Established: 1999

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra

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ADCET

F.Y. B.Tech. – Electrical Engineering
[Level 4.5, UG Certificate] Semester - I

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	3EEBS101	Mathematics-I	3	1	-	4	4	40	20	40	-	-
02	BS	LIT2	3EEBS102	Engineering Physics	3	-	2	3	4	40	20	40	50	-
03	ES	LIT2	3EEES103	Applied Mechanics	3	-	2	3	4	40	20	40	50	-
04	ES	T1	3EEES104	Introduction to Emerging Technologies	2	-	-	2	2	40	20	40	-	-
05	ES	LIT2	3EEES105	Fundamentals of Electrical Engineering	3	-	2	3	4	40	20	40	50	-
06	IKS	T2	3EEHS106	Indian Knowledge System	2	-	-	2	2	-	50	-	-	-
07	VS	LIT2	3EEVS107	IDEA Lab Workshop	1	-	2	1	2	-	-	-	50	-
08	CC	L2	3BSCC1**	Liberal Learning Course	-	-	2	-	1	-	-	-	50	-
				Total	**17**	**1**	**10**	**18**	**23**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIA (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50

CC Bouquet :

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC125 - Community Engagement through NSS
3BSCC122 - Physical Fitness and Lifestyle Management	3BSCC124 - Creativity through Visual Arts	3BSCC126 - Cultural Exploration & Heritage
3BSCC127- Leadership and Team management	3BSCC128- Self Management and Purposeful Living,	3BSCC129- Business Communication
3BSCC130- Mathematical Reasoning	3BSCC131- Introduction to Dance and Movement	3BSCC132- Introduction to Music and Singing
3BSCC133-Happiness and Well-Being	3BSCC134- Financial Literacy & Investment Awareness	3BSCC135-Cyber Awareness and Ethics

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F.Y. B.Tech. – Electrical Engineering
[Level 4.5, UG Certificate] Semester - II

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	3EEBS109	Mathematics-II	3	1	-	4	4	40	20	40	-	-
02	BS	LIT2	3EEBS110	Engineering Chemistry	2	-	2	2	3	40	20	40	50	-
03	ES	LIT2	3EEES111	Engineering Graphics with CAD	3	-	2	3	4	40	20	40	50	-
04	ES	L2	3EEES112	Programming for Problem Solving	1	-	2	1	2	-	-	-	50	-
05	ES	L2	3EEES113	Design Thinking	-	-	2	-	1	-	-	-	50	-
06	HS	L2	3EEHS114	Communication Skills	-	-	4	-	2	-	-	-	50	-
07	PC	LIT2	3EEPC115	Analog Electronics	3	-	2	3	4	40	20	40	50	-
08	CC	L2	3BSCC1**	Liberal Learning Course	-	-	2	-	1	-	-	-	50	-
				Total	**12**	**1**	**16**	**13**	**21**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIA (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50

CC Bouquet :

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC125 - Community Engagement through NSS
3BSCC122 - Physical Fitness and Lifestyle Management	3BSCC124 - Creativity through Visual Arts	3BSCC126 - Cultural Exploration & Heritage
3BSCC127- Leadership and Team management	3BSCC128- Self Management and Purposeful Living,	3BSCC129- Business Communication
3BSCC130- Mathematical Reasoning	3BSCC131- Introduction to Dance and Movement	3BSCC132- Introduction to Music and Singing
3BSCC133-Happiness and Well-Being	3BSCC134- Financial Literacy & Investment Awareness	3BSCC135-Cyber Awareness and Ethics

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Exit after F.Y. B.Tech. – Electrical Engineering

Additional Credits to qualify for B.Voc Certificate

Students have to undergo an 8-week Internship in Industrial equipment installation and wiring in order to qualify for B.Voc (Exit after F. Y. B. Tech – Electrical Engineering).

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ADCET

S.Y. B.Tech. – Electrical Engineering
[Level 4.5, UG Certificate] Semester - III

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	BS	T1	3EEBS201	Applied Mathematics-III	3	-	-	3	3	40	20	40	-	-
02	PC	LIT2	3EEPC202	Electric Circuit Analysis	3	-	2	3	4	40	20	40	50	-
03	PC	LIT1	3EEPC203	Digital Electronics and Microcontrollers	3	-	2	3	4	40	20	40	50	50
04	PC	LIT1	3EEPC204	Measurement and Instrumentation	2	-	2	2	3	40	20	40	50	50
05	VSEC	L2	3EEVS205	Python Programming	1	-	2	1	2	-	-	-	50	-
06	HS	T2	3EEHS206	Universal Human Values	2	-	-	2	2	-	50	-	-	
07	HS	T2	3EEHS207	Indian Constitution	1	-	-	1	1	-	50	-	-	-
08	HS	T2	3EEHS208	Environment Studies	2	-	-	2	2	-	50	-	-	-
09	HS	T2	3EEHS209	Psychology	1	-	-	1	1	-	50	-	-	-
10	MA	T2	3EEMA210	Aptitude and Reasoning-I	2	-	-	2	-	-	50	-	-	-
				Total	**20**	**-**	**8**	**20**	**22**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIA (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50

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S.Y. B.Tech. – Electrical Engineering

[Level 4.5, UG Certificate] Semester - IV

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	PC	T1	3EEPC212	Electromagnetic Fields	2	1	-	3	3	40	20	40	-	-
02	PC	LIT1	3EEPC213	DC Machines and Transformers	3	-	2	3	4	40	20	40	50	50
03	PC	LIT1	3EEPC214	Signals and Systems	3	-	2	3	4	40	20	40	50	50
04	PE	T1	3EEPE2XX	Professional Elective - 1	3	-	-	3	3	40	20	40	-	-
05	MM	LIT2	3EESE220	Multidisciplinary Minor - I	3	-	2	3	4	40	20	40	50	-
06	OE	T2	3EEOE2XX	Open Elective – 1	2	-	-	2	2	-	-	100	-	-
07	HS	T2	3EEHS2XX	Foreign Language	2	-	-	2	2	-	50	-	-	-
08	RM	L2	3EERM226	Research Methodology	-	-	2	-	1	-	-	-	50	-
09	EL	L2	3EEEL227	Innovation and Product Development	-	-	2	-	1	-	-	-	50	-
10	MA	T2	3EEMA228	Aptitude and Reasoning-II	2	-	-	2	-	-	50	-	-	-
				Total	**22**	**1**	**8**	**21**	**24**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Summer Internship (in Industry, R&D organization, or Academic Institute) shall be undertaken after the IV Semester during the summer vacation. The evaluation of the internship will be conducted during the V Semester

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIA (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50	ESE(Theory) : ≥ 40/ 100
Foreign Language Bouquet:	3EEHS224 - Foreign Language – German	3EEHS225 - Foreign Language – Japanese			

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Bridge Course: (DSY – Lateral Entry Students)

Sr. No.	Semester	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
											Theory			Laboratory	
											MSE	TA	ESE	CIA	ESE
01	III	BS	T1	3EEBS211	Matrix Algebra, Calculus and Probability*	3	-	-	3	3	-	-	100	-	-
02	II	HS	T2	3EEHS114	Communication Skills	-	-	4	-	2	-	-	-	50	-
Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination															
					Minimum Passing Criteria						CIA (Lab) : ≥20/50			ESE (Theory) : ≥40/100	

- Designed for DSY

Note: All Direct Second Year students admitted to the B.Tech. Electrical Engineering programme shall compulsorily undergo the prescribed bridge courses. Students admitted from diploma programmes other than the parent discipline shall additionally complete bridge courses as prescribed by the designated committee.

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Bridge Course: Change in Curriculum Revision - R2 to R3

Sr. No.	Semester	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
											Theory			Laboratory	
											MSE	TA	ESE	CIA	ESE
01	I	ES	T1	3EEES104	Introduction to Emerging Technologies	1	-	2	1	2	--	--	100	--	--
02	I	VS	LIT2	3EEVS107	IDEA Lab Workshop	2	-	-	2	2	--	--	--	50	--
Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination															
					Minimum Passing Criteria			CIA (Lab) : ≥20/50					ESE (Theory) : ≥40/100		

Note : Students shall complete the prescribed Semester I Bridge Courses during Semester III (Odd Semester) and the prescribed Semester II Bridge Courses during Semester IV (Even Semester).

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Exit Criteria after S.Y. B. Tech Electrical Engineering

(As per AICTE Guidelines)

Eligibility Criteria

- All conditions applicable to the Exit Option After First Year shall also apply. In addition, the following criteria must be met:
- Students will have the option to exit the Electrical Engineering Program after successfully completing the second year.
- To qualify this exit option students must complete Internship of minimum 8 weeks in Electrical Engineering related field, aimed at enhancing practical knowledge and industry exposure. Students must submit **internship** report in accordance with the schedule and guidelines provided.

Outcome:

- Upon exit, they will be awarded an **Undergraduate Diploma in Electrical Engineering**.

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T.Y. B. Tech. Electrical Engineering

[Level 5.5, UG B.Voc] Semester - V

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	PC	LIT1	3EEPC301	AC Machines	3	-	2	3	4	40	20	40	50	50
02	PC	LIT2	3EEPC302	Generation, Transmission and Distribution	2	-	2	2	3	40	20	40	50	-
03	PC	LIT1	3EEPC303	Control Systems	3	-	2	3	4	40	20	40	50	50
04	PE	LIT2	3EEPE3XX	Professional Elective - II	3	-	2	3	4	40	20	40	50	-
05	MM	T1	3EESE309	Multidisciplinary Minor - II	3	-	-	3	3	40	20	40	-	-
06	OE	T2	3EEOE3XX	Open Elective – II	2	-	-	2	2	-	-	100	-	-
07	HS	T2	3EEHS313	Project Management and Finance	2	-	-	2	2	-	50	-	-	-
08	HS	L2	3EEHS314	Entrepreneurship	-	-	2	-	1	-	-	-	50	-
09	EL	L2	3EEEL315	Summer Internship	-	-	-	-	1	-	-	-	50	-
10	MA	L2	3EEMA316	Aptitude and Reasoning-III	-	-	2	-	-	-	-	-	50	-
				Total	**18**	**-**	**12**	**18**	**24**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination, CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIA (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50	ESE(Theory) : ≥ 40/ 100

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T.Y. B. Tech. Electrical Engineering
[Level 5.5, UG B.Voc] Semester - VI

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	PC	LIT1	3EEPC317	Power Electronics	3	-	2	3	4	40	20	40	50	50
02	PC	LIT1	3EEPC318	Power System Analysis	2	-	2	2	3	40	20	40	50	50
03	PE	T1	3EEPE3XX	Professional Elective - III	3	-	-	3	3	40	20	40	-	-
04	MM	LIT2	3EESE324	Multidisciplinary Minor – III	3	-	2	3	4	40	20	40	50	-
05	OE	T2	3EEOE3XX	Open Elective – III	2	-	-	2	2	-	-	100	-	-
06	VSEC	LIT2	3EEVS328	Electrical Machine Design	1	-	2	1	2	-	-	-	50	-
07	CEA	L2	3EECE329	Mini Project	-	-	4	-	2	-	-	-	50	-
08	SS	T2	3EESS330	Self Study Course - I	2	-	-	2	2	-	-	100	-	-
09	MA	L2	3EEMA331	Aptitude and Reasoning-IV	-	-	2	-	-	-	-	-	50	-
				Total	**16**	**-**	**14**	**16**	**22**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIE (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50	ESE(Theory) : ≥ 40/ 100

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Exit Criteria after T.Y. B. Tech Electrical Engineering

(As per AICTE Guidelines)

Eligibility Criteria:

- Completion of all core courses in the first three years of the engineering curriculum.
- Demonstration of both theoretical understanding and practical application through:
  - Industry-Relevant Practical Training: Including internships or apprenticeships.
  - Advanced Skill-Based Course: Aligning with current industry needs.
  - Internship/Apprenticeship: At least 8 weeks in a relevant engineering field.
  - Community Engagement Project: Real-world problem-solving with societal benefit.
  - Capstone Project (Optional): Integration and application of learning outcomes across three years.

Outcome:

Students will be awarded a **B. Voc. Degree in Electrical Engineering**, signifying a strong foundation in engineering concepts, technical proficiency, and vocational readiness.

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ADCET

Final Year B. Tech.- Electrical Engineering

[Level 6, UG B.Tech] Semester - VII

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	PC	LIT1	3EEPC401	Digital Protection and Switchgear	2	-	2	2	3	40	20	40	50	50
02	PC	LIT1	3EEPC402	Electric Vehicle Technology	3	-	2	3	4	40	20	40	50	50
03	PC	LIT2	3EEPC403	Industrial Automation	2	-	2	2	3	40	20	40	50	-
04	PE	LIT2	3EEPE4XX	Program Elective - IV	3	-	2	3	4	40	20	40	50	-
05	PE	T1	3EEPE4XX	Program Elective - V	3	-	-	3	3	40	20	40	-	-
06	MM	T1	3EESE414	Multidisciplinary Minor – IV	3	-	-	3	3	40	20	40	-	-
07	EL	L1	3EEEL416	Project	-	-	8	-	4	-	-	-	50	50
				Total	**16**	**-**	**16**	**16**	**24**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIE (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50

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Final Year B. Tech.- Electrical Engineering

[Level 6, UG B.Tech] Semester - VIII

Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	PE	T1	3EEPE4**	Program Elective – VI	2	-	-	2	2	40	20	40	-	-
02	EL	L2	3EEEL423	Internship	-	-	-	-	12	-	-	-	50	-
03	SS	T2	3EESS424	Self Study Course - II	-	-	-	-	2	-	-	100	-	-
				Total	**02**	**-**	**-**	**02**	**16**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥ 8 / 20	MSE + ESE (Theory) : ≥ 32 / 80	TA (Theory) / CIE (Lab) : ≥ 20 / 50	ESE (Lab) : ≥ 20/50	ESE(Theory) : ≥ 40/ 100

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Program Elective Courses (PECs) / Honor's Track (20 Credits)

Specialization / Track Name	Department Professional Elective Courses					
	PE –I (3-0-0)	PE – II (3-0-2)	PE –III (3-0-0)	PE –IV (3-0-2)	PE- V (3-0-0)	PE –VI (3-0-0)
Class	S. Y. B. Tech	T. Y. B. Tech	T. Y. B. Tech	Final Year B. Tech	Final Year B. Tech	Final Year B. Tech
Semester	IV	V	VI	VII	VII	VIII
E-Mobility	Architectures of Electric and Hybrid Vehicles (3EEPE215)	Energy Storage Systems in Electric Vehicles (3EEPE304)	Power Electronics for EV Drivetrain (3EEPE319)	Charging Infrastructure (3EEPE404)	Design of EV Drivetrain (3EEPE409)	MOOC Courses offered by NPTEL/SWAYAM only (3EEPE418 to 3EEPE422)
Power Systems	Utilization of Electrical Energy (3EEPE216)	High Voltage Engineering (3EEPE305)	Flexible AC Transmission Systems (3EEPE320)	Electrical Installation, testing and Maintenance Systems(3EEPE405)	Power Quality (3EEPE410)	
Control Systems	Mathematical Modelling of Dynamic Systems (3EEPE217)	Advanced Control Systems (3EEPE306)	Intelligent Control (3EEPE321)	Electric Drives (3EEPE406)	Machine Learning and Artificial Intelligence (3EEPE411)	
Renewable Energy	Energy Economics (3EEPE218)	Solar Technology (3EEPE307)	Distributed Generation (3EEPE322)	Wind Energy Conversion Systems (3EEPE407)	Artificial Intelligence for Renewable Energy Systems (3EEPE412)	
Embedded Systems	Introduction to Embedded Systems (3EEPE219)	Embedded System Programming (3EEPE308)	Real Time Operating Systems (3EEPE323)	Advanced Embedded System with IOT (3EEPE408)	Smart Grid (3EEPE413)	

- Students may choose Professional Elective courses from a single track or across multiple tracks, based on their academic interests and career aspirations.
- Only one Professional Elective course may be selected from a given column in a semester. Additional courses from the same column may be taken in subsequent semesters, but not concurrently.
- Students opting for the Honors Degree shall complete all Honors courses from a single track, which shall be different from the track chosen for their Professional Elective courses.

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Multidisciplinary Minor(14 Credits) **Minor Stream - Sustainable E-Mobility (SE)**

Sr. No.	Semester	Course Category	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	IV	MM	3EESE220	Fundamentals of Electric Vehicles	3	-	2	3	4	40	20	40	50	-
02	V	MM	3EESE309	Battery Technology for Electric Vehicles	3	-	-	3	3	40	20	40	-	-
03	VI	MM	3EESE324	Motor control for Electric Vehicles	3	-	2	3	4	40	20	40	50	-
04	VII	MM	3EESE414	Converters for Electric Vehicles	3	-	-	3	3	40	20	40	-	-
				Total	**12**	-	**04**	**12**	**14**					

Emerging Specialization Minor (18 Credits) **Minor Stream - Renewable Energy (RE)**

Sr. No.	Semester	Course Category	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	IV	SM	3EERE221	Solar and Wind Energy	3	-	2	3	4	40	20	40	50	-
02	V	SM	3EERE310	Economics of Energy Systems	3	-	-	3	3	40	20	40	-	-
03	VI	SM	3EERE325	Energy storage systems	3	-	2	3	4	40	20	40	50	-
04	VII	SM	3EERE415	Grid interface of Renewable Energy sources	3	-	-	3	3	40	20	40	-	-
05	VII	SM	3EERE424	Minor Project	0	-	8	-	4	-	-	-	100	-
				Total	**12**	-	**12**	**12**	**18**					

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Honors with Research (20 Credits)

Sem	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
VII	EL	L1	3EEEL417	Research Project (Part 1)	-	-	20	-	10	-	-	-	50	50
VIII	EL	L1	3EEEL425	Research Project (Part 2)	-	-	20	-	10	-	-	-	50	50
				Total			**40**		**20**					

Legends: L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits, MSE - Mid-Semester Examination. CIA-Continuous Internal Assessment, TA - Teachers Assessment, ESE-End-Semester Examination

Minimum Passing Criteria	TA (Theory) : ≥8/20	MSE + ESE (Theory): ≥32/80	TA (Theory) / CIA (Lab) : ≥20/50	ESE (Lab) : ≥20/50

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Department of Electrical Engineering											
B. Tech. Program in Electrical Engineering (176 Credits)											
Course Category	**Acronym**	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**	**% of Category**
Basic Science Course	BS	8	7	3	0	0	0	0	0	**19**	**11**
Engineering Science Course	ES	10	7	0	0	0	0	0	0	**17**	**10**
Programme Core Course	PC	0	4	11	11	11	7	10	0	**52**	**30**
Programme Elective Course	PE	0	0	0	3	4	3	7	2	**20**	**11**
Open Elective (other than particular program)	OE	0	0	0	2	2	2	0	0	**6**	**3**
Multidisciplinary Minor	MDM	0	0	0	4	3	4	3	0	**14**	**8**
Vocational and Skill Enhancement Course	VSEC	2	0	2	0	0	2	0	0	**6**	**3**
Humanities Social Science and Management	HSSM	0	2	6	2	3	0	0	0	**15**	**9**
Indian Knowledge System	IKS	2	0	0	0	0	0	0	0		
Value Education Course	VEC	0	0	0	0	0	0	0	0		
Research Methodology	RM	0	0	0	1	0	0	0	0	**19**	**11**
Experiential Learning (Internship, Project)	EL	0	0	0	1	1	0	4	12		
Community Engagement Activity (CEA)/Field Project	CEA	0	0	0	0	0	2	0	0	**2**	**1**
Co-curricular & Extracurricular Activities	CCA	1	1	0	0	0	0	0	0	**2**	**1**
Self Study	SS	0	0	0	0	0	2	0	2	**4**	**2**
Total		**23**	**21**	**22**	**24**	**24**	**22**	**24**	**16**	**176**	**100**

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Department of Electrical Engineering

Course Information:

Class, Semester	FY. B.Tech, Semester - I						**Category**	**BS**	
Course Code, Course Title	**3EEBS101, Mathematics-I**						**Type**	**T1**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**	**Self Study**		**Credits**	
	3		1		-	2		4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**		**ESE**	
		40	20	40		-		-	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Determine the consistency of systems of linear equations using Echelon form of matrix
CO2	Compute Eigen values, Eigen vectors, powers and inverse of a square matrix using characteristic equation
CO3	Apply the concepts of complex number to solve the equations using De Moivre's theorem and hyperbolic identities
CO4	Calculate partial derivatives, Jacobians, and extreme values of function of two variables using concept of partial differentiation
CO5	Solve ordinary differential equation of order one and degree one using analytical method and numerical techniques.

Syllabus:

Module	Contents	Lecture Hours
I	**Solution of System of Linear Equations:** Definition of system of linear equations, Classification of system of linear equations, Rank of matrix: Concept and computation using Echelon form and Normal form, Rouché–Capelli Theorem (Statements only), Solution of non-homogeneous system of linear equations, solution of Homogeneous system of linear equations, Applications in engineering.	7
II	**Eigen Values and Eigen Vectors:** Definition of vectors in R^n, Linear Dependence and Independence of Vectors, Characteristic Equation of Matrix, Cayley-Hamilton theorem (statement only), Applications of Cayley-Hamilton theorem, Eigen Values and Properties, Eigen Vectors and Properties.	7
III	**Complex Number:** Definition of complex number, Polar and exponential form of complex number, De Moivre's Theorem and Simple Applications, Power and Roots of complex numbers, Applications in solving equations. **Hyperbolic Functions:** Definitions, Identities of hyperbolic functions, Relation between Circular functions and hyperbolic functions, Inverse hyperbolic functions,	8
IV	**Partial Differentiation and Applications:** Functions of several variables, partial derivatives of first order, Higher order partial derivatives, Homogeneous functions, Euler's Theorem on homogeneous function: statement and verification, Jacobians and Properties, Maxima and minima of functions of two variables.	8
V	**Ordinary Differential Equation of first order and first degree:** Linear differential equation, exact differential equation, reducible to exact differential equation, reducible to linear differential equation, Applications of engineering (branch oriented)	8
VI	**Numerical Solution of Ordinary differential equation of First Order & First Degree:** Euler's method, Modified Euler's method, Runge–Kutta third order, Runge-Kutta Method of order four, Taylor Series method.	7
	Total Lecture Hours	45

List of Tutorial with CO Mapping

Sr.No	Title of Tutorial	CO Mapped
1	Rank of matrix and Solution of Homogeneous System of Linear Equations	1
2	Solution of Non-Homogeneous System of Linear Equations	1

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3	Eigen Value, Eigen vectors and Properties	2
4	Cayley-Hamilton theorem and Applications	2
5	De Moivre's Theorem, Applications and Hyperbolic functions	3
6	Partial differentiations and Euler's theorem	4
7	Jacobians and Maxima-Minima of Two Variable Functions	4
8	Euler's and Modified Euler's Methods for Solving Initial Value Problems	5
9	Runge-Kutta Methods and Taylor series method	5
10	Ordinary differential equations of first order and first degree	5
	Total Tutorial Hours	**15**

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011.
2. H. K. Das , Advanced EngineeringMathematics , 22th Edition, S. Chand ,2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010
4. Dr. B. S. Grewal , Numerical Methods , 9th Edition, Khanna Publishers ., 2010

References:

1. Dr. B. S. Grewal , Higher Engineering Mathematics , 44th Edition, Khanna Publishers ,2018.
2. N. P. Bali, Manish Goyal , Advanced EngineeringMathematics , 7th Edition, Infinity science press ,2010.
3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi Griha Prakashan,1984
4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988.

Online Learning Resources

1. NPTEL Course onEngineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121
2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105
3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta , Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112
4. NPTEL Course on Mathematics-III, by Prof. Durga C Dalal, Dr. M. Guru Prem Prasad, IIT Guwahati https://nptel.ac.in/courses/122103012

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Course Information:

Class, Semester	FY. B.Tech, Semester - I						**Category**	**BS**	
Course Code, Course Title	**3EEBS102, Engineering Physics**						**Type**	**LIT2**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**				
	3	-	2	2	4				
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**		
		40	20	40		50	-		

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Describe** the basic principles of nanotechnology for nanomaterial production using appropriate synthesis methods and microscopy techniques.
CO2	**Use** the principles of magnetism and semiconductor physics to select suitable materials for engineering applications.
CO3	**Apply** optics concepts to analyze diffraction, polarization, lasers, and fiber optic transmission in engineering contexts.
CO4	**Apply** theoretical and practical knowledge to solve engineering problems in architectural acoustics and ultrasonic using appropriate formulas and experimental methods.
CO5	**Interpret** crystal structures and X-ray diffraction results to determine lattice parameters and interplanar spacing using Bragg's law and Miller indices.

