methods, Industrial Applications.	06
2.	Unit II -DC Motors and Drives Construction and Working of DC Motors, Types of DC Motors, Torque-Speed Characteristics, Starting and Braking of DC Motors, Speed Control Methods, DC Motor Drives, Applications in Mechatronic Systems	06
3.	Unit III – AC Motors and Drives Construction and Working of Single-Phase and Three-Phase Induction Motors, Synchronous Motors (Introduction), Torque-Speed Characteristics, Starting Methods, Speed Control Techniques, Variable Frequency Drives (VFD), Industrial Applications.	06
4.	Unit IV – Stepper Motors and Servo Drives	06



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	Stepper Motor Construction and Working, Types of Stepper Motors, Drive Circuits, Stepping Modes, Servo Motors (AC and DC), Servo Drive Systems, Position and Speed Control, Comparison of Stepper and Servo Motors, Applications in Robotics and CNC Systems.	
5. Unit v: Electrical Drive Systems	Introduction to Electric Drives, Components of Electric Drives, Load Characteristics, Four-Quadrant Operation, Braking Methods, Selection of Drives, Energy Efficiency in Electrical Drives, Industrial Applications.	06
6. Unit VI- Applications of Electrical Actuators and Drives	Actuators in Industrial Automation, Motor Drives in Conveyors and Material Handling Systems, Drives for Pumps, Compressors and Fans, Drives in Robotics and Mechatronic Systems, Electric Vehicle Drives (Introduction), Smart Actuators and Intelligent Drives, Case Studies.	06

References -

Text Books:

1. Electric Drives, Tata McGraw-Hill.
2. Fundamentals of Electric Drives, Narosa Publishing House.

Reference Books:

3. Performance and Design of AC Machines, CBS Publishers.
4. Modern Control Engineering, Pearson.



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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	L	T	P	Credits
Course Code: CSMD204	Course Name: MDM-II Fundamentals of Database Systems	3	-	-	3

Course Description:

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

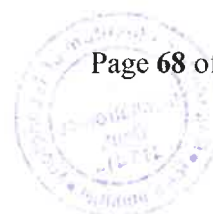
Course Learning Outcomes:

After Successful Completion of the course 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.



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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	6
2	Relational Model Structure of Relational Databases, Structured Query Language (SQL): Data Definition Language, Data Manipulation Language, Aggregate functions, Set Operations.	6
3	Integrity Constraints and Database Design Domain Constraints, Referential Integrity, Functional Dependencies, Decomposition, Normalization: 1NF, 2NF, 3NF	6
4	Data Storage and Indexes File Organization, Data Dictionary Storage, Indexing: B+ tree indexing and B tree indexing, Hashing: Static and Dynamic.	6
5	Basic of Transactions Concepts of transaction processing, ACID properties, Transaction states, Serializability, Testing for serializability.	6
6	Concurrency Control and Recovery System Lock-based protocols, Timestamp - based Protocols. Crash Recovery: Failure Classification, Log-Based Recovery, Checkpoints.	6

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.

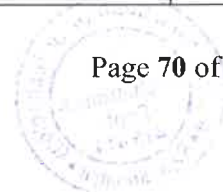
Course Learning Outcomes:

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.	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
- Ashfak 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:

1. K.Sam Shanmugan, Digital & Analog Communication Systems, Wiley India
2. RP Singh, S D Sapre, Communication System-Analog & Digital, Tata Mc-Graw Hill
3. Kennedy, Davis, Electronics Communication Systems, Tata McGraw Hill

Reference Books:

1. Bernard Sklar, Digital Communication-Fundamentals and Applications, Pearson Education
2. Tomasi, Electronic Communication Systems Pearson Education.
3. Taub, Schilling, Principles of communication systems, Tata McGraw Hill.
4. 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	05



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	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.	
4.	Dynamic Programming General method, Multistage graphs, All pair shortest paths, 0/1 Knapsack problem, Reliability design, Traveling sales person problem.	07
5.	Backtracking General method, n-Queens problem, Subset sum problem, Graph coloring 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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DEPARTMENT OF MECHATRONICS ENGINEERING

Class: S. Y. B. Tech	Semester: IV
Course Code: MEMD2041	Course Name: Behavioral Engineering and Design