Syllabus:

Module	Contents	Lecture Hours
I	**Diffraction & Polarization :** **Diffraction** - Introduction, Diffraction grating, Plane diffraction grating –construction and theory, Determination of wavelength of light using plane diffraction grating, Resolving power of grating, Numericals. **Polarization:-** Introduction, Polarization of light, Polarization by double refraction, Positive and Negative crystals, Laurent's half shade Polarimeter, Numericals.	6
II	**Laser and Fiber Optics :** **Laser**: Introduction, Principle of laser, Pumping and Population inversion, Characteristics of laser, Ruby Laser, Applications of laser in electrical engineering. **Optical fibre**: Introduction, Total internal reflection, Structure of optical fibre, Propagation mechanism of optical fibre, Numerical aperture, Acceptance angle, Skip distance, Attenuation, Types of optical fibre, Applications of optical fibre in electrical engineering.	7
III	**Acoustics and Ultrasonic :** **Acoustics :** Introduction, sound wave, properties of sound wave, Classification of sound waves, Basic requirements for acoustically good hall, Reverberation, Reverberation time, Sabine's formula (Conceptual discussion), Absorption coefficient, Factors affecting the architectural acoustics and their remedies. **Ultrasonic:** Ultrasonic waves, Magnetostriction effect and Oscillator, Determination of wavelength and velocity of ultrasonic waves, Detection of ultrasonic waves, applications of ultrasonic waves in field of electrical engineering, Numericals.	8
IV	**Crystallography :** Unit cell, Space lattice, Seven crystal system, Bravais space lattices, Properties of cubic unit cell, Relation between lattice constant and density, Interplanner spacing for cubic system, Miller indices, Symmetry elements in cubic crystal, X-ray diffraction, Bragg's law, Braggs X-ray spectrometer, X-ray spectra (Continuous and characteristics), Numericals.	7
V	**Semiconductors , Magnetic and Dielectric materials :** **Semiconductor** - Introduction, types of semiconductor, Band theory of semiconductor, Fermi energy and its location in semiconductor, conductivity of semiconductor, Hall effect. **Dielectrics** - Introduction to dielectrics, Dielectric parameter, dielectric polarization, types of polarization, Dielectric materials- solid, liquid, gaseous, Frequency and temperature dependence of dielectric material.	10

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	Magnetism - Types of magnetic material, soft and hard materials, Hysteresis effect, Domain theory of ferromagnetism.	
VI	**Nanophysics :** Introduction, Nanotechnology, nano-materials, Top-down and Bottom-up synthesis approach,, Ball milling method, Sol-gel synthesis method, Carbon nanotubes, Properties and applications of carbon nanotubes, Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM), Properties and applications of nano-materials in electrical engineering .	7
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Plane Diffraction Grating- Determination of the wavelength of light using plane diffraction grating.	3
2	Laurent's Half shade Polarimeter - Determination of specific rotation of optically active material.	3
3	Determination of wavelength of He-Ne laser light using diffraction grating.	3
4	Determination of divergence of He-Ne laser light	3
5	Numerical aperture of optical fibre: Calculation of NA of optical fibre using laser.	3
6	Verification of inverse square law.	3
7	Determination of band gap energy of given semiconductor.	2
8	Determination of the velocity of ultrasonic waves in given liquid and to determine the compressibility of the liquid	4
9	Kund's tube for determination of velocity of sound	4
10	Determination of the wavelength of the given monochromatic source of light by Newton's ring method	3
11	Study of B-H Curve of given sample	3
12	Study of Hall Effect and determination of Hall voltage	3
13	Determination of Miller Indices of a given plane and models	5
14	Study of 23 Symmetries in cubic crystal	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. M.N.Avadhanulu& P. G. Kshirsagar, A Text Book of Engineering Physics,12th Edition, S. Chand Publication,2018
2. P. K. Palanisamy, Engineering Physics, 2nd Edition, Sci Tech pub. (P) Ltd.2018
3. G Vijayakumari, Engineering Physics, 3rd Edition, Vikas Pub. House (P) Ltd ,2009
4. K.K.Chattopadhyay and A.N. Banerjee, Introduction to Nano Science and Nanotechnology,3rd, PHI Learning,2009

References:

1. David Halliday, Robert Resnick&Jearl Walker, Fundamentals of Physics,12th Edition,2021.
2. ResnickHalliday, Krane, Engineering Physics,8th Edition, John Wiley & Sons Pub.,2008.
3. R. K. Gaur & Gupta S. L, Engineering Physics,8th Edition, DhanapatRai Publication,2008
4. Sulbha K. Kulkarni, Nanotechnology Principles and Practices, 4th Edition, Springer,2007
5. Charles Kittle, Introduction to Solid State Physics, 7th Edition, Wiley India Pvt. Ltd,2008
6. V. Raghvan, Materials Science and Engineering,5th Edition, PHI Learning,2006.

Online Learning Resources

1.For optics- https://nptel.ac.in/courses/122/107/122107035/
2.For Quantum Physics -https://nptel.ac.in/courses/122/106/122106034/
3.For Ultrasonic -- https://freevideolectures.com/course/3531/engineering-physics-i/8
4. For Solid State Physics -- https://nptel.ac.in/courses/115/105/115105099/

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Photoelectric Effect	https://mp-amrt.vlabs.ac.in/exp/photoelectric-effect/index.html
2.	Numerical Aperture of Optical Fiber	https://lo-amrt.vlabs.ac.in/exp/numerical-aperture-optical-fiber/
3.	LASER Beam divergence and spot size	https://lo-amrt.vlabs.ac.in/exp/laser-beam-divergence/

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**ES**
Course Code, Course Title	**3EEES103, Applied Mechanics**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**	**Self Study**	**Credits**	
	3			2	2	4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Interpret** the resultant force for a force system using resolution and composition.
CO2	**Identify** reactions at the support of the beam by applying equilibrium conditions.
CO3	**Calculate** the forces in members of roof truss under point load by using analytical methods.
CO4	**Compute** centroid and moment of inertia for a composite plane lamina by using parallel and perpendicular axis theorem.
CO5	**Apply** the concept of dynamic equilibrium to analyze rigid bodies using equations of motion.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Applied mechanics** Basic concepts, force, types of force systems, law of transmissibility of force, moment of a force, couple, resolution of a force, resultant force, composition of forces, magnitude and direction of concurrent and non-concurrent force systems.	8
II	**Equilibrium** Equilibrium, conditions of equilibrium, lami's theorem, introduction to beam, types of beam, load, types of load, support, types of support, reactions at support, analysis of simple and compound beams using conditions of equilibrium.	7
III	**Analysis of Truss** Introduction of truss, types of trusses, determinacy of a truss, assumption for analysis of truss, Analysis of truss using method of joint and method of section.	7
IV	**Centroid** Introduction to Centroid and Centre of Gravity, Centroid of standard figures, Centroid of composite figures.	7
V	**Moment of Inertia** Moment of Inertia, Moment of Inertia of Standard shapes from first principle, Parallel and perpendicular axis theorem, Moment of Inertia of plain and composite figures, Radius of Gyration.	8
VI	**Dynamics of rigid bodies** Introduction of dynamics, Kinetics and Kinematics, Newtons 2nd law of motion, D'Alemberts Principle ,Work-Energy Principle, Impulse-momentum principle, torque, power .	8
	Total Lecture Hours	45

List of Experiments with CO Mapping

Sr.No	Title / Topic of the Experiment	CO Mapped
1	To verify triangle law of forces using force table	1
2	To verify law of polygon of forces using force table	1
3	To verify lami's theorem using force table	1
4	To verify law of moments using Bell crank lever	1
5	To calculate support reactions of beam	2
6	To calculate forces in members of truss.	3
7	To Solve numerical on force system and beam	1, 2

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8	To compute centroid of plain lamina			4
9	To Solve numerical on moment of inertia			4
10	To Solve numerical on dynamics of rigid bodies.			5
Total Practical Sessions		**15**	**Total Practical Hour**	**30**

Text Books

1. S. Ramamrutham, "Engineering Mechanics," 9th Edition, DhanpatRai Publishing Company (P). Ltd, 2010.
2. R. K. Bansal and Sanjay Bansal, "Engineering Mechanics," 6th Edition, Laxmi Publications Pvt. Ltd., 2013.
3. K. L. Kumar, "Engineering Mechanics," 4th Edition, Tata McGraw Hill Education, 2012.
4. S. B. Junnarkar, "Engineering Mechanics," 16th Edition, Charotar Publications, 2011.
5. S.S. Bhavikatti, "Engineering Mechanics," 4th Edition, New Age International Pvt. Ltd., 2012.

References:

1. S. P. Timoshenko and D. H. Young, "Engineering Mechanics," 3rd Edition, McGraw Hill Publishers, 2006.
2. F. P. Beer and E. R. Johnson, "Vector Mechanics for Engineers Vol.-I and II," 6th Edition, Tata McGraw Hill Education, 2011.
3. Ferdinand Singer, "Engineering Mechanics: Statics & Dynamics," 9th Edition, Harper and Row Publications, 2009.
4. S. Rajasekaran, "Fundamentals of Engineering Mechanics," 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.
5. Irving H. Shames, "Engineering Mechanics," 5th Edition, Prentice Hall of India, New Delhi, 2011.

Online Learning Resources

1. NPTEL, "Engineering Mechanics," Prof. U.K. Saha, IIT Guwahati, NPTEL, 2015. https://nptel.ac.in/courses/112103108
2. NPTEL, "Engineering Mechanics," Prof. U.K. Saha, IIT Guwahati, NPTEL, 2015. https://nptel.ac.in/courses/112103108
3. MIT OpenCourseWare, "Statics and Materials," Prof. Simona Socrate, MIT, 2007. https://ocw.mit.edu/courses/1-050-solid-mechanics-fall-2004/pages/lecture-notes/
4. Skyciv Software: https://skyciv.com/free-beam-calculator/ , https://skyciv.com/free-truss-calculator/

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Basic Engineering Mechanics and Strength of Materials Virtual Lab	https://eerc01-iiith.vlabs.ac.in/

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Established: 1999

Course Information:

Class, Semester	F.Y. B.Tech – Semester I						**Category**	**ES**	
Course Code, Course Title	**3EEES104, Introduction to Emerging Technologies**						**Type**	**T1**	
Prerequisites	--								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self Study**		**Credits**
	2		-		-		2		2
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**		**ESE**
		40	20	40			--		--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Describe the key characteristics of emerging technologies such as AI, IoT, AR/VR, Quantum Computing, and Blockchain
CO2	Apply the concepts of AI, IoT, CPS, and Blockchain to real-world case studies to identify their disruptive impact on digital transformation initiatives
CO3	Explain the role of robotics, additive manufacturing, and green technologies in supporting sustainability and ethical technology deployment
CO4	Implement innovative solutions using autonomous systems and green technologies to address sustainability challenges

Syllabus:

Module	Contents	Lecture Hours
I	**Foundations of Emerging Technologies and Innovation Ecosystem** Emerging technologies characteristics and disruptive impact, Indian innovation ecosystem: Digital India, Startup India, AIM, India Stack, National Education Policy and interdisciplinary learning, Case studies: Smart Cities, Aadhaar, UPI, Digital Health Mission.	5
II	**Artificial Intelligence, Machine Learning & Data Science** AI basics: history, goals, types of AI (Narrow, General, Super AI), Machine learning: supervised, unsupervised, reinforcement learning, Introduction to data science: lifecycle, Big Data (5Vs), visualization, Human-centered AI and ethical concerns: bias, privacy, responsible AI.	5
III	**IoT, Cyber-Physical Systems, Edge Computing & Cybersecurity** IoT: architecture, sensors, communication, cloud, Cyber-physical systems: smart grid, autonomous vehicles, industrial automation, Edge & fog computing: real-time applications and use cases, Cybersecurity basics: CIA triad, malware, phishing, digital hygiene.	5
IV	**AR/VR, Quantum Technologies and Blockchain** AR/VR/XR: definitions, tools, applications in gaming, education, healthcare, Metaverse and immersive computing, Introduction to quantum computing: qubits, entanglement, potential impact. Quantum AI. Blockchain, Smart Contracts, DApps, DeFi, NFTs,	5
V	**Robotics, Autonomous Systems & Additive Manufacturing** Robotics: types, sensors, actuators, applications in healthcare, defense, logistics, Autonomous systems: drones, driverless vehicles, swarm robotics, 3D/4D printing: additive manufacturing, materials, future directions, Design thinking for innovation in robotics & manufacturing.	5
VI	**Green Technologies, Sustainability & Tech Ethics** Emerging technologies for solving climate/environmental challenges, Smart grids, clean energy systems, climate tech, e-waste, Sustainable design and SDGs: tech for social good, Tech ethics: inclusivity, equity, digital divide, societal impact.	5
	Total Lecture Hours	30

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Course Information:

Class, Semester	F.Y. B.Tech, Semester - I					**Category**	**ES**
Course Code, Course Title	**3EEES105, Fundamentals of Electrical Engineering**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	3	-	2	2		4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Discuss the basic laws and principles of DC circuits using standard circuit representations and electrical parameters.
CO2	Explain the basic concepts of magnetic circuits and the working of DC machines.
CO3	Use AC principles to solve single-phase AC circuits and determine basic electrical quantities.
CO4	Apply three-phase circuit principles to determine line and phase quantities in star and delta connections.
CO5	Select suitable protective devices and EV batteries based on basic safety and application requirements.

Syllabus:

Module	Contents	Lecture Hours
I	**Fundamentals of DC Circuits** Introduction to basic electrical quantities, Ohm's law and its limitations, Series and parallel circuits, Types of electrical sources, Resistance, Inductance, Capacitance, Energy stored in capacitor, Charging and discharging of capacitor, Kirchhoff's laws.	**9**
II	**Magnetic Circuits** Concepts of magnetic circuits, Magnetic flux, Reluctance, Flux density, Magneto motive force, Magnetic field strength, Permeability, Comparison: Magnetic Vs. Electric circuits, Self-Inductance and Mutual Inductance, Magnetization curve (B-H Curve) and Hysteresis loop, Magnetic leakage and fringing effects, Operating principle of DC machine.	**7**
III	**Fundamentals of Alternating Current** Advantages of AC over DC, Faraday's laws of electromagnetic induction, Statically and dynamically induced emfs, Fleming's right hand rule, Lenz's law, Generation of sinusoidal voltage, Waveform, Cycle, Frequency, Time period, Instantaneous value, RMS value, Average value, Form Factor and Peak Factor, Concept of lagging and leading phase difference, Phasor representation.	**7**
IV	**Single Phase AC Circuits** AC circuit parameters: R, L, C circuit elements, R-L, R-C, R-L-C series A.C. circuits- voltage and current waveforms, vector diagram, Voltage, Impedance and Power triangle, power factor, RL Parallel and RL-C Parallel circuit, Series and parallel resonance.	**8**
V	**Three Phase AC Circuits** Advantages of three phase circuit over single phase AC circuits, Generation of 3-Phase alternating emf, Three phase waveform, Phase sequence, Types of supply systems and load connections, Relationship between line and phase quantities, Balanced and unbalanced system: Star and delta connections.	**7**
VI	**Electrical Protective Devices and Recent Industry Trends** **Protective Devices:** Personal protective equipment, Fuse, Miniature Circuit Breaker, Earth Leakage Circuit Breaker. **Recent Industry Trends**: Introduction to electric vehicles (EV), Classification of electric vehicle, Energy storage system, Types of batteries. EV charging infrastructure.	**7**
	Total Lecture Hours	**45**

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List of Experiments with CO Mapping		
S.No	**Title / Topic of the Experiment**	**CO Mapped**
1	Study of basic electrical components, equipment, their symbols, and safety precautions in electrical engineering.	1
2	Simulation and experimental verification of Kirchoff's voltage law.	1
3	Simulation and experimental verification of Kirchoff's current law.	1
4	Demonstration of mutually induced emf by using single-phase transformers.	2
5	Plotting the B-H curve for a magnetic material.	2
6	Measurement of frequency, time period, peak value, and rms value of a sinusoidal ac waveform using CRO	3
7	Determination of voltage, current, and power factor in an R-L series circuit	3
8	Measurement of active, reactive, and apparent power in an R-L-C series circuit	3
9	Connection and testing of three-phase star connected balanced load.	4
10	Connection and testing of three-phase delta connected balanced load.	4
11	Identify different types of fuses and circuit breakers	5
12	Connect MCB in electrical circuit and check its operation at normal and abnormal conditions.	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. D. P. Kothari, I. J. Nagrath, Basic Electrical Engineering, 4th Tata McGraw Hill, 2022
2. Rajendra Prasad Fundamentals of Electrical Engineering 1st PHI learning pvt ltd, 2005
3. U.A. Bakshi and U. V. Bakshi Basic Electrical Engineering, 1st Technical publication ,2005
4. B.L. Theraja and A. K. Theraja A Textbook of Electrical Technology Vol. 1, S. Chand Publications, 2023

References:

1. A.K. Thereja and B.L. Thereja, Electrical Technology volume II,2nd, S. Chand & Co. Publications,2007.
2. D. P. Kothari, I. J. Nagrath, Basic Electrical Engineering, 1st S K Kataria and Sons, 2022
3. V. K. Mehta & Rohit Mehta, Principles of Electrical Engineering and Electronics, 1st S. Chand Publishing, 2019
4. V. K. Mehta & Rohit Mehta, Basic Electrical Engineering, 1st S. Chand Publishing, 2006

Online Learning Resources

1. https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/
2. https://en.wikipedia.org/wiki/Magnetic_circuit
3. https://en.wikipedia.org/wiki/Electric_battery
4. https://bolt.earth/blog/indian-ev-charging-infrastructure-by-2030?srsltid=AfmBOoqB5TqQo6tujqS13-3c4x2iQUqf_KxLkR-zaIo4_qGd2YW0lNr7

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Simulation & Experimental verification of Kirchhoff's law	https://bes-iitr.vlabs.ac.in/exp/kirchhoff-law/simulation.html
2.	Plotting the B-H curve for a magnetic material	https://bop2-iitk.vlabs.ac.in/exp/hysteresis-loss/theory.html

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B. Tech, Semester – I					**Category**	**IKS**
Course Code, Course Title	**3EEHS106, Indian Knowledge System**					**Type**	**T2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	2	-	-	1		2	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

CO1	Explain the historical context and evolution of the Indian Knowledge System (IKS) and its relevance to modern engineering.
CO2	Analyze ancient Indian mathematical, astronomical, and technological methodologies and compare them with contemporary engineering practices.
CO3	Apply concepts from Ayurveda and ancient biological sciences to modern problem-solving in healthcare and related fields.
CO4	Evaluate traditional Indian architecture, materials, and construction principles as early forms of sustainable engineering design.
CO5	Integrate philosophical and scientific logic from Indian thought into ethical decision-making and sustainable engineering practices.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction & Historical Context (Lectures 1-5)** 1. Overview of the Indian Knowledge System: Philosophy and Scope 2. Historical timelines and key epochs 3. Geographical and cultural influences on ancient Indian science 4. Interdisciplinary approaches in ancient India. 5. Comparative analysis with other ancient civilizations	5
II	**Mathematics & Astronomy in Ancient India (Lectures 6-10)** 1. Foundations of Vedic Mathematics and its modern applications 2. Concepts of zero, decimal system, and number theory 3. Astronomical instruments and observational techniques 4. Calendrical systems and time measurement in ancient India 5. Engineering parallels in algorithmic design and computational thinking	5
III	**Ayurveda and Life Sciences (Lectures 11-15)** 1. Introduction to Ayurveda: Philosophy, doctrines, and methodologies 2. Medicinal systems and their chemical/pharmacological principles 3. Human physiology and surgical techniques in ancient texts (e.g., Sushruta Samhita) 4. Integrating traditional knowledge with modern biomedical engineering 5. Innovations in material sciences: Natural polymers and biocompatible materials	5
IV	**Architectural Knowledge & Engineering Innovations (Lectures 16-20)** 1. Ancient Indian architecture: Principles, materials, and techniques 2. Urban planning and infrastructure in historical Indian kingdoms 3. Structural innovations: Temples, forts, and water management systems 4. Engineering analysis of construction techniques from a modern perspective 5. Case studies: Earthquake-resistant designs in ancient constructions	5

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V	**Philosophy, Science & Ethics (Lectures 21-25)** 1. Indian philosophical schools and their perspectives on science 2. The concept of Rta (cosmic order) and its engineering analogies 3. Early scientific inquiry and epistemology in classical texts 4. Ethics, sustainability, and social responsibility in engineering 5. Integration of moral values and technical rigor in project design	5
VI	**Contemporary Relevance & Innovation (Lectures 26-30)** 1. Bridging ancient wisdom with modern technology 2. Case studies: Reviving lost techniques to inspire modern engineering solutions 3. Workshops on innovation and design thinking using Indian Knowledge System principles 4. Integration of cultural heritage in sustainable product design	5
	Total Lecture Hours	30

Text Books

1. Indian Knowledge Systems: An Introduction by Dr. Vivek Ramaswamy, Oxford University Press,2nd, 2005.
2. Traditions of Indian Science: A Textbook by Dr. Shyam R. Jha, Cambridge University Press, 1st, 2010.
3. Contemporary Perspectives on Ancient Indian Wisdom by Dr. Arvind Sharma, Routledge, 1st, 2013.
4. Foundations of the Indian Knowledge System by Dr. Meera Nair, Sage Publications, 3rd, 2015.
5. Indian Thought and Science: Bridging the Past and Present by Dr. Ram Prasad, Springer, 2nd, 2008.

References:

1. Encyclopedia of Indian Intellectual Heritage by Dr. Anil Kumar, Oxford University Press, 1st, 2012.
2. Indian Philosophy and Science: A Reference Guide by Dr. Lalit Singh, Cambridge University Press, 2nd, 2014.
3. The Vedic and Post-Vedic Traditions: A Reference Book by Dr. Pradeep Kumar, Routledge, 1st, 2003.
4. Handbook of Indian Knowledge Systems by Dr. Sunita Reddy, Sage Publications, 1st, 2016.
5. Traditional Indian Sciences: An Annotated Bibliography by Dr. Kavita Menon, Springer, 1st, 2020.

Online Learning Resources

https:// https://onlinecourses.swayam2.ac.in/imb23_mg53/preview

1.

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Department of Electrical Engineering

Course Information:

Class, Semester	F.Y. B.Tech, Semester - I						**Category**	**VS**	
Course Code, Course Title	**3EEVS107, IDEA Laboratory**						**Type**	**L2**	
Prerequisites	--								
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**	**Self Study**		**Credits**		
	1	-		2	1		2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**		
		--	--	--		50	--		

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Operate basic workshop tools for material processing and assembly
CO2	Make simple 2D and 3D designs using CAD software and prepare them using 3D printing, laser cutting, or CNC machining
CO3	Build basic electronic circuits using sensors, LEDs, motors, and microcontrollers
CO4	Apply fundamental programming concepts in embedded C (Arduino IDE) for controlling hardware and automating simple tasks.
CO5	Integrate mechanical parts and electronics to design and build working models or prototypes.

Syllabus:

Module	Contents	Lecture Hours
I	**Overview of IDEA Lab** Introduction to the IDEA Lab: Vision, objectives, **National Innovation Ecosystem** (IIC, Atal Innovation Mission, NISP), Importance of multi-disciplinary, project-based learning Inspirational case studies from IDEA Labs, Safety protocols, Do & Don'ts in IDEA Lab.	**1**
II	**Fundamentals of Design & Prototyping** **Design Thinking Basics**: Problem identification, ideation, prototyping, testing, and iteration, **Introduction to CAD Software**: Concepts of 2D and 3D modeling for various applications, File Formats for Fabrication: Understanding STL, DXF, G-Code, SVG, and their uses, Tolerances, fits, and design constraints for manufacturing.	**2**
III	**Digital Fabrication Technologies** **3D Printing**: Principles, types of 3D printers, materials, slicing software, and applications. **Laser Cutting & Engraving**: Principles, types of lasers, materials, design considerations, and safety. **CNC Router**: Introduction to CNC Router and Mini Desktop Lathe cum Milling operations, G-code fundamentals, material removal processes. **3D Scanning**: Principles of 3D scanning, applications in reverse engineering and quality control. **PCB Fabrication:** Introduction to PCB Milling Machine and PCB Prototype Machine for custom circuit boards.	**3**
IV	**Fundamentals of Embedded Systems & IoT** **Basic Electrical and Electronic Concepts:** Voltage, current, resistance, Ohm's Law, and fundamental components (resistors, capacitors, diodes, LEDs, sensors, actuators), Measuring Instruments **Overview of microcontrollers**: Overview of Arduino, ESP32, NodeMCU, and their applications in controlling hardware. Circuit simulation using TinkerCAD or Proteus. **IoT Basics**: Basic networking (Bluetooth/Wi-Fi/Ethernet), cloud integration	**3**

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V	**Programming for automation** **Arduino IDE and Embedded C Programming:** Setup, basic syntax (setup(), loop()), digital and analog I/O control. **Basic Control Systems:** Concepts of open-loop and closed-loop control with simple examples. **Introduction to Python.**	3
VI	**Project Planning and IPR** **Innovation Process:** From idea generation to concept validation **Project Planning & Management:** Defining scope, setting timelines, budgeting, and resource allocation. **Documentation and Presentation:** Writing a concept note, creating innovation posters, and effective pitching techniques. **Intellectual Property Rights (IPR):** Basics of Patents, Copyrights, and Trademarks relevant to innovation.	3
	Total Lecture Hours	15

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Introduction, Lab Safety & Tool Familiarization	1
2	Handa on practice of Mechanical Workshop Tools	1
3	3D Printing of simple parts	2
4	Laser Cutting	2
5	CNC Routing/ Engraving	2
6	Basic Electronics circuit	3
7	PCB Design and Prototyping	3
8	Microcontroller Programming and Sensor Interfacing	4
9	Mini Project	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. Veeranna D.K., AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2022
2. Saji T. Chacko, Susan S. Mathew, AICTE's Prescribed Textbook: Fundamentals of Electrical and Electronics Engineering (with Lab Manual), 1st Edition, Khanna Book Publishing Company, 2024
3. Mehta S.D., Electronic Product Design Volume - I (Basics of PCB Design), 1st Edition, S Chand & Company, 2011
4. Mehta-Gupta, Y.P.Mehta, Vishal Mehta, Workshop Calculation and Science, 1st Edition, Dhanpat Rai Publications, 2020

References:

1. A. K. Maini, Nakul Maini, All-in-One Electronics Simplified, 1st Edition, Khanna Book Publishing Company, 2021
2. J.G. Joshi, Electronics Measurements & Instrumentation, 1st Edition, Khanna Book Publishing Company, 2025
3. Dr. Sabrie Soloman, 3D Printing & Design, 1st Edition, Khanna Book Publishing Company, 2020
4. Kaushik Kumar, Hridayjit Kalita, Workshop/Manufacturing Practices, 5th Edition, S Chand & Company, 2011

Online Learning Resources

1. NPTEL Course on 3D Printing and Design for Educators, By Dr. Sharad K. Pradhan, NITTTR Bhopal https://onlinecourses.swayam2.ac.in/ntr24_ed17/preview
2. NPTEL Course on Electronic Systems Design: Hands-on Circuits and PCB Design with CAD Software, By Prof. Ankur Gupta, IIT Delhi, https://onlinecourses.nptel.ac.in/noc24_ee127/preview

Experiments that may be performed through virtual labs:

S. No	Experiment Name	Experiments Links
1.	3D Printing Virtual Simulation Lab	https://3dp-dei.vlabs.ac.in/
2.	Digital Fabrication of Flexible Circuit board	https://fab-coep.vlabs.ac.in/exp/digital-fabrication/
3.	Embedded System Design with 8051 and PIC Microcontroller	https://esd-coep.vlabs.ac.in/

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester – I/II					**Category**	**CC**
Course Code, Course Title	**Introduction to Yoga and Mindfulness**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	2	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	**Describe** the significance and practical applications of yoga for holistic well-being under guided classroom sessions, ensuring coverage of physical, mental, and spiritual aspects.
CO2	**Explain** the role of subtle energy systems (chakras, nadis) in health enhancement using yogic practices, showing linkage to at least two health benefits.
CO3	**Compare** different paths of yoga (Bhakti, Jnana, Karma, Raja) through readings and discussions, citing at least one key practice and outcome for each..
CO4	**Demonstrate** the Eight Limbs of Yoga in practical sessions, reflecting personal integration of at least four limbs in daily habits or behavior.
CO5	**Apply** yoga and mindfulness techniques in real-life stress situations to improve emotional resilience, showing measurable improvement in two or more psycho-somatic areas.

Practice Session

No	Contents	CO Mapped
1	**Introduction to Yoga Practice and Warming Up Exercises** Overview of yoga philosophy and benefits. Practice basic stretching and warm-up routines. Introduction to breath awareness and mindfulness.	1,5
2	**Omkar ,Prathana and types of Asanas , Surya Namaskar.** Practice of Chant Omkar and opening prayer for mental centering. Perform Surya Namaskar and learn its 10-step sequence. Explore basic asana types: standing, sitting, supine.	1,4
3	**Sleeping position Asanas** Practice of Setubandhasana, Pavanmuktasanan, ChakraasaSetuBandhasana, Understand the effects on back, digestion, and spine.	1, 2
4	**Opposite sleeping position** Practice of Bhujangasana, shalbasanan, Dhanurashan, Makrasanan Focus on strengthening the back and improving posture.	1, 2
5	**Seating Position** Practice of Padmaasna , Vajrasana , Gaumukhasan , Vakrasana Learn their benefits for digestion and meditation readiness.	1, 4
6	**Standing Position** Practice of Tadasana ,Vruksasana, Trikonaasan , Virasana. Emphasize balance, posture, and muscular endurance.	1, 4
7	**Meditation** Guided practice of breath-based (Anapan) and insight (Vipassana) meditation. Focus on observation without judgment.	4, 5
8	**Mantra meditation** Practice chanting and internal repetition of mantras. Use traditional mantras for focus and mental calm.	4, 5
9	**Yognidra** Perform deep relaxation technique (guided Yoga Nidra). Experience body awareness and mental stillness.	4, 5
10	**Pranayam 1** Practice AnulomVilom (alternate nostril), Bhramari (humming bee), and Sheetali (cooling breath).Focus on breath control and emotional regulation.	2, 5

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11	**Pranayam 2** Practice Sitkari and Kapalbhati. Learn their effects on metabolism, energy, and clarity.	2, 5
12	**Tratak** Perform Tratak (candle gazing) for concentration. Understand through demonstration or video.	4, 5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. Yog Jeevan . Dr. ChakoteRiya1st Editon2016
2. Yog Parchichaya Mandlik Guruji Nashik Mandlik Guruji Second Edition 2020

References:

1. Yoga for Modern Age Vethathiri Edition 16th , 2023
2. Maharishi, Simplified Physical Exercises Vethathiri Edition I, 2014

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**CC**
Course Code, Course Title	**Physical Fitness and Lifestyle Management**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	2	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the fundamentals of physical education and its role in developing holistic well-being.
CO2	Demonstrate appropriate fitness practices and techniques to improve cardiovascular endurance, strength, and flexibility.
CO3	Apply principles of wellness, including nutrition, sleep, and stress management, to maintain a healthy lifestyle.
CO4	Integrate yoga, mindfulness, and relaxation techniques to promote mental well-being and emotional balance.
CO5	Design a personalized lifestyle management plan based on fitness assessment, health goals, and behaviour change strategies.

Practice Session

No	Contents	CO Mapped
1	**Introduction to Physical Education** Understand the meaning and objectives of physical education.Learn its role in promoting health, fitness, and overall well-being.Explore career options and importance in daily life.	1
2	**General Warm up** Practice dynamic warm-up routines before workouts. Increase heart rate and blood circulation to muscles. Prevent injuries and improve workout performance.	2
3	**Limbering down exercises. Free hand exercises, Cooling down exercises** Perform safe cool-down techniques post activity.Reduce muscle soreness and stiffness.Bring heart rate back to normal gradually.	2
4	**Stretching exercises / Flexibility exercises** Improve range of motion in joints. Reduce muscle tension and prevent injuries. Learn static and dynamic stretching methods.	2
5	**Fitness Evaluation** 1 mile run and walk, Push ups , seat ups ,Seat and reach and BMI . Assess personal fitness using 1-mile run, push-ups, sit-ups, etc. Calculate BMI to understand body composition. Set personalized fitness goals based on results.	5
6	**Aerobic activities** Perform rhythmic activities to improve cardiovascular health. Engage in exercises like jogging, skipping, or dance aerobics. Enhance lung capacity and endurance.	2
7	**Sports and games** (, Cricket, Volleyball , basketball, Kho-Kho , Kabaddi, Athletics) Play team games like Cricket, Volleyball, Kabaddi, etc. Develop teamwork, coordination, and sportsmanship. Improve motor skills and physical agility.	2
8	**Sports and games(Badminton, Table Tennis, Chess)** Participate in games like Table Tennis, Badminton, Chess. Improve reflexes, concentration, and decision-making. Promote mental sharpness and social interaction.	4
9	**Circuit Training, Strength Activities** Perform multiple exercises in a sequence (circuit). Focus on building muscular strength and stamina. Use minimal equipment for maximum benefit.	2
10	**Agility and Coordinative activities** Practice quick movement drills to improve reflexes. Enhance body coordination and balance. Develop speed and reaction time.	2

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11	**Body weight exercises** Do exercises like push-ups, squats, lunges, and planks. Improve strength using your own body resistance. No need for gym equipment.	2
12	**Functional training** Mimic real-life movement patterns (bending, lifting, reaching). Improve daily functional strength and flexibility. Prevent posture-related problems.	3

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books:

1. Test, Measurement and Evaluation in Sports and Physical Education*. 5th ed., Friends Publications, 2023.
2. Rules of Games and Sports Updated version, Khel Shaitya Kendra, 2023.

References:

1. Beashel, Paul, and John Taylor. *Physical Education: Essential Issues*. Hodder Stoughton, 1997.
2. Sodhi, H. S., and S. K. Sidhu. *Physique and Selection of Sportsmen*. Punjab Publishing House, 1984.

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**CC**
Course Code, Course Title	**Six Sigma Happiness and Mind Mechanics**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	-	-	2	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	Analyze personal life patterns and decision-making processes using visual tools like life maps and time audits to improve self-awareness and productivity.
CO2	Identify and modify recurring behavioral or emotional challenges using root cause analysis and habit-tracking techniques
CO3	Apply reflective and psychological tools such as the Gratitude Journal, PERMA Wheel, and mindfulness meditation to enhance emotional well-being.
CO4	Utilize creative thinking and visualization techniques such as mind mapping, personal development canvas, and flow activities to enhance planning and motivation.
CO5	Formulate and monitor measurable personal goals using SMART criteria and Six Sigma strategies to construct a structured self-improvement and lifestyle plan.

Practice Session

No	Contents	CO Mapped
1	**Life Process Mapping** Understand personal daily patterns. Identify meaningful and unproductive activities. Improve decision-making awareness. Build a visual blueprint of life routines.	1
2	**Time Audit Diary** Track hourly usage of time. Identify time-wasters and focus zones. Increase productivity through reflection. Learn prioritization techniques.	1,2
3	**Root Cause Analysis** Find root causes behind repeated problems. Use cause-effect diagrams (Fishbone). Develop problem-solving skills. Prevent recurring emotional or behavioral setbacks.	1
4	**Habit Tracker Creation** Monitor progress of personal habits. Encourage accountability and consistency. Recognize triggers and patterns. Reinforce good habits using visual tools.	3
5	**Control Chart for Habits** Apply Six Sigma's statistical approach to habits. Track habit frequency over time. Identify variation in behavior patterns Improve self-control and discipline.	3
6	**Gratitude Journal** Practice daily reflection on positive moments. Enhance emotional well-being. Reduce stress and negativity. Cultivate a habit of appreciation.	4
7	**PERMA Wheel Self-Assessment.** Evaluate happiness using 5 key pillars (Positive emotion, Engagement, Relationships, Meaning, Achievement). Identify strengths and gaps in life satisfaction. Build awareness of emotional and social well-being. Create a personalized improvement plan.	4
8	**Flow Activity Practice** Engage in high-focus enjoyable activity. Understand the "flow" mental state. Boost intrinsic motivation. Reduce distractions and increase creativity.	4
9	**Mind Mapping the Brain** Visually organize thoughts and plans. Stimulate right and left brain together. Enhance memory, planning, and clarity. Strengthen problem-solving and goal-setting.	1, 5
10	**Guided Mindfulness Meditation** Practice breath work and awareness techniques. Reduce anxiety and mental fatigue. Increase present-moment awareness. Build emotional balance.	4

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11	**Personal Development Canvas** Create a visual profile of strengths, values, and aspirations. Encourage strategic self-improvement. Connect life areas (career, personal, social). Track personal growth visually.	5
12	**SMART Goal Setting + Six Sigma** Define Specific, Measurable, Achievable, Relevant, Time-bound goals. Integrate Six Sigma process for goal monitoring. Improve consistency in self-development. Align actions with purpose and metrics.	5

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1 S. Radhakrishnan, An Idealist View Of Life, 2015, HarperCollins.
2. Yogi Kochhar, Six Sigma Happiness (English Edition).
3 An idealist way of Life – S Radhakrishnan

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Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**CC**
Course Code, Course Title	**Creativity through Visual Arts**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	2	-	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	**Identify** and apply the elements of art—line, shape, color, texture, and space—through various drawing and painting techniques.
CO2	**Demonstrate** creativity and technical skills in using different mediums such as pastels, pen & ink, and water-based paints.
CO3	**Create** original prints using simplified printmaking techniques such as relief, intaglio, and monoprint methods.
CO4	**Design** visually appealing digital artwork such as posters, icons, and layouts using basic digital tools.
CO5	**Analyze** and reflect on personal artwork and peer creations to improve visual communication and aesthetic understanding.

Practice Session

No	Contents	CO Mapped
1	**Fundamentals of Visual arts** Introduction to elements of art: line, shape, colour, texture, space. Practice drawing with pencil and charcoal using simple objects and shapes. Explore light and shade for 3D effects.	1
2	**Basic Graphic Design** Learn principles of alignment, contrast, hierarchy, and balance. Create a basic visual composition using text and image elements. Use sketching or digital tools for layout planning.	2
3	**Typography & Font Design** Study of typefaces: serif, sans-serif, script, decorative. Draw custom fonts and stylized letters. Create a short phrase using hand-drawn typography.	2
4	**Logo Design** Understand logo types: symbolic, text-based, combination marks. Design a logo for a fictional company or cultural event. Focus on clarity, colour choice, and relevance.	4
5	**Poster Design** Choose a theme: social message, event, awareness, culture. Develop layout and imagery using watercolour, pen & ink, or digital tools. Apply principles of visual hierarchy and focal point.	4
6	**Photography Task: Lines & Angles** Capture photographs focusing on geometric lines, angles, and symmetry. Submit 3–5 original photographs with a short description of each. Discuss visual impact and framing.	1, 5
7	**Digital Infographic Design** Choose a topic (e.g., Indian innovations, clean energy, internet safety). Create a digital infographic using free tools like Canva or PowerPoint. Combine icons, minimal text, and visuals to communicate clearly.	4
8	**Visual Metaphor Drawing** Select a concept (e.g., freedom, growth, technology) and represent it visually. Use drawing techniques to convey metaphor without text. Encourage creativity and symbolic thinking.	3,5
9	**Calligraphic strokes of Devnagari** Practice traditional and artistic Devanagari calligraphy. Use ink pens or brush pens to form characters. Create a short meaningful phrase in decorative calligraphy.	2
10	**Collage on Innovation in India** Use newspapers, magazines, or printed material. Prepare a collage on topics like ISRO, start-ups, or digital India. Emphasize arrangement, contrast, and theme clarity.	3,5

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11	**Modern Arts** Introduction and fundamental of modern art, Study abstract and modern Indian Artists Create an abstract or modern art piece using acrylics, pastels, or digital tools. Focus on expression and experimentation.	**3,5**
12	**Geometric Pattern Design** Create a detailed design using compass, ruler, or digital drawing. Highlight symmetry, color, and repetition	**1,2**

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1. The New Drawing on the Right Side of the Brain.TarcherPerigee, 2012.
2. Digital Illustration: A Master Class in Creative Image-making.Rotovision, 2010.
3. A History of Indian Painting: The Modern Period.Abhinav Publications, 1994.
4. Basics of Visual Art. New Academic Publishing, 2015.

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Common for All Branches

Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**CC**
Course Code, Course Title	**Community Engagement through NSS**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	2	-		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Identify** the structure and needs of the local community through direct engagement and observation.
CO2	**Analyze** community issues and participate in collaborative problem-solving activities.
CO3	**Demonstrate** social and civic responsibility by applying engineering knowledge in real-world social contexts.
CO4	**Develop** teamwork, leadership, and democratic values through community mobilization and shared responsibility.
CO5	**Respond effectively** to emergencies and promote national integration, unity, and social harmony through participation in relevant campaigns and awareness programs.

Practice Session

No	Contents	CO Mapped
1	**Cleanliness Drive (Swachh Bharat Abhiyan)** Conduct campus and neighbourhood cleaning. Raise awareness about hygiene and waste segregation.	1,2,3
2	**Tree Plantation** Plant saplings in college or public areas. Educate the community on environmental benefits.	1,3
3	**Road Safety Campaign** Conduct rallies, skits, or poster campaigns. Spread awareness about traffic rules and safe driving.	2,3,5
4	**Health Check-up Camp** Organize basic health screening with medical professionals. Promote hygiene, nutrition, and disease prevention.	1,2,5
5	**Literacy Drive** Teach basic reading and writing to underprivileged children or adults. Distribute learning materials and encourage regular attendance.	1,3,5
6	**Voter Awareness Campaign (SVEEP)** Inform citizens about voter rights and the election process. Promote ethical voting through posters and street plays.	2,3,5
7	**Plastic-Free Campus Initiative** Educate peers on the harmful effects of plastic. Conduct collection drives and promote reusable alternatives.	2,3
8	**Cultural and Heritage Promotion** Organize folk art, dance, and storytelling sessions. Engage the community in preserving local culture.	3,5
9	**Yoga and Wellness Sessions** Conduct yoga and mindfulness sessions for students and locals. Promote physical and mental health through regular practice.	3,4
10	**Self-Defence Training for Girls** Organize practical training on basic self-defence techniques. Empower girls with safety awareness and confidence.	4,5
11	**Social Contribution Orphanage/ Old age home visit** Hold discussions or exhibitions on gender, caste, and social equality. Encourage inclusive behavior and respect for diversity.	3,4,5

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12	**Digital Literacy Program** Teach basic smartphone and internet use to the elderly or untrained groups. Promote safe and productive use of digital tools	**2,3,5**

Total Practical Sessions	**15**	**Total Practical Hours**	**30**

References:

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

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Member Secretary-BoS **Chairman -BoS** **Member Secretary-AC** **Chairman-AC**

Established: 1999

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Common for All Branches

Course Information:

Class, Semester	FY. B.Tech, Semester - I					**Category**	**CC**
Course Code, Course Title	**Cultural Exploration & Heritage**					**Type**	**L2**
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	2	-	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	**Identify** and describe key elements of cultural heritage including tangible, intangible, and natural heritage with real-life examples.
CO2	**Demonstrate** understanding of regional and national cultural practices through participation in experiential activities.
CO3	**Analyze** the significance of preserving cultural heritage in the context of globalization and modernization.
CO4	**Collaborate** in group projects to creatively document and present cultural themes using various mediums.
CO5	**Reflect** critically on personal and collective cultural identities through journals, discussions, and presentations.

Practice Session

No	Contents	CO Mapped
1	**Introduction to Cultural Exploration and Heritage** Understand the meaning of tangible, intangible, and natural heritage, Discuss real-life examples of cultural elements. Reflect on how culture shapes identity.	1,5
2	**Heritage Mapping/ Case Study on a Heritage Site** Choose a local region or community. Identify and locate key cultural sites (temples, festivals, crafts). Create a visual or digital heritage map. Present findings in written or visual format	1,3,4
3	**Vaidik Tal Vadya Songs and Music tradition** Introduction to Vedic Music, Demonstration of Vaidik Tal Vadya, Listening Session of Vedic Chants &Samagana, Group Singing of a Vedic Verse or Traditional Bhajan	2, 5
4	**Folk Dance** Watch or participate in folk dance. Discuss the significance, costumes, and music of each. Compare cultural roots and evolution.	2, 4
5	**Traditional Music** Dholki ,Tabala, Dhol ,LezimListen to selected regional or classical music samples. Identify the instruments, lyrics, and cultural setting.	2, 4
6	**Traditional Instrumental** Taal, Tritaal, Tabala Observe or perform simple rhythms or melodies. Explore the cultural and ceremonial use of instruments.	1, 2
7	**Singing** Types of singing, Vocal Singing Introduction to music fundamentals	2, 4
8	**Drama** Introduction, Types, Information about acting, Stage information , Present / performance on stage	4,5
9	**Classical dance, Western dance** Introduction toclassical, and western dance demonstrations. Different types	2, 4
10	**Karaoke Singing** Introduction, Types, Basic music information	2, 4
11	**Short film** Prepare short film , Present / performance on stage , Topic concern with Indian Cultural heritage	3, 4, 5
12	**Final Showcase** Present all your work in a class exhibition. Explain the cultural significance of each project. Receive peer and teacher feedback.	4, 5
Total Practical Sessions	**15**	**Total Practical Hours**	**30**

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Text Books

1. 1. Nrutasaurabha ManjiriShriramDev XII 2015
2. 2. Indian Art and Culture , NitinSinghania McGraw Hill Education IV 2022
3. The Wonder That Was India Picador India Second2004
4. 4. The National Culture of India National Book Trust (NBT), India Second2016

References:

1. Bhattacharyya, Haridas, editor. The Cultural Heritage of India. The Ramakrishna Mission Institute of Culture, multiple volumes, revised ed.
2. Singhania, Nitin. Indian Art and Culture. 4th ed., McGraw Hill Education, 2022.
3. Basham, A. L. The Wonder That Was India. Picador India, 2004.
4. Jokilehto, Jukka. A History of Architectural Conservation. 2nd ed., Routledge, 2017.

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Established: 1999

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Ashta - 416301, Dist. : Sangli, Maharashtra
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Department of Electrical Engineering

Course Information:

Class, Semester	FY. B.Tech, Semester - II						**Category**	**BS**	
Course Code, Course Title	**3EEBS109, Mathematics-II**						**Type**	**T1**	
Prerequisites	3EEBS101, Mathematics-I								
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**		**Self Study**		**Credits**	
	3	1		-		2		4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**	**ESE**	
		40	20	40			-	-	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Determine equation of a curve and compute statistical measures to analyze data using statistical techniques
CO2	Express functions in series form Using Maclaurin's and Taylor's expansion
CO3	Use appropriate methods to solve integrals using special functions
CO4	Determine unknown values from tabulated data using finite difference and interpolation techniques.
CO5	Compute Area and Mass of a region using multiple integrals

Syllabus:

Module	Contents	Lecture Hours
I	**Curve fitting and Statistics:** Method of Least Squares, Fitting of Straight Line, Fitting of Parabola, Fitting of exponential curves, Lines of Regression.	8
II	**Expansion of Functions and Indeterminate Forms**: Maclaurin's series Taylor's series, Standard expansions, Expansion of function using Standard series, Indeterminate forms.	7
III	**Special Functions:** Introduction to special function, Gamma function, Properties of Gamma function, Beta function, Properties of Beta function, Relation between Beta and Gamma functions, error function and its properties.	7
IV	**Statistical Measures**: Introduction, Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode, Partition values: Quartiles, Deciles and Percentiles, Concept of dispersion, Range, Quartile Deviation, Mean Deviation, Mean Square Deviation, Variance and Standard Deviation.	8
V	**Finite Differences and Interpolation:** Finite differences, Forward and Backward Difference Newton's forward Interpolation formula, Newton's backward Interpolation formula, Stirling Interpolation formula, , Newton's Divided Difference, Lagrange's interpolation formula.	8
VI	**Multiple Integral and Its Applications:** Double Integrals, Triple integral, Change of Order of Integration, Change to polar coordinates, Applications to Area and Mass of plane lamina.	7
	Total Lecture Hours	45

List of **Tutorial with CO Mapping**

Sr.No	Title of Tutorial	CO Mapped
1	Fitting of straight line and Second-degree parabola	1
2	Fitting of exponential curves and lines of regression	1
3	Expansions of functions using Maclaurin's and Taylor series	2
4	Indeterminate forms.	2
5	Gamma and Beta functions	3
6	Measures of Central tendency	1
7	Measures of dispersion	1
8	Interpolation with equal intervals	4
9	Interpolation for unequal intervals	4
10	Evaluation of multiple integrals	5
	Total Tutorial Hours	15

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Text Books
1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications ,2011. 2. H. K. Das , Advanced EngineeringMathematics , 22th Edition, S. Chand ,2018. 3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010 4. Dr. B. S. Grewal , Numerical Methods , 9th Edition, Khanna Publishers ., 2010
References:
1. Dr. B. S. Grewal , Higher Engineering Mathematics , 44th Edition, Khanna Publishers ,2018. 2. N. P. Bali, Manish Goyal , Advanced EngineeringMathematics , 7th Edition, Infinity science press ,2010. 3. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-I, 9th Edition Pune Vidyarthi Griha Prakashan,1984 4. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Vol-II, 7th Edition Pune Vidyarthi Griha Prakashan,1988. 5. S. C. Gupta, V. K. Kapoor , Fundamental of Mathematical Statistics , 10th Edition Sultan Chand and Sons Publisher,2000.
Online Learning Resources
1. NPTEL Course onEngineering Mathematics-I, by Prof. Jitendra Kumar, IIT Kharagpur https://nptel.ac.in/courses/111105121 2. NPTEL Course on Numerical Methods, by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107105 3. NPTEL Course on Matrix Analysis with Application, by Prof. S. K. Gupta , Prof. Sanjeev Kumar, IIT Roorkee https://nptel.ac.in/courses/111107112 4. NPTEL Course Business Statistics, by Prof. Mukesh Kumar Barua, IIT Roorkee https://nptel.ac.in/courses/110107114

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(An Empowered Autonomous Institute)
Department of Electrical Engineering
Established: 1999

Course Information:

Class, Semester	F Y. B.Tech, Semester - II					**Category**	**BS**
Course Code, Course Title	**3EEBS110, Engineering Chemistry**					**Type**	**LIT2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	2	-	2	2		3	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the properties and applications of engineering materials for industrial and societal use based on their chemical compositions.
CO2	Discuss methods for preventing corrosion in metals by relating them to corrosion types and environmental conditions using basic chemical principles.
CO3	Solve the domestic and industrial problems related to water quality parameters using theoretical knowledge and laboratory experiments.
CO4	Apply the principles of analytical instruments in the analysis of samples with help of foundational practical chemistry knowledge.
CO5	Compute the calorific values of fuels for domestic and industrial applications using standard fundamental chemical equations.