L	T	P	Credits
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	06



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	successful products leveraging behavioral engineering principles, Hands-on exercises in <u>applying</u> behavioral insights to <u>product ideation</u> and <u>prototyping</u>	
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	L	T	P	Credits
Course Code: MEMD206	Course Name: Automotive Drive Train	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:

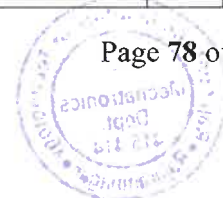
After successful completion of the course, students will be able to,

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



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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:

1. Kripal Singh, "Automobile Engineering", Vol. I Standard publisher's distributors.
2. Dr. N. K. Giri, "Automobile Engineering", Khanna Publishers.
3. S Srinivasan, "Automotive Mechanics" Tata McGraw Hill Publication.
4. K K Ramalingam, "Automobile Engineering" SCITECH publication.
5. R. K. Rajput, "Automobile Engineering" Laxmi Publications.
6. G. B. S. Narang, "Automobile Engineering;" Khanna Publishers.

Reference Books:

1. Heinz Heisler, "Advanced Vehicle Technology", Elsevier
2. Chhikara, "Automobile Engineering", Vol. II, Published by Satya Prakashan.
3. Motor Vehicle; Newton, K., Steeds, W., Garrett, T. K., published by society of automobile engineering.
4. Automobile Engineering; William H. Crouse, William Harry Crouse Tata McGraw-Hill Education.
5. Motor Vehicle science volume I; P. W. Ketts.
6. 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:

This course introduces the fundamentals of hydraulic and pneumatic systems used in industrial automation and fluid power applications. Students learn the structure, working principles, and functions of essential components such as cylinders, valves, pumps, motors, actuators, and control elements. It also covers the design and integration of electrohydraulic and electro-pneumatic troubleshooting systems for automation applications. Practical exposure to circuit implementation, troubleshooting, maintenance, and performance evaluation enables students to develop the skills required to design, operate, and maintain reliable fluid power systems in modern industries.

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. Integrate fluid power systems with electrohydraulic and electro-pneumatic troubleshooting systems for industrial applications.
5. Implement fluid power systems for industrial automation, including troubleshooting and maintenance.

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).	06
2.	HYDRAULIC SYSTEM AND COMPONENTS (PUMPS AND ACTUATORS) Pumping theory, Pump classification, Gear pump, Vane Pump,	06



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	construction and working of pumps, pump performance, piston pump, Variable displacement pumps, Linear hydraulic actuators, Types of hydraulic cylinders, Single acting, Double acting cylinders, Special cylinders like tandem, Rod less, Telescopic - Construction and application, Cushioning mechanism, Mounting of actuators, Rotary actuators - Gear, Vane and Piston motors.	
3.	HYDRAULIC VALVES, ACCUMULATORS AND CIRCUITS Directional control valve, 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.	APPLICATIONS OF FLUID POWER Fluid Power in Robotics and Mobile Automation, Fluid Power Simulation and Modeling, Smart Fluid Power Systems and IoT Integration, Case Studies of Fluid Power Applications in Industry, Future Trends in Fluid Power Technology.	06

References -

Textbooks:

1. Fluid Power, Anthony Esposito, Prentice Hall Publications.
2. Industrial Hydraulics and Pneumatics, Stewart
3. Industrial Hydraulics and Pneumatics, H.P. Garg.
4. Oil Hydraulic Systems: Principles and Maintenance by S. R. Mujumdar.
5. Jagadeesha T., Thammaiah Gowda, Fluid Power: Generation, Transmission and Control, Wiley.

Reference Books:

1. Industrial Hydraulics, Vickers Handbook.
2. 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 & 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:

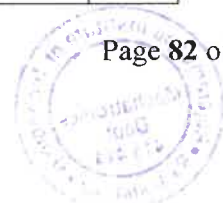
The course should enable the students to:

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 & 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,

- CO1. Explore the functions, characteristics, and operating principles of different sensors, transducers, and actuators.
- CO2. Examine the process and techniques involved in calibrating sensors and transducers for optimal performance.
- CO3. Evaluate and justify the choice of material and manufacturing methods used in the design of specific sensors.
- CO4. 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



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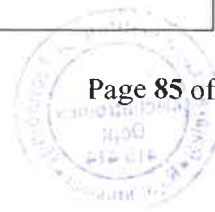
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2	Inductive & Capacitive Transducer: Inductive transducers: - Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer, Capacitive transducers:- Principle of operation, 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

References –Text Book:

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

Reference Books:



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



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Class: - S.Y. B. Tech. (All Branches)	Semester-III/IV	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.