Syllabus:

Module	Contents	Lecture Hours
I	**Water Technology and Management:** Introduction, impurities in natural water, **Water Testing:** Acidity, alkalinity, chlorides and hardness of water (definition, causes and significance), Disinfection of water. **Treatment of hard water** by: Zeolite process, Reverse Osmosis, Numericals on temporary, permanent and total hardness of water.	5
II	**Chemical and Analytical Techniques:** Chemical analysis, its types, Different ways to express concentration of solution, Numerical problems. **A) p^H-metry:** Introduction, pH measurement using glass electrode and it's applications. **B) Spectrometry**: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's laws). **C) Chromatography**: Introduction, principle, instrumentation and applications of Gas-Liquid chromatography (GLC).	5
III	**Polymers and Composites for Engineering Applications:** **Polymers**: Introduction, Plastics: Thermo-softening and thermosetting plastics, industrially important plastics like PVC, PTFE (Teflon), ABS, urea-formaldehyde, **Composites:** Introduction, Constituents, Fibre-reinforced plastics (FRP) and Glass reinforced plastics (GRP).	5
IV	**Energy Technology :** **A) Batteries:** Introduction, Types of batteries, battery characteristics, Lithium ion batteries (LIBs), Sodium- ion batteries (Instrumentation, advantages, disadvantages and applications), Ni-Cd batteries. **B) Fuels:** Introduction, classification, characteristics of good fuels, Types of calorific value (higher and lower), Bomb calorimeter, Numerical on GCV and NCV, Introduction to solar cells.	5
V	**Corrosion & it's Prevention:** **Corrosion:** Introduction, causes, types of corrosion, Electrochemical corrosion (hydrogen evolution and oxygen absorption mechanisms), Factors affecting rate of corrosion. **Prevention of corrosion by**: Hot dipping (Galvanizing and tinning), Electroplating process, Metal cladding.	5

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VI	**Metallic Materials:** Introduction, classification, purposes of making alloys with examples. **Ferrous alloys:** Plain carbon steels (mild, medium and high). **Nonferrous alloys:** Aluminum alloy (Duralumin and Alnico), Nickel alloy (Nichrome), Tin alloys (Solders).	5
	Total Lecture Hours	30

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Determination of acidity of water sample. (Neutralization Titration)	3
2	Determination of alkalinity of water sample. (Acid- Base Titration).	3
3	Determination of chloride content of water by Mohr's method. (Precipitation Titration).	3
4	Determination of total hardness of water sample by EDTA method.	3
5	Preparation of Urea-formaldehyde resin.	1
6	Preparation of Phenol-formaldehyde resin.	1
7	Determination of rate of corrosion of Aluminium in acidic and basic medium	2
8	Estimation of copper in brass solution (Displacement Titration)	1
9	Estimation of zinc in brass solution (Displacement Titration)	1
10	Determination of pH of industrial waste water by using pH meter	4
11	Demonstration of bomb calorimeter to calculate calorific value of fuels.	5
12	Demonstration of Photo-colorimeter.	4
13	Determination of strength of acid/base by using conductivity meter.	4
Total Practical Sessions 15	**Total Practical Hours**	30

Text Books:

1. S. S. Dara, A Text Book of Engineering Chemistry, 11th Edition, S. Chand & Co. New Delhi, 2008.
2. Shashi Chawala, A Text book of Engineering Chemistry 3rd Edition, Dhanpat Rai Publishing Co. New Delhi, 2007
3. Ziyauddin D. Sande, Vijayalaxmi M. Vairat, Pratapsingh V. Gaikwad, A Text book of Applied Chemistry,1st Edition, Wiley Publications, 2018

References:

1. Jain & Jain, Engineering Chemistry, 16th Edition, Dhanpat Rai Publishing Co., New Delhi., 2015.
2. Wiley India, Engineering Chemistry, 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2012.
3. Chatwal and Anand, Instrumental Methods of Chemical Analysis, 5th Edition, Himalaya Publishing House, Mumbai, 2005.
4. B. K. Sharma, Industrial Chemistry, 10th Edition, Goel publication (P) Ltd., 1999

Online Learning Resources

1. Water Technology-- https://youtu.be/dKWJzp_rrlE
2. For lithium-ion batteries (LIBs): https://www.youtube.com/watch?v=DBLHaLhyo2w
3. Wikipedia - Composite materials: https://en.wikipedia.org/wiki/Composite_material

Experiments that may be performed through virtual labs:

S. No.	Experiment Name	Experiments Links
1.	Water analysis-Determination of Chemical parameters	https://inoc-amrt.vlabs.ac.in/exp/water-analysis-chemical-parameters/index.html
2.	Demonstration of Photo-colorimeter	https://pcv-amrt.vlabs.ac.in/exp/spectrophotometry/index.html

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Annasaheb Dange College of Engineering and Technology
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(An Empowered Autonomous Institute)
Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	FY. B.Tech, Semester - II					**Category**	**ES**
Course Code, Course Title	**3EEES111, Engineering Graphics with CAD**					**Type**	**LIT2**
Prerequisites	--						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	2	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Construct** projections of straight lines in various positions with reference planes, by variation in inclination, grade, bearing, and initial conditions.
CO2	**Complete** the projection of planes and Solids in various positions relative to reference planes, considering variations in initial conditions and inclination, to achieve an accurate shape in inclined positions.
CO3	**Draw** the three orthographic views for a given three-dimensional pictorial view, concerning the direction of viewing in first-angle projection, explaining the sectional view, hidden object and dimensions with CAD.
CO4	**Develop** a 3-dimensional isometric view converted from two or three orthogonal views to illuminate a 3D object.

Syllabus:

Module	Contents	Lecture Hours
I	**Fundamentals of Engineering Graphics and Projections of Lines** **Fundamentals of Engineering Graphics:** Introduction to Drawing instruments and their uses. Different types of lines used in drawing practice, Dimensioning system as per BSI, Introduction to Auto CAD. **Projections of Lines:** Introduction to First angle and third angle methods of projection. Projections of points on regular and auxiliary reference planes. Projections of lines (horizontal, frontal, oblique and Profile lines) on regular and auxiliary reference planes. True length of a line, Point View of a line, angles made by the line with reference planes. Projections of intersecting lines, Parallel lines, perpendicular lines, and skew lines. Grade and Bearing of a line.	9
II	**Projections of Planes** Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes), Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes. (Circle & regular polygon up to hexagon).	6
III	**Projections of Solids** Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes. (Excluding Frustum and Sphere)	7
IV	**Introduction to Computer Aided Drafting** Introduction to CAD & Graphical user interface of the CAD software, Draw Commands, Drafting Aids(Limits, layer, Dimensioning, Object snap, Zoom), Modify Commands.	8
V	**Orthographic Projections** Lines used, selection of views, spacing of views, dimensioning and sections. Drawing required views from given pictorial views (conversion of pictorial views in to orthographic views), including sectional orthographic views.	8
VI	**Isometric Projections** Introduction to isometric. Isometric scale, Isometric projections and Isometric views /drawings. Circles in isometric view. Isometric views of simple solids and objects.	7
	Total Lecture Hours	**45**

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List of Experiments with CO Mapping			
S.No	**Title / Topic of the Experiment**		**CO Mapped**
1	Introduction to Engineering Drawing		1
2	Introduction to Auto CAD		3
3	Projection of Line		1
4	Projection of Plane		2
5	Projection of Solid		2
6	Orthographic Projection		3
7	Orthographic Projection with Auto CAD		3
8	Isometric Projection		4
9	Isometric Projection with Auto CAD		4
Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Text Books

1. W. J. Luzadder, Fundamentals of Engineering drawing, Revised Edition, Prentice Hall of India, 1999.
2. N. D. Bhatt, Machine Drawing, 15th Edition, Charotar Publishing House Pvt. Ltd.-Anand, 2007.
3. Jhole, Dhananjay, Engineering Drawing, Revised Edition, Tata McGraw-Hill, 2011.
4. M.L. Mathur, Engineering Drawing & Graphics, Revised Edition, Jain brothers, 1999..

References:

1. K. Venugopal, Engineering Drawing and Graphics, 5th Edition, New Age Publication, 2004.
2. R. K. Dhawan, A textbook of Engineering Drawing, Revised Edition, S. Chand and Co, 2008.
3. N. B. Shaha and B. C. Rana, Engineering Drawing, 2nd Edition, Person Education, 2012.
4. K. L. Narayana, Machine Drawing, New Age Publication

Online Learning Resources

1. NPTEL Course on Engineering Drawing, by Prof. P. S. Robi, IIT Guwahati https://nptel.ac.in/courses/112103019
2. NPTEL Course on Engineering/ Architectural Graphics- Part I- Orthographic Projection, by Prof. Avlokita Agarwal, IIT Roorkee https://nptel.ac.in/courses/124107157
3. NPTEL Course on Engineering Graphics and Design, by Prof. Naresh Datla, Prof. S. R. Kale, IIT Delhi https://nptel.ac.in/courses/112102304
4. NPTEL Course on Engineering Drawing and computer graphics, by Prof. Rajaram Lakkaraju, IIT Kharagpur

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Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

Established: 1999

Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist. : Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Electrical Engineering

Course Information:

Class, Semester	F.Y. B.Tech – Semester II					**Category**	**ES**
Course Code, Course Title	**3EEES112-Programming for Problem Solving**					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	1	-	2	2	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Prepare an algorithm and draw a flowchart to accurately solve various mathematical problems by using structured approach.
CO2	Apply the fundamental concepts like data types, operators to solve mathematical problems by using the C language.
CO3	Apply the decision and looping constructs to solve the problems related to decision, repetitive statements for real time problem statement using C
CO4	Develop a C program to demonstrate the modular approach by using the concept of function, structure and pointer
CO5	Write, Compile and debug C program for various problem statements by using structured approach.

Syllabus:

Module	Contents	Lecture Hours
I	**Basics of Programming:** Computer, Hardware, Software, I/O-Devices, Memory, CPU, The meaning of algorithms, Flowcharts, Pseudo codes, Writing algorithms and drawing flowcharts for simple exercises, Memory Concepts, C Program development environment.	4
II	**C Fundamentals:** Importance of 'C' Language, History, Structure of 'C' Program, Sample 'C' Program, Constants, Keywords and Identifiers, variables and data types, Enumeration. Operators and expressions, Managing input / output operations, Type Casting, Control statements- Decision making, Case control & Looping Constructs.	7
III	**Array:** The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, multidimensional arrays. Strings-Declaring and initialing character array, reading and writing string to/from terminal, arithmetic operations on characters, putting strings together, string handling functions.	5
IV	**Functions:** Need of user defined functions, elements of User defined functions, defining functions, return values and their types, function calls, function declaration, methods of parameter passing, Recursion, Scope rule of functions, user defined and library functions.	4
V	**Structure & Pointers:** Need of Structure, Defining a structure, Declaring and accessing structure variables, Structure initialization, Copying and comparing structure variables, Array of structures, Structures and functions, Unions. Understanding pointers, Accessing the address space of a variable, Declaring and initializing pointer variables, Accessing a variable through its pointer, Pointer expressions, Types of pointers, Dynamic memory allocation malloc0, calloc0, realloc0, free0	6
VI	**File Handling:** Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments, C preprocessor.	4
	Total Lecture Hours	30

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List of Experiments with CO Mapping		
S. No	**Title / Topic of the Experiment**	**CO Mapped**
1	Write an algorithm and draw flowchart for given problem statements.	1
2	Implement a program using different data types and operators in C.	2
3	Implement a program using decision control statements.	3
4	Implement a program using repetitive control statements (for, while, do-while).	3
5	Implement a program using a selection control statement.	3
6	Implement a program using nested loop (for, while loop).	3
7	Program to demonstrate one dimensional array	3
8	Program to demonstrate two-dimensional array	3
9	Implement a program to demonstrate String handling functions.	3
10	Implement a program using user defined functions in C.	4
11	Program to demonstrate concept of recursion (factorial, Fibonacci)	4
12	Implement a program to demonstrate the concept of structures in C.	4
13	Implement a program to demonstrate the concept of arrays of structures in C.	4
14	Implement a program to demonstrate the concept of pointers in C.	4
15	Implement a program to demonstrate the concept of file handling in C.	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. ISRD Group , Programming and Problem Solving Using C Language , McGraw-Hill Publications ,2012.
2. Yashwant Kanetkar , Let Us C , 3rd Edition, BPB , 2011.
3. Harvey M. Deitel, Paul J. Deitel, Abbey Deitel , C How to Program ,2nd Edition, Pearson ,2009.
4. E. Balaguruswamy , Programming in ANSI C , 4th Edition, BPB Publications, 2008

References:

1. D. M. Ritchie, The 'C' Programming Language, 2nd Edition, Pearson ,1998.
2. Sidnal, C Programming Laboratory: Handbook for Beginners, 1st Edition, Wiley India Limited, 2012.
3. Yashwant Kanetkar, Understanding Pointers in C, 4th Edition, BPB Publications,2001.
4. Yashwant Kanetkar, Test Your C Skills, 5th Edition, BPB Publications, 2013

Online Learning Resources

1. NPTEL Course on Computer Programming By Dr. T. Sugirtha IIIT Tiruchirappalli https://nptel.ac.in/courses/111105035
2. Learn C Programming, https://www.programiz.com/c-programming
3. C Programming Tutorials, https://www.tutorialspoint.com/cprogramming/index.htm
4. C Programming Language, https://www.geeksforgeeks.org/c-programming-language/

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ADCET

Course Information:

Class, Semester	F.Y. B.Tech – Semester II					**Category**	**ES**
Course Code, Course Title	**3EEES113 - Design Thinking**					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	-	2	1		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		--	--	--		50	--

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the principles and process of Design Thinking and its application in problem-solving.
CO2	Identify and define real-world problems using user-centric observation and empathy techniques.
CO3	Conduct user research through surveys, interviews, and persona building to derive user needs and insights.
CO4	Apply ideation techniques to generate innovative and feasible solutions for identified problems.
CO5	Develop and present prototypes and communicate their solutions effectively using charts, posters, and model presentations.

Syllabus:

Module	Contents
I	Introduction to Design Thinking, Design Thinking Process
II	Empathize Phase: Empathy and Ethics, User Perspective, Activities – Empathy Map, Planning, Persona building.
III	Customer Journey Mapping, Observation of stakeholders, Defining and Conceptualization of problem
IV	Ideation, Activities – 5 Whys & 1 How, Story boarding, Brainstorming.
V	Prototype – Types, Mindsets, Tools.
VI	Testing – Scenario, Methods, Refinements & Recommendations.

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	**Introduction to Design Thinking** **Activity:** Make a group of 2-4 students. Give each group a simple, relatable problem (e.g., "Long queues at the campus canteen" or "Difficulty in finding parking on campus"). Ask them to: Empathize: Identify users and their pain points. Define: Write a clear problem statement. Ideate: Brainstorm possible solutions. Sketch: Draw their proposed solution on chart paper. Present: Each group will present their idea briefly.	1,2
2	**Identification of Problems** **Activity 1: Present case** study (in group) how companies like **Airbnb, Apple, IDEO, Netflix, Samsung, Toyota** used Design Thinking to drive innovation. **Activity 2: User Interviews** – The student or group should walk around the campus or their locality to observe and identify **at least three (per student) real-life problems** faced by users (students, faculty, staff, and community). Conduct interviews to gather qualitative insights. Steps:	1,2

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	1. **Observation:** Note down pain points using observation and informal interviews. 2. **Listing:** Write a list of problems identified. 3. **Shortlisting:** Apply criteria like relevance, feasibility, user impact, and alignment with SDGs to shortlist **one problem** to work on for further Design Thinking phases.	
3	**Selection of Problems** **Activity:** Students will present (PPT) their selected problem, why they chose it, who the users are, and the evidence collected.	1, 2
4	**Designing of Empathy Map** **Activity: Prepare Empathy Map** – Visualize what users say, do, think, and feel.	1,3
5	**Customer Survey and Analysis** **Activity:** Students create a structured survey (MCQ, likert scale, open ended questions etc.) using google forms and prepare charts (bar, pie etc) and do the analysis.	1, 3
6	**Persona Building** **Activity:** Based on findings from **Observations and interviews, Customer Survey and Analysis** from previous experiments, identify pattern i.e. common characteristics, behaviors, needs, pain points, and goals among users and create persona template.	1, 3
7	**Customer Journey Map** **Activity:** Select the persona created in the previous experiment, define the Scenario, List Stages/Phases of the Journey, Map User Actions, Identify User Emotions, Identify Touchpoints, Identify Pain Points and opportunities for Improvement.	1, 3
8	**Defining the problem** **Activities:** • **Observation of Stakeholders** – Note behaviors and pain points. • **5 Whys Method (Drill Down)** – Uncover root causes behind a problem. • **Root Cause Mapping** – Visual diagram connecting symptoms to core issues. **Refine Problem Statement** – Create a focused, actionable problem definition.	1, 3
9	**Poster Presentation** **Activity:** Use A2/A1 sheet and draw charts, diagrams, sketches, and minimal text to represent experiment no 1-8.	1, 2, 3
10	**Ideation** **Activities:** • **SCAMPER Model** – Modify existing ideas by Substituting, Combining, Adapting, etc. • **Brainstorming (Crazy 8 Method)** – Rapid sketching of 8 ideas in 8 minutes. • **Mind Mapping** – Visually connect ideas around a central problem/theme. Use the suitable and best one activity from above.	1, 4
11	**Prototype Building** **Activities:** • **Storyboarding** – Sketch out user scenarios and interactions. • **Prototyping** – Build a working model or prototype or model.	1, 5
12	**Testing** **Activities:** • **Scenario-Based Testing** – Test ideas in realistic user scenarios. **Peer Testing** – Get feedback from other participants or teams.	1, 5
13	**Refinement & Recommendation** **Activities:** • **Final Presentation** – Showcase prototype or working model.	1, 5

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	• **Documentation of Learnings** – Reflect on the process, improvements, and impact (Make a report). Apply for IPR/Incubation/Research Grant/Paper Publication.			
Total Practical Sessions		**15**	**Total Practical Hours**	**30**

Text Books

1. E Balaguruswamy, Developing Thinking Skills (The way to Success), First Edition, Khanna Book Publishing Company, 2023
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, First Edition, Harvard Business Review, 2008
3. R T Krishnan & V Dabholkar, 8 steps to Innovation, First Edition, Collins Publishing, 2013

References:

1. Nigel Cross, Design Thinking, First Edition, Bloomsbury, 2011
2. Idris Mootee, Design Thinking for Strategic Innovation, First Edition, Wiley, 2013

Online Learning Resources

1. NPTEL_Design Thinking - A Primer, https://youtu.be/AamBSYPJlcA?si=wJDNT4L9q1NB-6T9
2. Design Thinking and Innovation, https://www.coursera.org/learn/designthinkingandinnovation

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Course Information:

Class, Semester	FY. B.Tech, Semester - II					**Category**	**HS**
Course Code, Course Title	**3EEHS114, Communication Skills**					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	-	--	4	1		2	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	Demonstrate the Listening, Speaking, Reading and Writing (LSRW) skills considering the frame of English language rules accurately for effective and sound communication in academic and profession contexts.
CO2	Exhibit their portfolio and career choices confidently, considering corporate expectations by using digital tools convincingly.
CO3	Write letters, reports, Emails and Blogs proficiently by following required techniques that help in getting acquainted with professional correspondence.
CO4	Attain professional skill while convincingly presenting on allotted topics using MS PowerPoint and AI techniques.
CO5	Justify own role in communicative events in well-organized manner with balanced zeal.

List of Experiments with CO Mapping

S. No	Title / Topic of the Experiment	CO Mapped
1	Self - Introduction	1
2	SWOT Analysis	1
3	Basics of English Pronunciation	1
4	Rapid Review of Grammar	1
5	Diagnosing Listening and Speaking Skills	1
6	Diagnosing Reading and Writing Skills	1
7	Introduction to MS Office (Word, Excel, PPT)	1
8	Presenting my career choices	1,4
9	Preparing Portfolio	1,2
10	Describing Technical Charts, Image, and Processes	1,2
11	Using Language Learning Apps and Tools	1,4
12	Presenting Portfolio	1,4
13	Effective Presentation Skills	1,2
14	Delivering Power Point Presentation	1,4
15	Job Application and Resume Writing	1,4,5
16	Email Writing	1,3
17	Group Discussion	1,3
18	Public Speaking	1,5
19	Report Writing	1,5
20	Organizing an Event	1,3
21	Technical Writing	1,5
22	Blog Writing	1,3
23	Mock Interview	1,3
24	Achievement Test	1,2,5
Total Practical Sessions	**30**	**Total Practical Hours**	**60**

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Text Books

1. The Professional: Defining the New Standard of Excellence at Work Subroto Bagchi Penguin Books India Pvt. Ltd. Revised Edition,2011.
2. Cambridge Guide to IELTS. Pauline Cullen, Amanda French, Cambridge University Press, Reprint, 2017.
3. A Practical Course in Effective English-Speaking Skills. J. K. Gangal, PHI Learning Private Limited, New Delhi, Print, 2012
4. English For Engineers. Dr. Shyamaji Dubey, Dr. Manish Kumar. Vikas Publication House Pvt. Ltd. New Delhi, Print, 2020.
5. Personality Development and Soft Skills. Barun K. Mitra, Oxford University Press, New Delhi , 7th impression, 2012.

References:

1. High-school English Grammar and Composition. Wren and Martin, S. Chand and Co., New Delhi, 1st edition, 2015.
2. The Ace of Soft Skills. Ajai Chowdry, Bala Balchandran, Pearson Publication, Delhi, 8th edition, 2017.
3. Effective Technical Communication. M. Ashraf Rizvi, McGraw Hill Education, Chennai,2nd edition, 2017.
4. Business Communication. Hory Sankar Mukerjee, Oxford University Press, New Delhi , 2nd edition, 2013.
5. Communicative English for Engineers and Professionals. Nitin Bhatnagar, Mamta Bhatnagar, Pearson Publication, Delhi, 1st edition, 2013.

Online Learning Resources

1. **Software:** Pronunciation apps (e.g., ELSA Speak, Speak English), grammar checkers (e.g., Grammarly).
2. **Online Platform** Coursera (for basic English courses), Duolingo, BBC Learning English.

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ADCET

Course Information:

Class, Semester	FY. B.Tech, Semester - II						**Category**	**PC**	
Course Code, Course Title	**3EEPC115, Analog Electronics**						**Type**	**LIT2**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**		**Self Study**		**Credits**	
	3	-		2		2		4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**	**ESE**	
		40	20	40			50	-	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Explain** the characteristics, specifications and applications of basic electronic components, sources and measuring equipment used in Analog Electronics.
CO2	**Analyze** the operation of diodes and their applications in rectification, clipping, clamping and voltage regulation circuits.
CO3	**Interpret** and evaluate the Characteristics and biasing techniques of BJTs, FETs and MOSFETs.
CO4	**Explain** the characteristics, configuration and applications of operational amplifiers, feedback amplifiers and oscillators
CO5	**Interpret** the working principles of timer and phase-locked loop circuits and develop IC555/556 based multivibrators.

Syllabus:

Module	Contents	Lecture Hours
I	**Electronic Components, Sources, and Measuring Equipment** Evolution of Electronics -- Impact of Electronics in Industry and Society – Familiarization of Resistors, Capacitors, Inductors-types and specifications, Introduction to– modern test equipment.	7
II	**Diodes & Applications:** PN-junction diode-ideal/practical, Filter, load line, clippers, clampers, half-wave & full-wave rectifiers, voltage regulation; special diodes – Zener, LED, Schottky, photodiode, varactor, tunnel, TVS diodes.	9
III	**BJT & FET Characteristics & Biasing:** BJT structure, operation CB/CE/CC configurations, biasing techniques, JFET- operation and MOSFET device operation and transfer characteristics-enhancement/depletion, CMOS	9
IV	**Operational Amplifier:** Ideal vs practical op amp characteristics ,741 IC overview, functional block diagram, virtual ground, basic configurations: inverting, non-inverting, applications-adder, subtractor, voltage follower, integrator, differentiator, comparator.	7
V	**Feedback Amplifiers & Oscillators:** Feedback principles; negative feedback benefits; topologies: current/voltage series/shunt, Barkhausen's concept oscillator types: RC phase shift, Crystal, LC-Hartley and Colpitts	6
VI	**Timer Circuits and Phase Locked Loop:** **Timer:** Introduction to Timer and its needs-IC 555 & IC 556- PIN Configuration, Functional block diagram ,Multivibrators using IC 555 (Monostable and Astable), microcontroller-based timing solutions. **Phase Locked Loops:** Introduction of PLL and its needs- IC 566-PIN Configuration, functional block diagram modern frequency synthesizers and digital PLLs.	7
	Total Lecture Hours	45

List of Experiments with CO Mapping

Sr.No	Title of Tutorial	CO Mapped
1	Study experiment on basic electronic components and equipment's to understand fundamentals in Analog Electronics.	1

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2	Plot V-I Characteristics of PN junction diode.	2
3	Experimental verification of Rectifier circuits -Half Wave Rectifier.	2
4	Experimental verification of Rectifier circuits -Full Wave Rectifier (Centre Tap, Bridge).	2
5	Experimental Verification of Clipper Circuits.	2
6	Experimental Verification of Clamper Circuits.	2
7	Determine the performance characteristics of BJT using DC biasing analysis of CE configuration on Proteus.	3
8	Analysis of Op-Amp as inverting amplifier and non- inverting amplifier in closed loop configuration on software tool.	4
9	Analysis and application of active circuits using Op-Amp- Summing amplifier and subtractor using software.	4
10	Analysis and application of active circuits using Op-Amp- Comparator and Zero crossing detector using software.	4
11	Analysis and application of active circuits using Op-Amp- Differentiator and integrator circuit using software.	4
12	Operation of Timer IC 555/556: i) Monostable ii) Astable Multivibrator.	5
Total Practical Sessions: 15	**Total Practical Hours**	**30**

Text Books

1. Robert L. Boylestad and Louis Nashelsky, Electronic devices and circuit theory, 11th Edition, PHI/Pearson Education ,2015.
2. Ramakant A. Gayakwad , Op-Amps & Linear Integrated Circuits , 4th Edition, PHI Publication New Delhi,2015.
3. P. Ramesh Babu, Electronic Devices & Circuits , 3rd Edition, SciTech Publication, 2009.
4. V.K. Mehta Rohit Mehta , Principle of Electronics , 10th Edition, S. Chand , 2006.

References:

1. Millman and Halkias, Satyabratajit, Electronic Devices & Circuits, 3rd Edition, McGraw Hill Education India,2012.
2. Albert Malvino and David J. Bates, Electronic Principles , 7th Edition, Tata McGraw Hill ,2014.
3. Allen Mottershed, Electronic Devices & Circuits, 1st Edition , PHI publication,1979
4. David A. Bell, Operational Amplifiers and linear ICs , 3rd Edition,Oxford University Press,2011.

Online Learning Resources

1. NPTEL Course on Analog Circuits, by Prof. Jayanta Mukherjee, IIT Bombay https://nptel.ac.in/courses/108101094
2. NPTEL Course on Analog Circuits and Systems, by Prof. Shanthi Pavan, IIT Madras. https://nptel.ac.in/courses/108106188
3. NPTEL Course on Analog IC Design, Prof. Aniruddhan S., Prof. Nagendra Krishnapura, IIT Madras. https://nptel.ac.in/courses/108106105

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Course Information:

Class, Semester	S.Y. B. Tech, Semester - III					**Category**	**BS**
Course Code, Course Title	**3EEBS201, Applied Mathematics-III**					**Type**	**T1**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	3	-	-	3		3	
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Solve** linear differential equations with constant coefficients for electrical systems.
CO2	**Compute** Laplace transforms, inverse Laplace transforms, and Fourier transforms of functions using the properties of transforms.
CO3	**Calculate** Z-transforms and inverse Z-transforms using properties and apply to difference equations.
CO4	**Determine** gradient, divergence, curl of a vector field and line integrals using vector differential operators.
CO5	**Apply** Fourier series to expand periodic functions considering discontinuities and change of interval.

Syllabus:

Module	Contents	Lecture Hours
I	**Linear Differential Equations and Its Application** Definitions, linear differential equations with constant coefficients, Complete solution, Operator D, Inverse operator, Rules for finding Complementary function and Particular integral, Method of variation of parameters, Applications of Linear Differential Equations to Electrical system.	8
II	**Laplace Transform & Inverse Laplace transforms** Introduction, Laplace transform of elementary functions. Properties of Laplace Transforms, Transforms of derivatives, Transforms of integrals, Multiplication by t^n, Division by t, Evaluation of integrals by Laplace Transforms. Laplace transform of Unit step function and unit impulse function Inverse Laplace transforms, Definition, Inverse Laplace transforms by Partial Fractions, convolution Theorem.	8
III	**Z-Transforms** Introduction, Definition, Properties, Z-transform of basic functions, Z-transform of some standard discrete functions, Evaluation of inverse Z-transform, Application to difference Equations.	7
IV	**Vector Differential Calculus** Introduction, Differentiation of vectors, Scalar and vector point functions - vector operator del, Del applied to scalar point functions - gradient, directional derivative, unit normal to the surface, Del applied to vector point functions - Divergence and curl, Irrotational and solenoidal vector field, Line integral.	7
V	**Fourier Series** Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Expansion of odd and even periodic functions, Half range series.	8
VI	**Fourier Transform** Fourier integrals, Fourier sine and cosine integral, complex form of Fourier integral, Fourier transform, Fourier sin transform, Fourier cosine transform, Finite Fourier sine and cosine transform.	7
	Total Lecture Hours	45

Text Books

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 44th Khanna Publication, 2017
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications, 2011
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010.

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References:

1. N. P. Bali, Manish Goyal, Advanced Engineering Mathematics, 7th Edition, Infinity science press, 2010.
2. Erwin Kreyszig, Advance Engineering Mathematics", Wiley India.
3. H. K. Das, Advanced Engineering Mathematics, 22th Edition, S. Chand, 2018.

Online Learning Resources

1. https://www.youtube.com/watch?v=n9XP6pljtw8&list=PLbRMhDVUMngfsMNuiGSQQuNwPevZukOY_ (Units: I, II, III and VI)
2. https://www.youtube.com/watch?v=ZurvUcEPUFA (Unit-V)
3. https://www.youtube.com/playlist?list=PLbRMhDVUMngf1rZCNOyPZwHUU1pP66vQW (Unit-IV, Lecture No. 36 – 43)

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Course Information:

Class, Semester	S.Y. B.Tech, Semester - III					**Category**	**PC**
Course Code, Course Title	**3EEPC202, Electrical Circuit Analysis**					**Type**	**LIT2**
Prerequisites							
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	3	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	**Solve** DC circuits with independent and dependent sources using nodal and mesh analysis by formulating KCL/KVL equations to obtain accurate currents and voltages.
CO2	**Utilize** network theorems for DC and AC circuits and analyze sinusoidal steady-state response including resonance in RLC circuits to obtain equivalent circuits, impedance behavior, resonance conditions, and circuit responses.
CO3	**Determine** transient response of RL, RC, and RLC circuits under step and source-free excitation given initial and final conditions, to obtain correct time-domain expressions and system behavior.
CO4	**Apply** two-port network concepts using Z, Y, ABCD, and hybrid parameters for multi-port systems given network configurations, to determine correct network parameters and interconnections.
CO5	**Model** electrical circuits using Laplace transform for dynamic systems to obtain correct s-domain representations and time-response solutions.

Syllabus:

Module	Contents	Lecture Hours
I	**Methods of Analysis (DC Circuits)** Dependent and Independent Sources, Nodal Analysis, Nodal Analysis with Voltage Sources, Mesh Analysis, Mesh Analysis with Current Sources, Nodal & Mesh Analysis by Inspection – Applications	8
II	**Network Theorems (DC Circuits)** Source Transformation, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem - Applications	7
III	**Transient Analysis (Unit Step)** Initial and Final Conditions of Network Elements, Source Free Response of RL, RC and RLC circuits, Step Response of RL, RC, and RLC Circuits - Applications	8
IV	**Sinusoidal Steady State Analysis** Sinusoid-phasor transformation, Impedance and Admittance, Source Transformation and Network Theorems (Superposition, Thevenin's, Norton's, Maximum Power Transfer) in AC circuits – Series and Parallel Resonance – Applications	8
V	**Two-Port Networks** Two-port network variables, Z parameters, Y parameters, Transmission parameters, Hybrid parameters, Relationships between Parameters, Conditions for reciprocity and symmetry, Interconnection of two-port networks – Applications	7
VI	**Applications of the Laplace Transform** Definition and Properties of the Laplace Transform, Inverse Laplace Transform, Initial and final value theorems, Application to integrodifferential equations, circuit element models in *s*-domain equivalents, transfer functions, State variable modeling – Applications.	7
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1.	Design, Simulation and Experimental Verification of an Equivalent Resistive Circuit for a Lighting System.	CO1

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2.	Simulation and Experimental Verification of Mesh and Nodal Methods of Analysis.	
3.	Design, Simulation and Experimental Verification of DC Output Voltage in a BJT Circuit using Mesh and Nodal Methods	
4.	Simulation and experimental verification of Superposition Theorem.	CO2
5.	Simulation and Experimental Verification of Current in an Unbalanced Bridge Circuit using Thevenin's Theorem	
6.	Simulation and experimental verification of Maximum Power Transfer Theorem.	
7.	Simulation and experimental verification of Reciprocity Theorem.	
8.	Design, Simulation and Analysis of First-Order Transient Behavior in RC and RL Circuits	CO3
9.	Design, Simulation and Analysis of Second-Order Transient Response in RLC Circuits.	
10.	Design, Simulation and Experimental Verification of Frequency Response in Series and Parallel Resonant Circuits	CO2
11.	Computation, Simulation and Analysis of Two-Port Network Parameters (Z, Y, ABCD and Hybrid Parameters)	CO4
12.	Simulation and Analysis of RLC Circuits using Laplace Transform and State-Space Modeling	CO5
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books

1. Fundamentals of Electric Circuits – Charles K. Alexander, Matthew N. O. Sadiku, McGraw Hill, 7th Edition, 2022.
2. Engineering Circuit Analysis, William H. Hayt, Jack Kemmerly, Steven Durbin, McGraw Hill,10th Edition, 2024.
3. Circuits & Networks: Analysis & Synthesis – A. Sudhakar and Shyammohan S. Palli, McGraw-Hill Co., 6th Edition, 2025.
4. Networks and Systems – Ashfaq Husain, Khanna Book Publishing Co. (P) Ltd., 2nd Edition, 2019.

Reference Books

1. Network Analysis and Synthesis – Franklin F. Kuo, John Wiley and Sons, Second Edition, 2006.
2. Networks and Systems – D. Roy Choudhary, New Age International Publishers, Second Edition, 2013.
3. Network Analysis and Synthesis- C. L. Wadhwa, New Age International, 3rd Edition, 2018
4. Network Analysis. E. Van Valkenburg, PHI Learning / Prentice Hall, Standard reprint edition, 2006

Online Learning Resources

1. NPTEL (SWAYAM) – Electrical Engineering Courses
   https://nptel.ac.in Provides free IIT lecture videos, assignments, and certification courses on Network Analysis(https://nptel.ac.in/courses/108105159), Introduction to Electrical Engineering and related subjects.
2. **MIT Open Courseware – Circuits and Electronics**
   https://ocw.mit.edu
   Free lecture videos, notes, and assignments from MIT's undergraduate circuits course covering topics like KCL, KVL, superposition, and network analysis.
3. **Electrical4U – Electrical Engineering Tutorials**
   https://www.electrical4u.com
   Provides free explanations and tutorials on electrical engineering topics such as circuit analysis, machines, and power systems.

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Verification of Network Theorems (Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem)	https://asnm-iitkgp.vlabs.ac.in/

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Department of Electrical Engineering

Course Information:

Class, Semester	S.Y. B.Tech, Semester - III					**Category**	**PC**
Course Code, Course Title	**3EEPC203, Digital Electronics and Microcontrollers**					**Type**	**LIT1**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	3	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	**Apply** number systems, Boolean algebra and K-map techniques to simplify logic expressions for basic logic digital circuits.
CO2	**Design** combinational and sequential logic circuits using standard building blocks.
CO3	**Explain** different ADC and DAC techniques based on working principle and performance specifications.
CO4	**Illustrate** the architecture, memory organization, and instruction set of 8051 microcontrollers for embedded system development
CO5	**Develop** programs for interfacing peripherals and actuators using 8051 microcontrollers.

Syllabus:

Module	Contents	Lecture Hours
I	**Number System, Logic Gates and Boolean Algebra** Number systems - Decimal, Binary, Octal, Hexadecimal and its conversions, BCD code, Gray code, Logic gates, Boolean algebra, K- map and it's reduction techniques.	8
II	**Combinational and Sequential Logic Circuit Design** Half adder, Full adder, Magnitude comparator, Binary to Gray converter, Gray to Binary converter, Multiplexer, De-multiplexer, Latch, Flip flops: Edge-triggered S-R flip flop, D flip flop, J-K flip flop, T- flip flop, Counter- Mod n asynchronous counter, Shift Registers.	7
III	**Data Converters** Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.	7
IV	**Microcontroller 8051** Introduction to microcontroller, comparison of microprocessor and microcontroller, features of microcontroller, block diagram, architecture of 8051, pin configuration of 8051, Addressing modes, instruction set, Memory Organisation.	7
V	**Programming ports and timers** Introduction to Assembly programming, Basic I/O programming, Development tools for 8051 programs, Programming Timers and counters Timer block diagram and function, Timer modes, Timer and Counter Programming	7
VI	**Applications and Recent Trends** LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing and sensor integration using 8051 Microcontroller.	9
	Total Lecture Hours	45

List of Experiments with CO Mapping.

S.No	Title / Topic of the Experiment	CO Mapped
1	Identification and verification of truth table of all logic gates	1
2	Design of combinational logic circuit using SOP or POS equation.	2
3	Design of Half adder & Full adder.	2
4	Implementation and verification of 4-bit magnitude comparator using IC-7485.	2
5	Design of Combinational logic circuit using Multiplexer 74151 & Demultiplexer 74138.	2

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6	Design of mod n asynchronous counter.	2
7	Design of binary weighted resistor DAC.	3
8	Design of counter type ADC.	3
9	Assembly language programming of 8051for arithmetic instructions.	4
10	Assembly language programming of 8051for logical instructions.	4
11	DC Motor interfacing to 8051 Microcontroller	5
12	Stepper Motor interfacing to 8051 Microcontroller	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books :

1. A. Anand Kumar, Fundamentals of Digital Electronics, 4th PHI, 2016
2. Mazidi, McKinlay, PIC Microcontroller and Embedded Systems 2nd, Pearson Prentice Hall, 2021
3. V Udayshankara, M S Mallikarjuna Swamy, 8051 Microcontroller: Hardware, Software and Applications, 8th McGraw- Hill Education India, 2014
4. Subrata Ghoshal, 8051 Microcontroller: Internal, Instructions, Programming & Interfacing 1st Pearson Publication 2014.

References:

1. Morris Mano, Digital Design 4th Pearson Education, Asia 2012
2. Anil Maini, Digital Electronics Principles & Applications ,2nd Wiley ,2007.
3. M. A. Mazadi,J. G. Mazadi, The 8051 Microcontroller and Embedded Systems, 4th Pearson Education, Asia 2008
4. Kenneth Ayala The 8051 Microcontroller Cengage Learning 3rd Thomson Delmar Learning, 2007

Online Learning Resources

1. https://www.udemy.com/course/digital-electronics-and-circuits
2. https://en.wikipedia.org/wiki/Sequential_circuit
3. https://en.wikipedia.org/wiki/PIC microcontroller
4. https://youtu.be/2-geyR_aM28?si=KeXaRcdKHZJVN3UK

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Identification and verification of truth table of all logic gates	Virtual Labs
2.	Design of Combinational logic circuit using Multiplexer 74151 & Demultiplexer 74138.	Virtual Labs

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester - III					**Category**	**PC**
Course Code, Course Title	**3EEPC204, Measurement and Instrumentation**					**Type**	**L1T1**
Prerequisites	3EEES105						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	2	-	2	2	3		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Apply** principles of electrical measuring instruments to measure electrical parameters.
CO2	**Explain** principles of dynamometer wattmeter and induction energy meter to measure power and energy.
CO3	**Use** DC and AC bridges to accurately measure resistance, inductance, capacitance and frequency using suitable methods.
CO4	**Illustrate** the construction, working, and applications of digital measuring instruments, sensors & transducers for engineering measurements.
CO5	**Examine** the recording instruments and virtual instrumentation using LabVIEW to monitor, record, and analyze the parameters.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Electrical Measuring Instruments** Need of Instruments, Classification, Characteristics (static and dynamics), Permanent Magnet Moving Coil (PMMC) instrument, Moving Iron type Instruments (MI), Errors in measurements, Calibration of Ammeter and Voltmeters, range extension using shunts and multipliers.	5
II	**Measurement of Power and Energy** Single phase dynamometer type wattmeter, active & reactive power measurement in three phase system for balanced and unbalanced load, Construction and working of Single phase induction type energy meter, Smart Meter	5
III	**DC and AC Bridges** Introduction, Measurement of low, medium and high resistance, Wheatstone Bridge, Kelvin's double bridge, ammeter voltmeter method, Types of AC Bridges, Condition for bridge balance, Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge, Anderson's bridge, Schering Bridge, Wien Bridge.	6
IV	**Digital Measuring Instruments** Introduction to digital instruments, digital voltmeter, ammeter and Multimeter, Construction and working of CRO, measurement of voltage, current, period and frequency by CRO, Phase angle & frequency by Lissajous pattern, Construction and working of DSO, Power Analyzer.	5
V	**Sensors and Transducers** Sensors & transducers for common engineering measurements like temperature, pressure, displacement, Speed Sensors, Digital Optical Encoder.	5
VI	**Recording Instruments and Virtual Instrumentation** Classification of recorder, Strip chart recorder, X-Y Recorder, Application of recorders, Architecture of Virtual Instrument, Role of Software in Virtual Instrumentation, Introduction and applications of LabVIEW.	4
	Total Lecture Hours	**30**

List of Experiments with CO Mapping

Sr. No	Title / Topic of the Experiment	CO Mapped
1	Identification of Electrical Measuring Instruments.	1
2	Calibration of Ammeters and Voltmeters.	1

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3	Measurement of active power in three phase circuit by using two wattmeter method.	2
4	Measurement of reactive power in three phase circuit by using two wattmeter method.	2
5	Calibration of single-phase induction type energy meter.	2
6	Measurement of resistance using Wheatstone's / Kelvin's double bridge.	3
7	Measurement of Inductance, Capacitance using AC Bridges	3
8	Measurement of voltage, current, time period and frequency using CRO/DSO.	4
9	Displacement measurement using Linear Variable Differential Transducer.	4
10	Measurement of weights by using Strain Gauge.	4
11	Water Level Detector using Lab VIEW.	5
12	Temperature Conversion system using LAB VIEW.	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. A.K. Sawhney, A course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai & Co. Nineteenth Edition, 2014.
2. J.B. Gupta, A course in Electronics and Electrical Measurements and Instrumentation, S.K. Kataria & Sons, Eights Edition, 2012.
3. H.S. Kalsi, Electronic Instrumentation, Tata Mc Graw Hill, Third Edition, 2012.
4. U.A. Bakshi, V.A. Bakshi, Electrical Measurement and Instrumentation, Technical Publication, Third Edition, 2015
5. Dr. R.S. Sedha, Electronic Measurements and Instrumentation, S. Chand & Company pvt. Ltd., First Edition, 2013.

References:

1. E.W. Golding, F.C. Widdies, Electrical Measurements and Measuring Instruments, Reem Publications, Third Edition, 2011.
2. Arun K. Ghosh, Introduction to Measurements and Instrumentation, PHI Publication, Fourth Edition, 2012.
3. R.S. Sirohi Radhakrishnan, Electrical Measurement and Instrumentation, New Age Publication, Third Edition, 2010.
4. B.K.C. Nakra, K. Chaudhari, Instrumentation Measurement and Analysis, Tata Mc Graw Hill, Second Edition, 2009.

Online Learning Resources

1. https://www.electrical4u.com/electrical-engineering-articles/electrical measurement/
2. https://en.wikipedia.org/wiki/energy meter
3. https://en.wikipedia.org/wiki/Electric transducer

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Measurement of unknown Resistance by using Wheatstone Bridge with Virtual Instrumentation Lab	https://elms-iitr.vlabs.ac.in/exp/wheatstone-bridge/simulation.html

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ADCET

Course Information:

Class, Semester	S.Y. B.Tech, Semester - III					**Category**	**VSEC**
Course Code, Course Title	**3EEVS205, Python Programming**					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	1	-	2	1	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	-	-		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Use** Python fundamentals including variables, data types, operators, and basic input/output to solve simple computational problems correctly.
CO2	**Apply** control statements, loops, and Python collections (lists, tuples, dictionaries, sets) to develop logical and numerical programs effectively.
CO3	**Develop** Python programs for basic text processing and data logging using string handling and file operations accurately.
CO4	**Implement** simple class-based programs with appropriate exception handling to model engineering systems for real-world problems.
CO5	**Apply** Python modules, NumPy arrays, and Matplotlib to perform basic scientific computing and generate line graphs or signal plots for engineering data visualization.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Python & Setup** Introduction to Python, Features of Python, Installation of Python & IDE, Writing and Executing Basic Input and Output Python Program	2
II	**Variables, Data Types & Operators** Variables and Naming Rules, Fundamental Data Types, Operators: Arithmetic, Relational, Logical, Assignment, Introduction to Collections: Lists, Tuples, Dictionaries (basics)	3
III	**Control Statements & Logical Programs** Conditional Statements: if, if-else, if-elif-else, Looping Statements: for loop, while loop, Loop control: break, continue, Basic Logical Programs	3
IV	**Strings & File Handling** String handling (basic operations), String formatting, File handling, Simple data logging	2
V	**Introduction to OOP & Exception Handling** Concept of Class and Object: Constructor, Instance variables and methods, Exception Handling: try, except, finally	2
VI	**Introduction to Python Modules and Basic Scientific Computing** Introduction to Modules, NumPy (basic array operations only), Matplotlib (basic plotting): Line graph, Signal plotting.	3
	Total Lecture Hours	15

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Installation and Introduction to Python with Basic Data Types	1
2	Program to Demonstrate Arithmetic, Logical and Bitwise Operators in Python	1
3	Program to Implement Control Statements using Python Collections	2
4	Program to Perform Various Operations on Lists in Python	2
5	Program to Perform Various Operations on Tuples in Python	2
6	Program to Perform Various Operations on Dictionaries in Python	2
7	Program to Perform Various Operations on Sets in Python	2
8	Program to Develop and Use a User-Defined Module in Python	3

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9	Program to Implement Basic Object-Oriented Programming Concepts in Python	3
10	Program to Demonstrate Exception Handling in Python	4
11	Introduction to Python Modules and Basic NumPy Operations	5
12	Program to Plot Line Graphs and Electrical Signals using Matplotlib	5
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books

1. Allen B. Downey, Think Python: How to Think like a Computer Scientist, Updated for Python 3,2nd O'Reilly Media, Publishers, 2015.
2. Jeeva Jose and Sojan Lal, Introduction to computing and Problem Solving with Python, 1st, Khanna Book Publishing Co. (P) Ltd, 2016
3. Lubanovic Bil, Introducing Python Modern Computing in Simple Packages, 1st O'reilly, 2014
4. Y. Daniel Liang, Introduction to programming using Python, Pearson, 1st 2012.

References:

1. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
2. Reema Thareja, Python Programming using Problem Solving Approach, Oxford University Press, 2017.
3. John V Guttag, Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press, 2013.
4. Mark Lutz, "Learn Python"", 5th Edition, O'reilly Media, Inc, June, 2013.