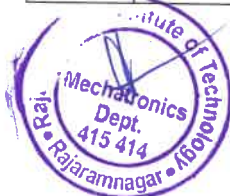
Course Learning Outcomes:

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
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	04



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	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.	
3.	Climate change and Sustainable development From unsustainable to sustainable development, Urban problems related to energy, Water conservation: Rainwater harvesting, Watershed management, Climate change, Global Warming, Ozone layer depletion, Acid Rain, Consumerism & waste Products, Concepts of Eco-labeled products, Eco-mark, Awareness of Environmental Legislation.	04

Guidelines for Project:

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

References –

Text Books:

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

Reference Books:

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



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Class: S.Y. B. Tech.	Semester: IV	L	T	P	Credits
Course Code: MC2501	Course Name: Microcontrollers and Embedded Systems Lab	-	-	2	1

Course Description:

In this course, the fundamentals of embedded system hardware and firmware design are explored. Issues such as embedded processor selection, hardware/firmware partitioning, development tools, firmware architecture, firmware design and firmware debugging will be discussed. The PIC microcontroller architecture is discussed.

Course Learning Outcomes:

- After successful completion of the course, students will be able to,
1. Write embedded C programs for on-chip and off-chip peripherals.
 2. Interface peripherals with the PIC microcontroller.
 3. Compile, debug, and test logic on PIC microcontroller.

Prerequisite: Engineering Mathematics, Engineering Physics

Expt. No.	Name of Experiment	Hrs.
1.	Develop a logic to study I/O port using led and a switch.	02
2.	Develop a logic to study stepper motor interfacing.	02
3.	Develop a logic to study DC motor interfacing using PWM.	02
4.	Develop a logic to study timer in PIC microcontroller.	02
5.	Develop a logic to study External interrupts.	02
6.	Develop a logic to study 16x2 LCD interfacing.	02
7.	Develop a logic to study matrix keyboard interfacing.	02
8.	Develop a logic to study ADC interfacing.	02
9.	Develop a logic to study sensor interfacing.	02
10	Design and develop PCB using Diptrace software.	02



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References:

Textbooks:

1. Embedded systems architecture programming and design by Rj Kmal, II edition, Tata MC Graw-Hill.
2. Designing embedded systems with PIC microcontroller: principles and applications by Tim Wilmshurt, Elsevier

Reference Books:

1. Embedded systems design by Stevie Heath, II edition, Newness publications
2. Embedded systems architecture: A comprehensive guide for engineers and programmers by Tammy Neogaard, Elsevier.
3. Embedded systems, Rajkamal, Tata McGraw-Hill



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Class: - S.Y. B. Tech.	Semester-IV	L	T	P	Credits
Course Code: MC2543	Course Name: Workshop Practices	-	-	2	1

Course Description:

The Workshop Practice Laboratory course provides practical exposure to fundamental machining and manufacturing processes used in mechanical engineering workshops. The course enables students to perform basic lathe operations such as plain turning, facing, taper turning and knurling. It also introduces welding techniques, including Metal Inert Gas (MIG) welding and Tungsten Inert Gas (TIG) welding using stainless steel material. Students gain hands-on experience in modern manufacturing technologies such as CNC machine programming, CNC machining operations, and Electrical Discharge Machining (EDM). In addition, the course includes practical work involving milling and grinding operations to develop skills in precision machining, surface finishing, and safe handling of workshop equipment.

Course Learning Outcomes:

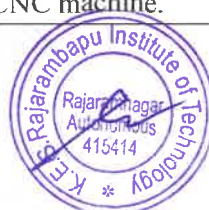
After successful completion of the course, students will be able to,

1. Perform lathe operations such as turning, facing, taper turning, and knurling with subsequent milling and grinding finishing operations.
2. Demonstrate MIG and TIG welding processes.
3. Develop and execute basic CNC programs and perform machining on a CNC machine.
4. Demonstrate the operation of the Electrical Discharge Machining (EDM) process.

Prerequisite:

Basic knowledge of engineering workshop practices, engineering drawing, and manufacturing processes. Students should be familiar with basic hand tools, measurement instruments, and fundamental safety practices in a mechanical workshop.