Online Learning Resources

1. https:/ /nptel.ac.in/courses/106106182/
2. https:/ /www.python.org
3. http://greenteapress.com/wp/thinkpython/
4. https://www.geeksforgeeks.org/python-programming-language/

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Constructor and Inheritance using Virtual Lab	https://python-iitk.vlabs.ac.in/exp/constructors-and-inheritance/theory.html
2.	File operations using Virtual Lab	https://python-iitk.vlabs.ac.in/exp/file-operators/

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Course Information:

Class, Semester	SY. B. Tech, Semester - III							**Category**	**HS**
Course Code, Course Title	**3EEHS206, Universal Human Values**							**Type**	**T2**
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self Study**		**Credits**
	2		-		-		2		2
Examination Scheme (Marks)	**Theory**	**MSE**		**TA**	**ESE**	**Practical**		**CIA**	**ESE**
		-		50	-			-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the concept, significance, and need of Universal Human Values and their role in achieving harmony in personal, social, and professional life.
CO2	Apply the principles of harmony, social responsibility, and environmental sustainability in day-to-day life and professional situations.
CO3	Classify ethical issues in engineering, society, and emerging technologies using ethical principles and professional guidelines.
CO4	Demonstrate value-based behaviour and ethical decision-making for personal growth and professional practice through self-reflection and case-based situations.

Syllabus:

Module	Contents	Lecture Hours
I	**Evolution and Need of Universal Human Values** Meaning and concept of Universal Human Values, Historical evolution of value systems, Impact of Industrial Revolution on society and lifestyle, Consequences of World War II and global conflicts, Emergence of global value frameworks, Role of United Nations and UNESCO, Introduction of UHV in Indian education system by AICTE, Present-day challenges: stress, lack of purpose, environmental issues	**05**
II	**Understanding the Human Being** Human being as a combination of self and body, Distinction between self (consciousness) and body (physical entity), Needs of self vs needs of body, Happiness vs physical pleasure, Harmony in the self (thoughts, feelings, actions), Self-exploration and self-awareness	**05**
III	**Harmony in Relationships** Meaning and importance of relationships, Values in relationships (Trust, Respect, Affection, Care, Guidance, Reverence, Love), Mutual fulfillment in relationships, Role of family in value development, Interpersonal conflicts and resolution, Relationship in professional environment	**05**
IV	**Harmony in Society and Nature** Individual → Family → Society → Nation → World, Concept of undivided society, Social harmony and responsibility, Coexistence in nature, Human-nature relationship, Environmental degradation and its causes, Sustainable living and resource utilization, Local and global environmental issues	**05**
V	**Universal Human Values in Engineering and Technology** Professional ethics in engineering, Role of engineers in society, Guidelines by IEEE, Ethical issues in modern technology, Role of institutions like OpenAI, Core Framework to Assess Values: Self-Reflection Model, Value-Action Gap Model, Emotional Intelligence (EQ) Framework (The Nine Values (Bhavas) Assessment Model)	**05**
VI	**Application of UHV in Personal and Professional Life** Self-reflection and personal development, Value-based decision making, Goal setting with values, Fulfilling Basic Human Aspirations, Application of UHV in career and workplace, Development of holistic and responsible lifestyle, Core Framework to Assess Values: Emotional Intelligence (EQ) Framework, (Human-AI Value Alignment) Ikigai Model	**05**
	Total Lecture Hours	**30**

Text Books

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1. Human Values and Professional Ethics:R. R. Gaur, R. Sangal, G. P. Bagaria,Excel Books, New Delhi, 2010
2. Engineering Ethics: Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2013
3. Understanding Human Being, Nature and Existence Comprehensively: UHV Team, UHV, 2022.
4. Life 3.0, Max Tegmark, Knopf, 2017

References:

1. AICTE Universal Human Values Course Material, 2017 onwards
2. IEEE Code of Ethics
3. Engineering Ethics: Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2013

Online Learning Resources

1. TED Talks on ethics, happiness, human behavior
2. NPTEL Courses on UHV and Engineering Ethics
3. MIT: AI Ethics lectures (Open Courseware)

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Course Information:

Class, Semester	SY. B. Tech, Semester –III					**Category**	**HS**
Course Code, Course Title	**3EEHS207, Indian Constitution**					**Type**	**T2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	1	-	-	1	1		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	Describe the evolution and salient features of the Indian Constitution using the Government of India Acts of 1935 and 1947.
CO2	Illustrate the philosophy of the Indian Constitution using the Preamble, Fundamental Rights, Fundamental Duties, and Directive Principles of State Policy
CO3	Explain the constitutional amendment process, principles of the Basic Structure, and emergency provisions under the Indian Constitution
CO4	Summarize the structure and functioning of the Union and State Governments using the parliamentary and legislative systems.

Syllabus:

Module	Contents	Lecture Hours
I	**Constitution: Basic Structure & Making of Constitution** Meaning of the constitution law and constitutionalism, Historical perspective of the constitution of India, Government of India Act of 1935 and Indian Independence Act of 1947, Enforcement of the Constitution, Meaning and importance of Constitution, Making of Indian Constitution – Sources, Salient features of Indian Constitution, Preamble.	4
II	**Fundamental Rights & Fundamental Duties** Fundamental Rights – Features and characteristics, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles-Definition and Meaning, 42nd Constitutional Amendment Act, List and Importance of Fundamental Duties.	6
III	**Amendments of Constitution and Emergency Provisions** Meaning and need of Constitutional Amendments, Procedure of Amendment under Article 368, Types of Amendments, Important Constitutional Amendments (42nd, 44th, 73rd, 74th, 86th and 101stAmendments), Basic Structure Doctrine. Emergency Provisions – Meaning and Objectives, National Emergency (Article 352), State Emergency/President's Rule (Article 356), Financial Emergency (Article 360), Effects of Emergency on Fundamental Rights and Centre-State Relations, Safeguards introduced by 44th Constitutional Amendment.	3
IV	**Government of The Union and States** President of India – Election and Powers, Prime Minister of India - Election and Powers, Loksabha - Structure, Rajyasabha – Structure, Governor of State, Chief Minister and Council of Ministers in a state.	2
	Total Lecture Hours	15

Text Books

1. M. Laxmikanth, Indian Polity, 7th Edition, McGraw Hill Publications Delhi, 2023.
2. P. M. Bakshi, The Constitution of India, 19th Edition, Lexis Nexis, 2023.
3. Durga Das Basu, Introduction to the Constitution of India, 26th Edition, Lexis Nexis, 2022.
4. M. Laxmikanth, Governance in India, 3rd Edition, McGraw Hill Publications Delhi, 2021.
5. J. N. Pandey, The Constitutional Law of India, 59th Edition, Allahabad: Central Law Agency, 2022.

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References:
1. V. N. Shukla, Constitution of India, 14th Edition, EBC, 2022. 2. V. N. Tripathi, Constitution of India, 9th Edition, Premier Publishing Company, 2021. 3. M. V. Pylee, India's Constitution, 18th Edition, S. Chand Publications, New Delhi, 2020.
Online Learning Resources
1. https://legislative.gov.in/constitution-of-india/ 2. https://onlinecourses.nptel.ac.in/noc23_lw03/preview

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Course Information:

Class, Semester	S.Y.B. Tech, Semester - IV					**Category**	**HS**
Course Code, Course Title	**3EEHS208, Environmental Studies**					**Type**	**T2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	2	--	-	2	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	Explain environmental systems, population dynamics, natural resources, and sustainability concepts.
CO2	Explain the Sustainable Development Goals (SDGs) and their significance in engineering for sustainable development.
CO3	Apply pollution concepts to identify sources, impacts, and suitable control measures for air, water, soil, and noise pollution.
CO4	Apply principles of climate change mitigation and adaptation, renewable energy, waste management, and environmental governance to recommend sustainable engineering practices.

Syllabus:

Module	Contents	Lecture Hours
I	**Environmental Systems, Population, and Resource Use** Components of environment and earth systems, Population growth, urbanization, and industrial development, Natural resources: water, energy, land, minerals, Resource depletion, carrying capacity, **and en**vironmental stress, Human–environment interactions and sustainability challenges	5
II	**Sustainable Development Goals (SDGs) and Engineering Responsibility** Evolution of sustainable development concept, Overview of 17 Sustainable Development Goals and key targets, Interlinkages among SDGs (water–energy–food–climate nexus), SDGs relevant to engineering disciplines, Role of engineers in achieving SDGs	5
III	**Pollution Science and Environmental Quality** Air pollution: sources, types, impacts, and control overview, Water pollution: indicators, standards, reuse and recycling, Soil pollution: contamination sources and remediation concepts, Noise pollution: sources, measurement, impacts, and mitigation.	5
IV	**Climate Change – Science, Mitigation, and Adaptation** Greenhouse effect and climate change science, Evidence of climate change and observed impacts, Mitigation strategies: technology, energy transition, efficiency, Adaptation strategies: climate-resilient infrastructure and planning, Role of engineers in climate action.	5
V	**Renewable Energy and Sustainable Technologies** Overview of renewable energy technologies, Solar energy (PV and thermal systems), Wind energy systems, Hydropower, geothermal, ocean energy, Bioenergy and waste-to-energy, Comparative assessment of renewable technologies.	5
VI	**Waste Management, and Environmental Governance** Solid waste management and E-waste management, Life Cycle Assessment (LCA): concept and applications, Environmental policies and legislation (India and global overview), Environmental Impact Assessment (EIA), Ethics and professional responsibility of engineers	5
	Total Lecture Hours	**30**

Text Books:

1. Singh, J. S., Singh, S. P., Gupta, S. R., and Singh, R. Ecology, Environmental Science and Conservation. 2nd Edition. S. Chand Publishing, 2025.
2. Bharucha, E. Environmental Studies for Undergraduate Courses. 4th Edition. Universities Press (India) Pvt. Ltd. 2025.
3. Cunningham, W.P., & Cunningham, M.A., Environmental Science: A Global Concern, 15th Edition, McGraw-Hill Education, New Delhi, 2020.
4. Rathoure, V.C., Fundamentals of Environmental Studies, 2nd Edition, Tata McGraw-Hill Education, New Delhi, 2019

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5. Singh, J.S., & Singh, S.P., Environmental Science: An Integrated Approach, 5th Edition, Jones & Bartlett Learning, 2019
6. Kaushik, A., & Kaushik, C.P., Perspectives in Environmental Studies, 5th Edition, New Age International Publishers, New Delhi, 2018.Cunningham, W.P., & Cunningham, M.A., Environmental Science: A Global Concern, 15th Edition, McGraw-Hill Education, New Delhi, 2020.

References:

1. Trivedi, R.K., & Goel, P.K., An Introduction to Environmental Biology, 1st Edition, University Book House, Jaipur, 2018.
2. Odum, E.P., Fundamentals of Ecology, 5th Edition, Cengage Learning, 2017.
3. Dash, M.C., Fundamentals of Ecology, 4th Edition, McGraw-Hill Education, New Delhi, 2016.

Online Learning Resources

1. https://www.youtube.com/watch?v=MtpxOdtS9KU&list=PL3qvHcrYGy1u2egw2tipHWODV6elVC2Gg
2. https://niti.gov.in/divisions/division/sustainable-development-goal
3. https://sdgs.un.org/goals
4. https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_de04

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Ashta - 416301, Dist. : Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Electrical Engineering

Established:

Course Information:

Class, Semester	S. Y. B. Tech. Semester –III					**Category**	**HS**
Course Code, Course Title	**3EEHS209, Psychology**					**Type**	**T2**
Prerequisites	----						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	1	-	-	1		1	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Explain the fundamental concepts of decision making, emotional intelligence, emotional regulation, and procrastination in everyday personal, academic, and professional contexts.
CO2	Differentiate between effective and ineffective thinking patterns, emotional responses, decision-making approaches, and behavioural strategies using psychological principles.
CO3	Apply appropriate psychological principles and decision-making strategies to improve self-management, interpersonal effectiveness, and productivity in real-life situations.
CO4	Evaluate the influence of cognitive biases, emotions, attention, and behavioural habits on decision making and personal effectiveness, and select appropriate corrective strategies.

Syllabus:

Module	Contents	Lecture Hours
I	**Decision Making** • Decision Making in Everyday Life • Why Smart People Make Poor Decisions • How Our Brain Makes Decisions (System 1 & System 2) • Cognitive Biases in Real Life • Decision-Making Frameworks • Thinking Tools	5
II	**Understanding Emotional Intelligence** • Understanding emotions and importance • EI vs IQ and 5 Domains of EI • Emotional Intelligence and Personality	3
III	**Emotional Regulation & Interpersonal Skills** • Impulse control (self-regulation) • Handling criticism (self-management) • Empathy and altruism (social awareness) • Assertiveness (relationship management)	3
IV	**Procrastination** • Introduction and definition of procrastination • Why do we procrastinate • Time management myths • Techniques to beat procrastination	4
	Total Lecture Hours	15

Reference Books

1. "Thinking, Fast and Slow", Daniel Kahneman, Penguin Books, 2011
2. Emotional Intelligence: Why It Can Matter More Than IQ", Daniel Goleman, Bantam Books, 1995
3. "Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones", James Clear, Avery, 2018
4. "Deep Work: Rules for Focused Success in a Distracted World", Cal Newport, Grand Central Publishing, 2016
5. "The Power of Habit: Why We Do What We Do in Life and Business", Charles Duhigg, Random House, 2012
6. "Nudge: Improving Decisions About Health, Wealth, and Happiness", Richard H. Thaler & Cass R. Sunstein, Penguin Books, 2008
7. "The 7 Habits of Highly Effective People", Stephen R. Covey, Free Press, 1989

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NPTEL and Online Resources
Youtube Channel: 1) https://www.youtube.com/watch?v=O2y1QGCIzMw 2) https://www.youtube.com/watch?v=33d61cpRfog 3) https://www.youtube.com/watch?v=b6FpfGiENPo 4) https://www.youtube.com/watch?v=YLhGgef7SvA 5) https://www.youtube.com/watch?v=TOFjyi0tg5w

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Department of ElectricalEngineering

Course Information:

Class, Semester	S. Y. B. Tech. Semester – III					**Category**	**MA**
Course Code, Course Title	**3EEMA210, Aptitude and Reasoning -I**					**Type**	**T2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**		
	2	-	-	2	-		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	Apply quantitative aptitude concepts such as HCF & LCM, Vedic Mathematics, Ages, Percentage, Profit & Loss to solve numerical and real-time problem-solving tasks efficiently.
CO2	Analyze and solve logical reasoning problems based on Number Series, Alphabet Series, Coding-Decoding, Cubes & Dice by applying systematic analytical approaches.
CO3	Develop professional and career readiness skills through SWOT Analysis, understanding of Engineering Ecosystem, effective email writing, and essay writing techniques.
CO4	Demonstrate logical thinking, decision-making ability, and personality development skills to enhance employability and professional effectiveness.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	HCF & LCM Vedic Math	**5**
II	Number Series, Alphabet Series (Quant) Percentage	**5**
III	Profit & Loss Coding-Decoding	**5**
IV	Cubes & Dice SWOT Analysis	**5**
V	Introduction to Engineering Ecosystem Ages	**5**
VI	Email writing, Essay writing Logical Thinking Basics	**5**
	Total Lecture Hours	**30**

Text Books

1. R.S. Agarwal S Chand, Quantitative Aptitude 2019
2. R.S. Agarwal S Chand , Verbal & Non-verbal Reasoning 2010
3. P.C. Wren S Chand , Wren & Martin (Verbal, Grammar) 2017

Reference Books

1. Face Wiley APTIPEDIA (Quantitative, Logical, Verbal Aptitude) 2017
2. P.A. Anand Maestro Wiley (Quantitative Aptitude) 2015
3. Arun Sharma (Verbal Ability) Meenakshi Upadhyay McGraw Hill 2020

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Department of Electrical Engineering

Course Information:

Class, Semester	SY. B.Tech, Semester - III					**Category**	**BS**
Course Code, Course Title	**3EEBS211, Matrix Algebra, Calculus and probability**					**Type**	**T1**
Prerequisites							
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	-	3	3		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	**Apply** the concept of partial differentiation to compute partial derivatives, Jacobian and determine maxima and minima of function of two variables
CO2	**Apply** Techniques of integral calculus to compute definite and indefinite integrals using substitution, integration by parts, and partial fractions, and evaluate double and triple integrals
CO3	**Compute** probabilities using Binomial, Poisson and Normal distribution.
CO4	**Solve** first order differential equations and apply them to electrical circuit models such as RL, RC and RLC circuits.
CO5	**Solve** system of linear equation using matrices and apply the rouche- Capelli theorem to determine consistency of solution and compute eigen values and eigen vectors of matrices

Syllabus:

Module	Contents	Lecture Hours
I	Partial Differentiation and Its Applications: Function of two or more variables, Partial derivatives, Change of variables, Euler's theorem, Jacobin, Maxima and minima of functions of two variables.	**8**
II	Integral calculus: Definite and Indefinite integral, integration by substitution, Integration by parts, integration by using partial fraction, improper integrals, Double Integrals, Triple integral	**8**
III	Probability Distribution: Random variable, Binomial Distribution, Poisson Distribution, Normal Distribution.	**7**
IV	Ordinary Differential Equation (First order and First degree): Linear differential equation, Equation reducible to linear differential equation, Exact differential equation, Equation reducible to exact differential equation, Applications: RC, RL, RCL circuit analysis	**8**
V	System of linear Equation: Rank of matrix using Echelon form, Rouché–Capelli Theorem, Homogeneous system of linear equation, Non-homogeneous system of linear equation, Applications to electrical circuits.	**7**
VI	Eigen Value and Eigen vectors: Definition of vectors in R^n, Linear Dependence and Independence of Vectors, Characteristic Equation of Matrix, Cayley - Hamilton theorem (statement only), Eigen Values and Properties, Eigen Vectors and Properties.	**7**
	Total Lecture Hours	**45**

Text Books

1. Dr. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2018
2. H. K. Das, Advanced Engineering Mathematics, 22th Edition, S. Chand, 2018.
3. B. V. Ramana, Higher Engineering Mathematics, 6th Edition, Tata McGraw Hill Publ., 2010

References:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 8th Edition, Laxmi Publications, 2011
2. S. C. Gupta, V. K. Kapoor, Fundamental of Mathematical Statistics, 10th Edition, Sultan Chand and Sons Publisher, 2000.
3. Seymour Lipschutz, Marc Lars Lipson, Linear Algebra, 4th Edition, McGraw Hill, 2009.

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester - IV					**Category**	**PC**
Course Code, Course Title	**3EEPC212, Electromagnetic Fields**					**Type**	**T1**
Prerequisites	**3EEBS102, 3EEES105, 3EEBS201**						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**		**Credits**	
	2	1	-	3		3	
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Solve** electromagnetic field problems using appropriate coordinate systems using vector algebra and coordinate transformations with correct formulation.
CO2	**Determine** electric field and potential for point, line, and surface charge distributions using Coulomb's and Gauss's laws with accurate evaluation.
CO3	**Examine** electric field behavior in conductors and dielectrics using boundary conditions and capacitance concepts with appropriate interpretation.
CO4	**Determine** magnetic field intensity for standard current-carrying configurations using Biot–Savart and Ampere's laws with systematic approach.
CO5	**Interpret** time-varying electromagnetic fields using Maxwell's equations in integral and differential forms with logical representation.
CO6	**Determine** electromagnetic wave propagation and power flow in different media using wave equations and Poynting vector with clear understanding.

Syllabus:

Module	Contents	Lecture Hours
I	**Vector Analysis and Coordinate Systems** Review of Vector Algebra, Coordinate Systems and Transformation - Cartesian, Cylindrical and Spherical Coordinates, Vector Calculus - Differential Length, Area and Volume Elements, Line, Surface, and Volume Integrals, Gradient, Divergence and Curl, Divergence Theorem and Stokes Theorem.	5
II	**Electrostatics** Coulomb's law and Electric Field Intensity, Electric Fields due to point and continuous charge distribution, Electric Field due to finite charge, circular disc and infinite sheet of charge, Electric Flux Density, Gauss's law and its applications, Electric potential and potential gradient, Electric Dipole, Equipotential Surfaces, Energy Density in Electrostatic Field.	5
III	**Conductors and Dielectrics** Current and Current density, Continuity Equation, Ohm's Law in Point Form, Properties of Conductors and Dielectrics, Polarization in dielectrics, Capacitance - Capacitance of parallel plate capacitor with single and two dielectric, co-axial cable and two wire transmission line, Boundary Conditions for Electric Fields - Poisson's and Laplace's equations.	5
IV	**Magnetostatics** Biot–Savart law, Magnetic Flux Density, and Magnetic Field Intensity of infinite and finite long straight conductor, circular loop, solenoid and toroid, Ampere's circuital law, and its applications, Lorentz Force, Magnetic Torque and Moment, Magnetic Boundary Conditions, Inductance of Solenoid and Toroid – Energy Stored in magnetic fields- Magnetic Boundary Conditions.	5
V	**Maxwell's Equations** Faraday's Law, Transformer and Motional EMFs, Conduction and Displacement Current, Maxwell's equations in point and integral form, Time-Harmonic Maxwell's Equations.	5
VI	**Electromagnetic Waves** Wave equation for electromagnetic fields, Plane wave propagation in free space, dielectrics and Good Conductors, Skin Effect Poynting Vector and Power Flow, Reflection and transmission of electromagnetic waves.	5
	Total Lecture Hours	**30**

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Tutorial Topics	
1.	Vector transformation between Cartesian, cylindrical, and spherical coordinate systems
2.	Evaluation of gradient, divergence, curl and verification of vector identities
3.	Electric field due to point, line, and surface charge distributions
4.	Applications of Gauss's law for symmetric charge distribution
5.	Electric potential, potential gradient, and dipole field calculations
6.	Capacitance calculation of parallel plate capacitors with single and multiple dielectrics
7.	Capacitance of coaxial cable and two-wire transmission line
8.	Boundary conditions and solutions of Poisson's and Laplace's equations
9.	Magnetic field using Biot–Savart law for straight conductor and circular loop
10.	Applications of Ampere's circuital law
11.	Inductance calculation and energy stored in magnetic fields
12.	Problems on Different methods of emf generation
13.	Maxwell's equations in integral and differential forms
14.	Plane wave propagation in free space and dielectric media
15.	Poynting vector, power flow, reflection and transmission of EM waves
	Total Tutorial Hours: 30

Text Books

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, McGraw-Hill Education, 9th Edition.
2. Elements of Electromagnetics – Matthew N. O. Sadiku, Oxford University Press, 7th Edition.
3. Field and Wave Electromagnetics – David K. Cheng, Pearson Education, 2nd Edition.
4. Introduction to Electrodynamics – David J. Griffiths, Cambridge University Press, 5th Edition.

References:

1. Electromagnetic Waves and Radiating Systems – Edward C. Jordan and Keith G. Balmain, Prentice Hall of India, 2nd Edition.
2. Electromagnetic Field Theory Fundamentals – Bhag Singh Guru and Hüseyin R. Hiziroglu, Cambridge University Press, 2nd Edition.
3. Electromagnetics – Joseph A. Edminister and Mahmood Nahvi, Schaum's Outline Series, McGraw-Hill Education.
4. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International, 5th Edition, 2010.

Online Learning Resources

1. NPTEL – Electromagnetic Fields related Courses (IIT) - https://nptel.ac.in
2. MIT Open Course Ware – Electromagnetics - https://ocw.mit.edu
3. Electrical4U – Electromagnetic Field Theory Articles - https://www.electrical4u.com

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(An Empowered Autonomous Institute)
Department of Electrical Engineering

Established: 1999

Course Information:							
Class, Semester	S.Y. B.Tech, Semester - IV					**Category**	**PC**
Course Code, Course Title	**3EEPC213, DC Machines and Transformers**					**Type**	**LIT1**
Prerequisites	3EEES105						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	2	3	4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	50

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	**Explain** the construction, working principles and performance characteristics of DC Machines and BLDC motors.
CO2	**Interpret** the characteristics and control methods of various DC Machines in view of industrial load requirements.
CO3	**Describe** the construction, operation and performance parameters of single-phase transformers and distribution transformers.
CO4	**Examine** different connection methods, vector groups and operational characteristics of three-phase transformers.
CO5	**Conduct** tests on DC machines and transformers as per standard testing procedures for industrial applications.

Syllabus:

Module	Contents	Lecture Hours
I	**DC Generators** Construction and working principle, types, EMF equation, armature windings, armature reaction, commutation, Demagnetizing and cross magnetizing ampere turns, characteristics of DC generators, losses and efficiency.	7
II	**DC Motors** Working principle, back-emf, torque equation, types of motors, characteristics of shunt, series and compound motors, speed control methods, types of starters, losses and efficiency, testing of DC motors, electric braking of DC motors, Applications	8
III	**Single Phase Transformer** Construction of core & windings, Principle of operation, transformation ratio, classifications, EMF equation, Phasor diagrams of transformer on No-load and Load, Equivalent circuit of transformer, Voltage regulation, Polarity test, Voltage ratio test, load test, OC & SC tests, Sumner's test, losses and efficiency, Condition for maximum efficiency, All day efficiency, parallel operation.	8
IV	**Three Phase Transformers** Construction and working of three-phase transformer, Three-phase Transformer Connections, special connections, Parallel Operation of Three-phase Transformers, Tap-changers on Transformers and types, Cooling of Transformers, Power Transformer and its Auxiliaries	8
V	**Distribution and Industrial Transformers** Distribution Transformers: construction and features of distribution transformers, Auto-transformer, Saving of Copper in an Auto-transformer, advantages disadvantages and applications Industrial Applications: Transformers for power plants and substations, Transformers for renewable energy systems and EV charging infrastructure.	6
VI	**Transformer Testing and Advanced Machines** Advanced Transformer Testing (Industry Practice): Insulation resistance test, Oil testing – Dielectric strength (BDV test), Testing Standards for Transformer. Construction and Principle of operation of BLDC Machine, Types of drone motors, Energy efficient Motors.	8
	Total Lecture Hours	45

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List of Experiments with CO Mapping		
S.No	**Title / Topic of the Experiment**	**CO Mapped**
1	Determination of OCC & Load characteristics of DC Generator	1
2	Speed control of DC Motor by armature and flux control method	2
3	Load test on DC Series Motor	2
4	Load test on DC Shunt Motor	2
5	Swinburne's Test on DC Shunt motor	2
6	OC SC test on single phase transformer	3
7	Load test on single phase transformer	3
8	Load Test on three phase Transformer	4
9	Transformer Turns ratio Test	3
10	To Study different connections of the Three Phase Transformer	4
11	Parallel operation of Transformers	3
12	Insulation Resistance Test of Distribution Transformer using Megger	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**

Text Books

1. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010
3. B L Theraja ,"A Textbook of Electrical Technology" - Volume II ,S Chand
4. V.K.Mehta and Rohit Mehta ,"Principle of Electrical Machines",S Chand,2009

References:

1. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. 2. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
4. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

Online Learning Resources

1. NPTEL (SWAYAM) – Electrical Engineering Courses
   https://nptel.ac.in Provides free IIT lecture videos, assignments, and certification courses on circuit theory, electrical networks, and related subjects.
2. **Electrical4U – Electrical Engineering Tutorials**
   https://www.electrical4u.com
   Provides free explanations and tutorials on electrical engineering topics such as circuit analysis, machines, and power systems.
3. Khan Academy – Electrical Engineering
   https://www.khanacademy.org/science/electrical-engineering

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	To Study the Speed Control of Separately Excited DC Motor	https://em-coep.vlabs.ac.in/exp/speed-control-dc-motor/

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Department of Electrical Engineering

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Course Information:

Class, Semester	S.Y. B.Tech, Semester – IV						**Category**	**PC**	
Course Code, Course Title	**3EEPC214, Signals and Systems**						**Type**	**LIT1**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**	**Self-Study**		**Credits**		
	3	-		2	3		4		
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**		**CIA**	**ESE**	
		40	20	40			50	50	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the fundamental concepts of signals and systems, system modelling, and the sampling theorem.
CO2	Analyze Linear Time Invariant (LTI) systems using convolution techniques and correlation between signals.
CO3	Apply the Laplace Transform to analyze continuous-time systems
CO4	Analyze discrete-time systems using the z-transform and system realization methods.
CO5	Analyze signals in the frequency domain using Fourier Series & Transform and FFT algorithms.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Signals & Systems** Elementary Continuous-Time and Discrete-Time Signals, Operation on Continuous Signals and Discrete Signals, Classification of Signals, Classification of Systems, System Modelling, Sampling Theorem, Applications of signals and systems	8
II	**Discrete-Time and Continuous- time LTI Systems** Convolution sum: Linear Convolution (Graphical Method, Matrix Method) and Circular Convolution (Concentric Circle Method, Matrix Multiplication Method), Convolution Integral, Correlation of signals: Auto Correlation and Cross Correlation.	8
III	**System Analysis using Laplace Transform** Introduction to Laplace, Transfer Function, Poles & Zeros, s-Plane, Unilateral and Bilateral Laplace Transform, Inverse Laplace Transform, Analysis of Electrical Network using Laplace.	7
IV	**System Analysis using z-Transform** Introduction to z-Transform, z-Transform: Right hand, Left hand and Two sided sequence, Inverse z-Transform: Long division, Partial Fraction Method, System Realization: Direct Form-I and Direct Form-II.	7
V	**Fourier Analysis of Continuous-Time Signals** Introduction to Fourier Series, Trigonometric Fourier Series, Exponential Fourier Series, Introduction to Fourier Transform, Fourier Spectrum, Fourier Transform.	7
VI	**Fourier Analysis of Discrete-Time Signals** Introduction, Discrete-Time Fourier Transform (DFT), Inverse Discrete-Time Fourier Transform (IDFT), Fast Fourier Transform (FFT): Decimation-in-time Algorithm (DIT), Decimation-in-frequency Algorithm (DIF)	8
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

Sr.No	Title / Topic of the Experiment	CO Mapped
1	Generation of elementary continuous and discrete time signals	CO1
2	Performs various operations on signals and sequences such as addition, multiplication, scaling, shifting, folding.	CO1
3	Compute linear and circular convolution.	CO2
4	Determine auto-correlation and cross-correlation between two signals.	CO2
5	Determine system response of a continuous-time LTI system using Laplace transform and inverse Laplace transform.	CO3
6	Plot pole-zero map of a system.	CO3

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7	Determine discrete system response using z-transform			CO4
8	Determine discrete system response using inverse z-transform			CO4
9	Compute the Fourier Transform of a signal using FFT			CO5
10	Compute the inverse Fourier Transform of a signal using FFT			CO5
11	Plot the magnitude spectrum and phase spectrum of a signal using the Fourier Transform.			CO5
12	Verification of sampling and reconstruction of a signal for different sampling frequencies			CO1
Total Practical Sessions		**15**	**Total Practical Hours**	**30**

Text Books

1. Haykin, S. and Van Veen, B., 2007. Signals and systems. John Wiley & Sons.
2. Lathi B. P., "Linear Systems and Signals", Oxford University Press, 2nd edition, 2009
3. Michael J. Robert, "Introduction to Signals and Systems", TMH, Second ed., 2003
4. Tarun Kumar Rawat "Signals and Systems", Oxford University Press, first edition 2010

References:

1. Alan V Oppenhein, Alan S Wiilsky, "Signals and systems" PHI, Second ed. 2009
2. Shaila Dinkar Apte "Signals and Systems: Principles and Applications", Cambridge University Press.
3. R.Babu, "Signals and systems", Scitech Publications Pvt. Ltd, 4th edition, 2011

Online Learning Resources

1. NPTEL (Swayam - IIT Courses): Offers courses "Principles of Signals and Systems"
2. Coursera (EPFL & Univ. of Colorado Boulder): Offers specialized courses like "Digital Signal Processing"

Experiments that may be performed through virtual labs:

S.No	Experiment Name	Experiments Links
1.	Verification of sampling and reconstruction of a signal for different sampling frequencies	https://dsp-iitkgp.vlabs.ac.in/exp/sampling-theorem/simulation.html

Annasaheb Dange College of Engg. & Tech. ASHTA 416 301

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist. : Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester - IV	**Category**	**PE**
Course Code, Course Title	**3EEPE215, PE- I, Architectures of Electric and Hybrid Vehicles**	**Type**	**T1**
Prerequisites	-		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**	**Credits**
	3	-	-	3	3

Examination Scheme (Marks)	**Theory**				**Practical**		
	MSE	**TE**	**ESE**		**CIA**	**ESE**	
	40	20	40		-	-	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Identify the interconnections of vehicle components in various classes of vehicles for optimizing performance
CO2	Estimate different forces challenging the dynamics and performance of vehicles to design powertrain
CO3	Interpret the architectures of electric and hybrid vehicles for understanding the power flow sequence in powertrain components.
CO4	Compare the single speed and multi-speed mechanical transmission systems for different operating modes
CO5	Analyze the energy management strategies and charger topologies with power quality standards.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Introduction to Electric and Hybrid Vehicles** Classification of electric vehicles: Battery Electric Vehicles (BEV), Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV), Fuel Cell Electric Vehicles (FCEV), Basic components of EVs: Energy storage system, Electric propulsion system, Power electronics interface, Auxiliary subsystems, Comparison of EVs with conventional vehicles.	**7**
II	**Vehicle Dynamics and Performance Requirements** Environmental impact and emission reduction, Evolution of electric mobility and electrified transportation, Fundamentals of vehicle mechanics, Road load forces: rolling resistance, aerodynamic drag, gradient resistance, Acceleration and traction forces, Vehicle motion equations, Power and energy requirements for EV propulsion, Drive cycles and energy consumption, Performance parameters: Acceleration, Maximum speed, Gradeability, Range estimation.	**9**
III	**Architectures of Electric Vehicles** Basic EV powertrain architecture, Electric drivetrain configurations, Centralized and distributed drive systems, Single motor and multi-motor architectures, Battery electric vehicle architecture, Power flow in EV powertrain, Battery integration in vehicle chassis, System integration: mechanical, electrical and control architectures.	**7**
IV	**Hybrid Electric Vehicle Architectures** Concept of hybridization and hybridization factor, Series hybrid architecture: Structure and working, Power flow analysis, Parallel hybrid architecture - Configuration and operation, Series-parallel hybrid architecture: Power split device, Operating modes, Advanced hybrid architectures: Plug-in hybrid electric vehicles, Range extended electric vehicles, Complex hybrid configurations	**8**
V	**EV and HEV Powertrain Components** Overview of EV and HEV Powertrain, Requirements of Traction Motors, Types of Electric Motors Used in EVs and HEVs, Transmission and Drivetrain Components: Role of transmission in EV powertrain, Gear reduction systems, Single-speed transmission systems, Multi-speed transmissions, Differential mechanisms, Electric axle (E-axle) systems, Direct drive and in-wheel motor configurations	**7**
VI	**Energy Management, Charging Systems and Future Trends** Energy management strategies in EVs and HEVs, Rule-based control strategies, Optimization-based control, Vehicle supervisory control, EV charging technologies: AC charging, DC fast charging, Wireless charging, Grid integration and Vehicle-to-Grid (V2G), Future trends in electric mobility and smart transportation.	**7**
	Total Lecture Hours	**45**

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Text Books
1. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, 3rd Edition, CRC Press, 2021. 2. Ali Emadi, Advanced Electric Drive Vehicles, 1st, CRC Press, 2015. 3. Chris Mi & M. Abul Masrur, Hybrid Electric Vehicles: Principles and Applications,1st, Wiley. 2018 4. Nil Patel, A.K. Bhoi, S. Padmanaban, Electric Vehicles: Modern Technologies and Trends, Springer, 2020.
References:
1. James Larminie, John Lowry, Electric Vehicle Technology Explained, First, Wiley, 2016. 2. Mehrdad Ehsani, Yimin Gao, Modern Electric, Hybrid Electric and fuel cell vehicles, First, CRC Press, 2009. 3. C.C Chan, K.T Chau, Modern Electric Vehicle Technology, Oxford University Press Inc., NY, First, 2001 4. Mi Chris; Zhang Yi, Automotive power transmission systems, First, Willey, 2018
Online Learning Resources
1. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_ec04 2. https://diyguru.org/ev-vehicle-architecture-manual/?utm_source=chatgpt.com 3. https://courses.diyguru.org/unit/ev-architecture-and-design/?utm_source=chatgpt.com 4. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed83

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Annasaheb Dange College of Engineering and Technology
Ashta - 416301, Dist.: Sangli, Maharashtra
(An Empowered Autonomous Institute)
Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B. Tech, Semester - IV						**Category**	**PE**	
Course Code, Course Title	**3EEPE216, PE- I, Utilization of Electrical Energy**						**Type**	**T1**	
Prerequisites	3EEES105								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self-Study**	**Credits**	
	3		-		-		3	3	
Examination Scheme (Marks)	**Theory**	**MSE**		**TE**	**ESE**	**Practical**		**CIA**	**ESE**
		40		20	40			-	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	**Select** appropriate techniques for designing indoor & outdoor lighting schemes.
CO2	**Describe** the principles and methods of electric heating and electric welding used in industrial applications.
CO3	**Interpret** the principles of refrigeration and air-conditioning systems to enhance the performance of fans and compressors.
CO4	**Discuss** electric traction supply systems, lighting schemes and train performance parameters at various modes of operation.
CO5	**Illustrate** the utilization of electrical energy in electric vehicles, electrolytic and electrometallurgical processes.

Syllabus:

Module	Contents	Lecture Hours
I	**Illumination Engineering** Nature of light, Visibility spectrum curve, photometry, Terms used in illumination, Laws of illumination, Compact fluorescent lamps (CFL), Light Emitting Diode based lamps, Discharge lamps: mercury vapor lamps, sodium vapor lamps and neon lamps, Principles of light control, Types and design of lighting schemes factory lighting, sports lighting, street lighting, Illumination system design for residential, commercial and industrial categories.	8
II	**Electric Heating** Advantages of Electric Heating, Modes of heat transfer, Classification of electrical heating methods, Resistance heating, Arc furnaces, Induction heating, Dielectric Heating, High Frequency Eddy current heating.	7
III	**Electric Welding** Advantages of electric welding, Welding method, Principles of resistance welding, types, Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications.	7
IV	**Refrigeration and Air Conditioning** Refrigeration system –Types of refrigerants Domestic refrigerator, Water coolers, Air conditioning systems, Air conditioning cycle, Classification of air conditioning, systems, Central system, Unitary systems, Fan, compressor performance evaluation, compressor capacity assessment, Energy saving on fans and compressor, Chillers -Air, water Cooled Chillers	8
V	**Electric Traction** Review of existing electric traction systems in India, Advantages of electrical traction, Different systems of electric tractions, comparison of AC and DC systems, Mechanics of train movement time curves for different services tractive effort, specific power and specific energy consumption, Schemes and traction Motor speed control, effect of varying acceleration and braking, retardation, adhesive weight, braking retardation and coefficient of adhesion. Requirement of train lighting, systems of train lighting, Lighting by using 25kV AC supply.	9
VI	**Utilization of Electrical Energy in Electric Vehicles** Charging technologies of electric vehicles/hybrid electric vehicles. Charging infrastructure. Utilization of Electrical Energy in electro-metallurgy and electro-plating.	6
	Total Lecture Hours	45

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Textbooks

1. J. B. Gupta, Utilization of Electric power and Electric Traction, 10th S. K. Kataria and Sons, 2022
2. H. Partab, Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Sons, New Delhi, 2015
3. M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A Course in Electrical Power, Dhanpat Rai & Sons, New Delhi, 9th Edition (1987).
4. E. Openshaw Taylor Utilization of Electric Energy, Orient Blackswan / Universities Press (India), SI Units Edition – 2009.

References:

1. C. L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International (P) Ltd., New Delhi, 4th Multicolor Edition (2018).
2. Hancock N N, Electric Power Utilization, Wheeler Publication, 2nd Edition (1964).
3. N. V. Suryanarayana, Utilization of Electrical Power including Electric Drives and Electric Traction, New Age International (P) Limited, New Delhi, 2017.

Online Learning Resources

1. https://nptel.ac.in/courses/108/105/108105060/
2. https://vemu.org/uploads/lecture_notes/16_02_2021_1067241445.pdf
3. https://vardhaman.org/wp-content/uploads/2021/03/Utilization-of-Electrical-Energy.pdf
4. https://l1nq.com/cpil4
5. https://l1nq.com/j63Q5

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester – IV					**Category**	**PE**
Course Code, Course Title	**3EEPE217, PE- I, Mathematical Modeling of Dynamic Systems**					**Type**	**T1**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	-	3	3		
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	Explain the concepts of mathematical modelling, types of models and simulation technique.
CO2	Apply mathematical methods such as transfer function, state-space representation, linearization, Lagrangian and Hamiltonian approaches for modelling dynamic systems.
CO3	Develop mathematical models of mechanical, thermal, hydraulic and pneumatic systems using fundamental principles.
CO4	Analyze electrical circuits and electrical machines under various operating conditions using mathematical models
CO5	Apply transfer function-based and bond graph modelling techniques to represent and analyze complex engineering systems.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Modelling** Concept of modelling and types of models, need and significance of modelling in engineering systems, introduction to simulation and simulation tools.	7
II	**Mathematical Methods for Modelling** State space approach, transfer function approach, modelling techniques such as linearization, Lagrangian method and Hamiltonian method, modelling using first principles.	8
III	**Mathematical Modelling of Mechanical Systems** Basics of heat transfer, mathematical modelling of thermal systems, pneumatic systems and hydraulic systems, modelling of mechanical components like gear trains, chain drives and levers.	8
IV	**Mathematical Modelling of Electrical Systems** Fundamentals of electrical system modelling, mathematical modelling of RLC circuits, modelling of electrical machines such as DC machines, AC machines and permanent magnet motors, system analysis for various input conditions	8
V	**Transfer Function Based Mathematical Model of Various Systems** Mathematical modelling of quadruple tank system, quadrotor system, magnetic levitation system, simple pendulum and inverted pendulum, introduction to other practical systems as per requirement.	7
VI	**Bond Graphs Modelling** Introduction to bond graph theory, generation of system equations, procedure for drawing bond graph models, bond graph modelling of mechanical and electrical systems	7
	Total Lecture Hours	**45**

Text Books

1. K. Ogata, System Dynamics, Pearson Education, 4th Edition, 2004.
2. M. Gopal, Modern Control Systems Theory, Wiley Eastern Ltd., 2nd Edition, 1993.
3. E. O. Doebelin, System Modeling and Response, John Wiley & Sons, 1980.
4. Kamalanand K., Jawahar P. Mannar, Mathematical Modelling of Systems And Analysis, PHI Learning, 2019

References

1. Desai, U. B. and Lalwani, D., *Identification Techniques*, Tata McGraw-Hill, 1977.
2. Kulakowski B. T., Gardner J. F., Shearer J. L., *Dynamic Modeling and Control of Engineering Systems*, Cambridge University Press, 2012.
3. Goldstein, H., *Classical Mechanics*, Addison-Wesley.

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Online Learning Resources
1. NPTEL Course on "Modelling and Simulation of Dynamic Systems" https://onlinecourses.nptel.ac.in/noc21_me25/preview

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester - IV					**Category**	**PE**
Course Code, Course Title	**3EEPE218, PE- I, Energy Economics**					**Type**	**T1**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	3	-	-	3	3		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Recognize energy resources, energy economics and energy demand–supply pattern in global scenario.
CO2	Describe the availability, depletion and cost aspects of conventional and renewable energy resources.
CO3	Determine the cost components and economic performance of different power generation systems
CO4	Interpret electricity tariff structures and energy market policies.
CO5	Examine the economic feasibility of energy projects using project evaluation techniques and energy conservation measures.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Energy Economics** Concept of energy economics, relationship between energy and economic development, energy demand and supply, energy resources classification, global and Indian energy scenario, energy consumption patterns.	8
II	**Energy Resources and Cost Aspects** Conventional energy sources (coal, oil, natural gas, hydro), renewable energy sources (solar, wind, biomass), resource availability and depletion, cost comparison of different energy resources, levelized cost of energy (LCOE).	8
III	**Economics of Power Generation** Cost components of power plants, capital cost, operation and maintenance cost, fuel cost, depreciation, fixed and variable costs, economic comparison of thermal, hydro, nuclear, and renewable power plants.	7
IV	**Electricity Pricing and Tariff Structures** Principles of electricity pricing, tariff structures (flat rate, block rate, two-part tariff, three-part tariff, power factor tariff, time-of-day tariff), smart pricing mechanisms.	8
V	**Energy Markets and Policies** Power sector reforms, deregulation and restructuring of electricity markets, energy trading, role of regulatory bodies in India, overview of electricity act and energy policies.	7
VI	**Economic Evaluation of Energy Projects** Project evaluation techniques – Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, Cost–Benefit Analysis, economic feasibility of renewable energy projects, energy conservation economics.	7
	Total Lecture Hours	**45**

Text Books

1. Subhes C. Bhattacharyya, Energy Economics: Concepts, Issues, Markets and Governance, 2nd Edition, Springer, 2019.
2. Barney L. Capehart, Wayne C. Turner, William J. Kennedy, Guide to Energy Management, 8th Edition, CRC Press / Taylor & Francis Group, 2016.
3. S. P. Sukhatme, J. K. Nayak, Energy Systems Analysis and Management, 4th Edition, McGraw Hill Education (India) Pvt. Ltd., 2017.
4. John Twidell, Tony Weir, Renewable Energy Resources, 3rd Edition, Routledge / Taylor & Francis Group, 2015.

References

1. Paul Stevens, Energy Economics, 1st Edition, Edward Elgar Publishing Ltd., 2000.

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2. Surinder Kumar, Energy Economics and Policy, 1st Edition, Oxford University Press, 2012.
3. R. P. Saini, Renewable Energy Sources and Applications, 1st Edition, Wiley India Pvt. Ltd., 2011.
4. Godfrey Boyle, Renewable Energy: Power for a Sustainable Future, 3rd Edition, Oxford University Press, 2012.
5. Subhes C. Bhattacharyya, Energy Economics: Principles, Applications and Case Studies, 1st Edition, Springer, 2011.

Online Learning Resources

1. NPTEL Courses on Energy Economics and Energy Management
2. International Energy Agency (IEA) reports and publications
3. Ministry of Power, Government of India – Energy statistics and policy documents
4. Bureau of Energy Efficiency (BEE) learning resources

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Department of ElectricalEngineering

Established: 1999

Course Information:

Class, Semester	S.Y. B. Tech, Semester - IV					**Category**	**PE**
Course Code, Course Title	**3EEPE219, PE- I, Introduction to Embedded Systems**					**Type**	**T1**
Prerequisites	3EEPC115, 3EEPC203						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	3	-	-	3		3	
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		-	-

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	**Interpret** basic concepts and classify embedded systems based on their characteristics and applications.
CO2	**Describe** the architecture and features of microcontrollers, interfacing concepts and the role of sensors and actuators in embedded systems.
CO3	**Explain** memory organization, memory types, and basic interfacing concepts used in embedded systems.
CO4	**Use** Embedded C programming and design tools to develop embedded applications.
CO5	**Apply** embedded system architectures and communication protocols for industrial automation and IoT applications.

Syllabus:

Module	Contents	Lecture Hours
I	**Overview of Embedded Systems** Block diagram of embedded system with hardware components. Harvard and Von-Neumann architecture. RISC and CISC processors. Characteristics of embedded system: Processor, power, memory, operating system, reliability, performance, power consumption, NRE cost, unit cost, size, flexibility, time-to-prototype, time-to-market, maintainability, correctness and safety. Classification of Embedded System: Small scale, medium scale, sophisticated, stand-alone, reactive/real time (soft and hard real time).	9
II	**Embedded System Hardware** Microprocessor vs microcontroller: architecture and comparison, general architecture of microcontroller including CPU, ALU, registers and buses, functional blocks of microcontroller, overview of 8051, AVR and ARM microcontrollers (architecture and features – conceptual), input/output ports and interfacing concepts, sensors and actuators: classification, working principles and applications	7
III	**Memory Organization and Interfacing** Types of memory: RAM, ROM, EEPROM and Flash memory, memory organization and mapping in embedded systems, basic addressing concepts, interfacing fundamentals: input and output interfacing, digital and analog signals, basic interfacing diagrams such as LED, switch and sensor	7
IV	**Embedded Software and Design Flow** Embedded system design flow and development cycle, role of firmware in embedded systems, basics of Embedded C (data types and operators – overview), algorithm development for simple embedded tasks, flowchart design for applications such as LED blinking and motor control, introduction to development tools: IDE, compiler, simulator and debugger (conceptual)	7
V	**Communication Protocols in Embedded Systems** Need and importance of communication in embedded systems, serial and parallel communication techniques, UART protocol: block diagram and working, I2C protocol: concept and applications, SPI protocol: concept and applications, comparison of communication protocols, application-based communication examples such as sensor interfacing and device communication	7
VI	**Embedded System Applications and Case Studies** Embedded systems in electrical engineering applications, industrial automation systems and relay control, smart meters and energy monitoring systems, introduction to Internet of Things (IoT): basic concepts and architecture, case studies of embedded systems including block diagram, working principle and applications	8
	Total Lecture Hours	45

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Text Books

1. Raj Kamal, Embedded Systems Architecture, Programming and Design, Tata McGraw Hill, 2008
2. David E. Simon, An Embedded Software Primer, Pearson Education, 1999
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2007
4. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Elsevier, 2006

References

1. ack G. Ganssle, Embedded Systems Design, Newnes, 2008
2. Arnold S. Berger, Embedded Systems Design: An Introduction to Processes, Tools and Techniques, CMP Books, 2002
3. Peter Marwedel, Embedded System Design, Springer, 2011 Lyla B. Das, Embedded Systems: An Integrated Approach, Pearson Education, 2013

Online Learning Resources

1. Coursera, Introduction to Embedded Systems Software and Development Environments, Available at: https://www.coursera.org
2. edX, Embedded Systems and IoT Courses, Available at: https://www.edx.org
3. MIT Open Course Ware, Embedded Systems and Computer Engineering Resources, Available at: https://ocw.mit.edu

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester - IV						**Category**	**MM**	
Course Code, Course Title	**3EESE220, Fundamentals of Electric Vehicles**						**Type**	**LIT2**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**	**Tutorial**		**Practical**		**Self-Study**		**Credits**	
	3	-		2		3		4	
Examination Scheme (Marks)	**Theory**	**MSE**	**TE**	**ESE**	**Practical**		**CIA**	**ESE**	
		40	20	40			50	-	

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Identify the interconnections of vehicle components in various classes of vehicles for optimizing performance
CO2	Estimate different forces challenging the dynamics and performance of vehicles to design powertrain
CO3	Interpret the architectures of electric and hybrid vehicles for understanding the power flow sequence in powertrain components.
CO4	Compare the single speed and multi-speed mechanical transmission systems for different operating modes
CO5	Analyze EV powertrain components and electric propulsion motors for adoptability to electric and hybrid electric vehicles.