Course Content		
Unit No	Description	Hrs
1.	Lathe job involving operations like plain turning, facing, taper turning, and knurling followed by finishing operations on milling and grinding machines to achieve the required dimensions and surface finish.	06 turns (12 Hrs)
2.	Demonstration of Metal Inert Gas (MIG) and Tungsten Inert Gas (TIG) welding processes.	02 turns (4 Hrs)
3.	CNC machining experiment involving CNC machine programming and execution of machining operations on CNC machine.	03 turns (6 Hrs)



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4.	Demonstration of the working principle and operation of the Electrical Discharge Machining (EDM) process.	01 turn (2 Hrs)
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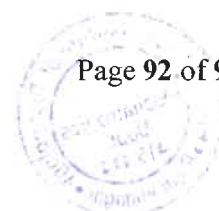
References -

Text Books:

- P.N. Rao, *Manufacturing Technology (Vol. I & II)*, McGraw Hill Education.
- Serope Kalpakjian and Steven Schmid, *Manufacturing Engineering and Technology*, Pearson Education.
- S.K. Hajra Choudhury, A.K. Hajra Choudhury, S.K. Nirjhar Roy, *Workshop Technology (Vol. I & II)*, Media Promoters & Publishers Pvt. Ltd.

Reference Books:

- Mikell P. Groover, *Fundamentals of Modern Manufacturing*, Wiley India Pvt. Ltd.
- Hazara Choudhari, *Mechanical Workshop Practice-II*, Prentice Hall India.
- K.K. Singh, *Manufacturing Technology*, S. Chand Publishing.
- B.S. Raghuvanshi, *Workshop Technology*, Dhanpat Rai & Co.
- K. Venugopal, *Workshop Technology Manual*, New Age International Publishers.



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Class: - S. Y. B. Tech.	Semester-IV	L	T	P	Credits
Course Code: MC262	Course Name: Robot Operating System Lab	-	-	2	1

Course Description:

This lab course provides hands-on experience with ROS, Linux commands, and robot simulation. Students will work with Turtlesim, Mitsubishi robotic arms, and Smorphy kits, performing tasks like node communication, object manipulation, and remote navigation. The course culminates in designing a voice-controlled humanoid robot project for real-world applications.

Course Learning Outcomes:

1. Illustrate the basics of Robot operating system simulation interface.
2. Explain basic Linux commands for ROS installation.
3. Demonstrate node concepts in multi-Robot system communication.
4. Apply basic robotic actions with Robotic arm.
5. Analyze the robotic prototypes used in various industries.
6. Demonstrate various actions using humanoid robots.

Prerequisite: Basics of programming.

Course Content		
Experiment No	Description	Hrs
1.	Implement basic Linux commands for terminal operations in ROS environment.	02
2.	Implement virtual machine concepts and Installation of ROS environment.	02
3.	Creation of basic inter nodes communication between Talker listener nodes.	02
4.	Create ROS2 nodes using the Turtlesim simulator of the ROS environment.	02
5.	Executing Turtlesim for running nodes, teleoperations, swamping and remapping of nodes.	02
6.	Implementation of Mitsubishi Robotic Arm, calibration and Melfa programming basics.	02
7.	Perform object Pick and Drop operations through Mitsubishi robotic arm.	02
8.	Perform various operations on Smorphy robotic kit and implement its remote navigation process.	02
9.	Design a voice-based action synchronization for a humanoid Robot.	02
10.	Design project	02
Reference Books:		



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	Textbook: 1. Robot Operating System for Absolute Beginners: Robotics Programming Made Easy”. 2. Programming Robots with ROS” by Quigley, Gerkey and Smart. 3. The Linux Command Line” by William Shotts. 4. Robot Operating System for Absolute Beginners: Robotics Programming Made Easy”. 5. Programming Robots with ROS” by Quigley, Gerkey and Smart. 6. The Linux Command Line” by William Shotts. 7. “It-Yourself Guide to the Robot Operating System: Volumes” by Patrick Goebel	
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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
6.	Writing a postcard Grammar- Pronoun - man	02
7.	Topic- Weather	02



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	Reading texts related to vacation and formation of “W” questions	
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.



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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 student will be assessed. Each assessment will be of minimum 10 marks. The best 10 performances of the student will be considered for ISE.