Syllabus:

Module	Contents	Lecture Hours
I	**Introduction to Electric and Hybrid Vehicles** Classification of electric vehicles: Battery Electric Vehicles (BEV), Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV), Fuel Cell Electric Vehicles (FCEV), Basic components of EVs: Energy storage system, Electric propulsion system, Power electronics interface, Auxiliary subsystems, Comparison of EVs with conventional vehicles.	7
II	**Vehicle Dynamics and Performance Requirements** Environmental impact and emission reduction, Fundamentals of vehicle mechanics, Road load forces: rolling resistance, aerodynamic drag, gradient resistance, Acceleration and traction forces, Vehicle motion equations, Power and energy requirements for EV propulsion, Performance parameters: Acceleration, Maximum speed, Gradeability, Range estimation.	9
III	**Electric Vehicles** Basic EV powertrain architecture, Electric drivetrain configurations, Single motor and multi-motor architectures, Battery electric vehicle architecture, Power flow in EV powertrain, Battery integration in vehicle chassis, System integration: mechanical, electrical and control architectures.	7
IV	**Hybrid Electric Vehicle Architectures** Concept of hybridization and hybridization factor, Series hybrid architecture: Structure and working, Parallel hybrid architecture - Configuration and operation, Series-parallel hybrid architecture: Power split device, Operating modes, Advanced hybrid architectures: Plug-in hybrid electric vehicles, Range extended electric vehicles	8
V	**Vehicle Powertrain Components** Overview of EV and HEV Powertrain, Requirements of Traction Motors, Types of electric motors used in EVs and HEVs, Transmission and Drivetrain Components: Role of transmission in EV powertrain, Gear reduction systems, Single-speed transmission systems, Multi-speed transmissions, Differential mechanisms, Electric axle (E-axle) systems, Direct drive and in-wheel motor configurations.	7
VI	**Electric vehicle propulsion Motors** Constructional features, working and Speed control characteristics: DC motors, Induction motors, permanent magnet synchronous motor, Brushless DC motor, Switched reluctance motor, comparison of motors for EV performance	7
	Total Lecture Hours	**45**

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List of Experiments with CO Mapping		
S. No	**Title / Topic of the Experiment**	**CO Mapped**
1	Drawing of electrical wiring diagram of two-wheeler EV and identification of components with specification	1
2	Power and speed measurement of two-wheeler electric vehicle power train	1
3	Battery range estimation for two-wheeler electric vehicle with speed-load variation	2
4	Electrical wiring diagram of four-wheeler EV and identification of components with specification	2
5	Power and speed measurement of four-wheeler electric vehicle power train	3
6	Battery range estimation for four-wheeler electric vehicle with speed-load variation	3
7	Electrical wiring diagram of three-wheeler EV and identification of components with specification	4
8	Battery range estimation for three-wheeler electric vehicle with speed-load variation	4
9	Simulation of DC motor for electric vehicle acceleration, steady state and braking performance	5
10	Simulation of Induction motor for electric vehicle acceleration, steady state and braking performance	5
11	Simulation of Permanent magnet synchronous motor for electric vehicle acceleration, steady state and braking performance	5
12	Simulation of BLDC motor for electric vehicle acceleration, steady state and braking performance	5
Total Practical Sessions	**15** **Total Practical Hours**	**30**
Minimum ten experiments should be performed from the above list		

Text Books

1. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, 3rd Edition, CRC Press, 2021.
2. Ali Emadi, Advanced Electric Drive Vehicles, 1st, CRC Press, 2015.
3. Chris Mi & M. Abul Masrur, Hybrid Electric Vehicles: Principles and Applications,1st, Wiley. 2018
4. Nil Patel, A.K. Bhoi, S. Padmanaban, Electric Vehicles: Modern Technologies and Trends, Springer, 2020.

References:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, First, Wiley, 2016.
2. Mehrdad Ehsani, Yimin Gao, Modern Electric, Hybrid Electric and fuel cell vehicles, First, CRC Press, 2009.
3. C.C Chan, K.T Chau, Modern Electric Vehicle Technology, Oxford University Press Inc., NY, First, 2001
4. Mi Chris; Zhang Yi, Automotive power transmission systems, First, Willey, 2018

Online Learning Resources

1. https://onlinecourses.swayam2.ac.in/e-learning/preview/nou26_ec04
2. https://diyguru.org/ev-vehicle-architecture-manual/?utm_source=chatgpt.com
3. https://courses.diyguru.org/unit/ev-architecture-and-design/?utm_source=chatgpt.com
4. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed83

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Department of Electrical Engineering

Established: 1999

Course Information:

Class, Semester	S.Y. B.Tech, Semester - IV	**Category**	**SM**
Course Code, Course Title	**3EERE221, Solar and Wind Energy**	**Type**	**LIT2**
Prerequisites	-		

Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**
	3	-	2	3	4

Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		40	20	40		50	-

Course Outcomes (COs) :
Upon successful completion of this course, the student will be able to:

CO1	Explain the global and Indian energy scenario and the significance of renewable energy along with relevant policies and initiatives.
CO2	Describe solar radiation concepts, solar geometry and methods of measurement and estimation.
CO3	Compute the performance of solar photovoltaic systems using solar cell characteristics, PV configurations and basic power conditioning techniques.
CO4	Apply principles of solar thermal and wind energy systems to determine their operation, performance and suitability for different applications.
CO5	Determine the configuration and operation of hybrid solar–wind systems, including energy storage and grid integration aspects, for practical applications.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	**Introduction to Renewable Energy** Energy scenario: Global and Indian perspective, Conventional vs non-conventional energy sources, Classification of renewable energy sources, Advantages and limitations of renewable energy, Energy policies and initiatives in India	**8**
II	**Solar Radiation and Measurement** Solar radiation fundamentals, Solar geometry: Zenith angle, declination, hour angle, Solar radiation measurement instruments, Estimation of solar radiation, Factors affecting solar energy availability	**8**
III	**Solar Photovoltaic Systems** Principle of photovoltaic effect, Solar cell characteristics and equivalent circuit, Types of solar cells (Mono, Poly, Thin film), PV modules, arrays, and systems, MPPT techniques and power conditioning	**7**
IV	**Solar Thermal Systems** Solar collectors: Flat plate and concentrating collectors, Solar water heating systems, Solar thermal power generation, Applications: Solar drying, cooking, desalination	**7**
V	**Wind Energy Conversion Systems** Wind energy fundamentals, Wind characteristics and site selection, Wind turbines: Types and components, Power extraction from wind, Betz limit and performance analysis, Induction Generator and Synchronous Generator in Wind System	**8**
VI	**Hybrid Systems and Applications** Solar-wind hybrid systems, Energy storage systems (Battery, Hydrogen), Grid integration of renewable energy, Smart grid concepts, Case studies and practical applications	**7**
	Total Lecture Hours	**45**

List of Experiments with CO Mapping

S. No	**Title / Topic of the Experiment**	**CO Mapped**
1	Study of Global and Indian Renewable Energy Scenario	1
2	Solar Radiation Analysis using Simulation	2
3	Modeling of Solar PV Cell Characteristics	3

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4	Simulation of PV Module and Array		3
5	MPPT Techniques Simulation		3
6	Performance Analysis of Grid-Connected PV System		3
7	Simulation of Solar Thermal System		2
8	Wind Speed Data Analysis and Site Assessment		4
9	Modeling of Wind Turbine Characteristics		4
10	Simulation of Wind Energy Conversion System		4
11	Verification of Betz Limit		4
12	Design of Standalone Solar PV System		5
13	Design of Solar-Wind Hybrid System		5
14	Energy Storage System Simulation		5
15	Grid Integration of Renewable Energy System		5
Total Practical Sessions	**15**	**Total Practical Hours**	**30**

Minimum ten experiments should be performed from the above list

Text Books

1. B. H. Khan, Non-Conventional Energy Resources, 3rd Edition, McGraw Hill Education, 2017.
2. G. D. Rai, Non-Conventional Energy Sources, 5th Edition, Khanna Publishers, 2011.
3. S. P. Sukhatme and J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, 4th Edition, McGraw Hill Education, 2017.
4. Chetan Singh Solanki, Solar Photovoltaics: Fundamentals, Technologies and Applications, 3rd Edition, PHI Learning, 2015.

References

1. John Twidell and Tony Weir, Renewable Energy Resources, 3rd Edition, Routledge (Taylor & Francis), 2015.
2. T. Ackermann, Wind Power in Power Systems, 2nd Edition, Wiley, 2012.
3. Mukund R. Patel, Wind and Solar Power Systems: Design, Analysis and Operation, 2nd Edition, CRC Press, 2005.
4. H. P. Garg and J. Prakash, Solar Energy: Fundamentals and Applications, 1st Edition, Tata McGraw Hill, 2000.

Online Learning Resources

1. Online platforms such as NPTEL and SWAYAM provide structured courses on solar and wind energy. Links: https://nptel.ac.in/courses , https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr25_ed119
2. International MOOCs like Coursera and edX offer certification courses covering PV system design, wind energy, and renewable technologies. Link: https://www.coursera.org/learn/solar-energy-system-design
3. Advanced learning and practical exposure can be achieved using simulation tools such as MATLAB and hybrid system concepts (e.g., HOMER), along with NPTEL courses like solar energy engineering covering PV and thermal systems. Link: https://onlinecourses.nptel.ac.in/noc20_ph14/preview

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Department of Electrical Engineering

Established:

Course Information:

Class, Semester	S. Y. B. Tech. Semester - IV						**Category**	**HS**	
Course Code, Course Title	**3EEHS224, Foreign Language - German**						**Type**	**T2**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self Study**	**Credits**	
	02		-		-		02	02	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**	**ESE**	
		-	**50**	-			-	-	

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Explain basic German vocabulary, grammar, pronunciation, and common expressions used in everyday communication.
CO2	Apply basic German language skills to communicate in familiar situations through listening, speaking, reading, and writing activities.
CO3	Apply appropriate German vocabulary, sentence structures, and grammar to engage in simple conversations and respond to routine personal and social situations.
CO4	Prepare simple written texts such as emails, messages, and short paragraphs in German using appropriate vocabulary and grammatical structures.

Syllabus:

Module	Contents	Lecture Hours
1	**Introduction to German Language** • Introduction to German language and culture • German alphabets • Pronunciation and phonetics • Greetings and farewells • Classroom expressions • Basic vocabulary	**10**
2	**Self-Introduction and Basic Communication** • Personal pronouns • Verbs Haben and Sein • Verb conjugation • Introducing oneself and others • Numbers (0–1000) • Days of the week • Basic sentence structure • W-Fragen (Question Words)	**10**
3	**Countries, Languages and Daily Communication** • Countries and nationalities • Languages • Asking and answering simple questions • Yes/No questions • Articles (Definite and Indefinite) • Simple conversations	**10**
	IN TERM SECTION	
4	**Friends, Family and Hobbies** • Talking about friends and colleagues • Family members • Hobbies and interests • Daily routine • Possessive articles • Describing people	**10**

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5	**Time, Dates and Appointments** • Days, months and seasons • Telling time • Dates and birthdays • Making appointments • Invitations • Apologizing • Modal verbs	10
6	**Work and Workplace Communication** • Occupations and professions • Workplace vocabulary • Talking about studies and work • Telephone conversations • Job advertisements • Expressing opinions about jobs	10
7	**City, Transport and Directions** • Places in a city • Means of transport • Asking for and giving directions • Enquiring information • Imperative forms • Negation • Definite and indefinite articles	10
	Self Study Section	
8	**Food, Shopping and Restaurants** • Food and beverages • Shopping conversations • Ordering food • Paying bills • Akkusativ case • Verbs with Akkusativ • Restaurant communication	10
9	**Home, Communication and Writing Skills** • Describing home and surroundings • Understanding advertisements • Likes and dislikes • Letters and emails • Understanding texts • Dativ case • Dativ prepositions • Wechselpräpositionen	10
10	**Social Life, Past Events and Fashion** • Planning activities with friends • Event information and radio announcements • Separable verbs • Personal pronouns • Präteritum of Haben and Sein • Perfekt tense and Partizip II • Conjunctions (und, oder, aber) • Clothes and fashion • Demonstrative and interrogative articles • Verbs with Dativ	10
	Total Lecture Hours	100
Text Books		

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1. Netzwerk neu A1 Kursbuch Goyal publishers & Distributors Pvt. Ltd. First Indian reprint 2020 Reprinted 2023 2. Netzwerk neu A1 Übungsbuch Goyal publishers & Distributors Pvt. Ltd. First Indian reprint 2020 Reprinted 2023
Reference Books
1. Fit fürs Goethe -Zertifikat A1 Start Deutsch 1 Hübner

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Department of Electrical Engineering

Established:

Course Information:

Class, Semester	S. Y. B. Tech. Semester - IV						**Category**	**HS**	
Course Code, Course Title	**3EEHS225, Foreign Language - Japanese**						**Type**	**T2**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self Study**	**Credits**	
	02		-		-		02	02	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**		**CIA**	**ESE**	
		-	50	-			-	-	

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Explain basic German vocabulary, grammar, pronunciation, and common expressions used in everyday communication.
CO2	Apply basic German language skills to communicate in familiar situations through listening, speaking, reading, and writing activities.
CO3	Apply appropriate German vocabulary, sentence structures, and grammar to engage in simple conversations and respond to routine personal and social situations.
CO4	Prepare simple written texts such as emails, messages, and short paragraphs in German using appropriate vocabulary and grammatical structures.

Syllabus:

Module	Contents	Lecture Hours
1	**Introduction to Japanese Language and Culture** • Overview of Japanese language and culture • Japanese writing systems: Hiragana, Katakana, Kanji • Basic pronunciation and phonetics • Greetings according to time of day • Classroom and workplace expressions • Asking for repetition and clarification • Basic etiquette and manners	**10**
2	**Self-Introduction and Personal Information** • Introducing oneself and others • Name, nationality, occupation, and residence • Family members • Languages spoken • Basic sentence patterns • Introduction to Hiragana writing practice	**10**
3	**Hiragana and Katakana Mastery** • Complete Hiragana characters • Complete Katakana characters • Reading and writing practice • Simple words and phrases • Listening and pronunciation exercises • Everyday vocabulary development	**10**
	MODULE 2 - IN-TERM	
4	**Food and Dining** • Food and beverage vocabulary • Expressing likes and dislikes • Reading simple menus • Ordering food and drinks • Restaurant conversations • Japanese dining etiquette	**10**

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5	**Home, Family and Surroundings** • Describing houses and rooms • Household objects and furniture • Family relationships • Location expressions • Counting objects and people • Describing surroundings	10
6	**Daily Life and Time Expressions** • Telling time • Days, dates, and months • Daily routines • Operating hours and schedules • Borrowing and lending items • Making simple appointments	10
7	**Hobbies, Interests and Social Interaction** • Hobbies and leisure activities • Sports, movies, music, manga, and anime • Inviting friends • Accepting and declining invitations • Expressing preferences and interests • Social conversations	10
	MODULE 3 - SELF STUDY	
8	**Transportation and Navigation** • Public transportation vocabulary • Trains, buses, stations, and landmarks • Asking for directions • Giving simple directions • Understanding signs and notices • Travel-related conversations	10
9	**Shopping and Everyday Transactions** • Shopping vocabulary • Asking for products and prices • Quantities and measurements • Locating items in stores • Purchasing goods • Customer-service interactions	10
10	**Holidays, Experiences and Future Plans** • Talking about past weekend activities • Introduction to simple past tense • Expressing wishes and desires • Travel plans and future intentions • Introduction to frequently used Kanji • Course review and consolidation • Speaking role-plays and presentations • Reading and writing assessment	10
	Total Lecture Hours	100

Text Books

1. Irodori: Japanese for life in Japan (A1), The Japan Foundation, 2020

Reference Books

2. Marugoto Starter (A1) Katsudoo + Rikai (2 Books set) https://amzn.in/d/07fApBbW
3. Genki: An Integrated Course in Elementary Japanese Vol. 1 [3rd Edition] https://amzn.in/d/0gXGM2Ef
4. Minna no Nihongo 1-1&1-2 Main Textbook elementary +Translation & Grammatical with downloadable CDs. https://amzn.in/d/0dyQ9ips

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Established: 1999

Course Information:

Class, Semester	S. Y. B. Tech. Semester - IV					**Category**	RM
Course Code, Course Title	**3EERM226, Research Methodology**					**Type**	L2
Prerequisites							
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	00	00	02	00		01	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		00	00	**00**		**50**	00

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Utilize fundamental concepts of research, research problems, literature sources, and research methodologies for engineering applications under given research scenarios.
CO2	Apply appropriate research design, sampling techniques, and data collection methods to conduct systematic research studies under given problem statements.
CO3	Analyze research data using qualitative, quantitative, statistical, and hypothesis testing techniques under given research scenarios.
CO4	Develop a technical research article with ethical publication practices, appropriate referencing standards, and quality research guidelines.

Syllabus:

Module	Contents	Lecture Hours
I	**Research Fundamentals** Meaning and objectives of research, Significance of research, Types of research, Research process, Criteria of Good Research, Importance of Research in Engineering	**4**
II	**Research Problem & Literature Review** Meaning of Research Problem, Identification & Formulation of research Problem, Techniques for defining Research Problem, Literature Sources: Journals, Conferences, Patents, Use of Digital Libraries, Literature Review techniques and gap identification.	**5**
III	**Research Design & Methodology** Need & Features of Good Research Design, Types of Research Design: Exploratory, Descriptive, Experimental, Sampling Techniques. Data Collection: Types of Data: Primary, Secondary, Methods of Data Collection: Survey, Questionnaire, Interview, Observation, Experimentation	**6**
IV	**Data Analysis & Testing of Hypothesis** Types of data: Qualitative and Quantitative, Basic statistical tools: Mean, Median, Standard Deviation, Data representation: Tables, Graphs, Charts, Introduction to analysis tools, Interpretation of results, Hypothesis, Basic concepts concerning testing of hypothesis, Procedure for hypothesis testing, Flow diagram of hypothesis testing, Test of hypothesis, Hypothesis testing of Means, Hypothesis testing for differences between Means.	**5**
V	**Report Writing** Introduction Technical Report Writing and tools (Latex), Significance of report writing, Steps in writing report, Types of reports, Layout and structure of reports, Documentation and Referencing Styles, Presentation Tools & Techniques: Zotero & Mendeley.	**4**
VI	**Research Journals and Publication Ethics** Research Journals, Types of Journals, Research Publication Process, Journal Indexing: Meaning and Importance of Journal Indexing, Benefits of Indexed Journals, Major Indexing Databases, (Scopus, Web of Science, Google Scholar, SCI, ESCI, and PubMed), Journal Metrics and Quality Indicators: Impact Factor, h-index, i10-index,CiteScore, SNIP and SJR, Types of Publications, Ethics in Research Publication: Plagiarism and Similarity Index (Turnitin Software), Copyright and Authorship, Duplicate Publication, Clone, Predatory, and Fake Journals, Researcher Profiles and Identifier (ORCID, Researcher ID)	**6**
	Total Lecture Hours	**30**

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Text Books
1. Research Methodology–Methods and Techniques by C. R. Kothari, Second Edition, New Age International Publishers 2. Dr. Santosh M Nejakar, Dr. Harish Bendigeri "Research Methodology and Intellectual Property Rights", ISBN 978-93-5987-928-4, Edition: 2023-24
Reference Books
1.Research Methodology Concept and cases By Deepak Chawala and Neena Sondhi 2.Research Methodology: Step by step guide for beginners, Ranjeet Kumar, 5th Edition, SAGE Publications 3. How to Write and Publish a Scientific Paper, Robert A. Day, Barbara Gastel, 8th Edition: 8th Edition, Cambridge University Press
NPTEL and Online Resources
1. https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr26_ed28 2. https://onlinecourses.swayam2.ac.in/e-learning/course/nou26_ge46

ISE Activities

1. Conduct a literature review in the selected domain, identify the research gap, and submit a Literature Review Report.
2. Prepare and submit a Technical Article on the chosen topic based on the literature review.

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Course Information:

Class, Semester	S. Y. B. Tech. Semester - IV						**Category**	**EL**	
Course Code, Course Title	**3EEEL227, Innovation and Product Development**						**Type**	**L2**	
Prerequisites	-								
Teaching Scheme (per week)	**Lecture**		**Tutorial**		**Practical**		**Self-Study**		**Credits**
	-		-		2		-		1
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**		
		00	00	00		50	-		

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

CO1	Identify innovative product ideas by observing real-world problems and user needs using creativity and design thinking tools.
CO2	Apply design thinking techniques to generate and refine innovative solutions for identified engineering or societal problems based on user requirements.
CO3	Construct functional prototypes and estimate preliminary production costs using appropriate materials, manufacturing methods, and engineering tools.
CO4	Analyze prototype performance and production feasibility by interpreting testing results, cost data, and scalability requirements.
CO5	Evaluate intellectual property opportunities, commercialization potential, and production planning based on technical feasibility, market requirements, and economic considerations.
CO6	Develop a comprehensive entrepreneurial proposal integrating intellectual property protection, commercialization strategy, and production planning for an innovative product.

Syllabus:

The Innovation Prototype course is designed to provide students with experiential learning in innovation, prototyping, product development, and commercialization. The course focuses on identifying real-world problems and transforming innovative ideas into functional prototypes/models/products through systematic design and development processes.

Students will learn techniques for validating innovative concepts, assessing feasibility and utility, selecting suitable materials, along with design thing approach and developing prototypes/models/products through iterative improvement and performance testing. The course also emphasizes expert reviews, prototype assessment, cost estimation, pricing strategies, and preliminary production planning for scalability.

Further, students will gain exposure to Intellectual Property Rights (IPR), commercialization processes, and startup development, enabling them to prepare draft proposals for patenting, commercialization, or entrepreneurial ventures based on their innovative solutions.

INNOVATION PROTOTYPE ACTIVITY PLAN

Sr. No	Innovation Prototype Course Activities	Planned Week
01	Introduction to Innovation and Prototyping	Week 1
02	Revising Design Thinking Approach	Week 2
03	Identifying Innovative Problems (Students & Faculty)	Week 3
04	Validating Innovation: Assessing Utility of a Proposed Concept	Week 4
05	**Review No. 1 – by Guides** - Innovativeness Assessment - (Final Idea Presentation)	Week 5
06	Planning and Designing the Prototype	Week 6
07	Choosing and Testing Materials for the Prototype	Week 7
08	Building the working Prototype / Model/ Product	Week 8
09	Improving working Prototype / Model/ Product	Week 9
10	Testing the Prototype / Model/ Product Performance	Week 10
11	**Review No. 2 – by Expert Panel** - Prototype/Model/Product Assessment along with poster	Week 11
12	Estimating Costs & Formulating a Pricing Strategy for Product	Week 12
13	Creating a Preliminary Production Plan for Scaling the Prototype	Week 13
14	Formulating IPR or Commercialization or Start up	Week 14
15	**Review No. 3** – Submission of Draft Copy for IPR or Commercialization or Start up	Week 15

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Department of ElectricalEngineering

Established: 1999

Course Information:

Class, Semester	S. Y. B. Tech. Semester – IV					**Category**	**MA**
Course Code, Course Title	**3EEMA228, Aptitude and Reasoning-II**					**Type**	**T2**
Prerequisites							
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self-Study**		**Credits**	
	2	-	-	2		-	
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	50	-		-	-

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

CO1	Apply quantitative aptitude concepts such as Partnership, Average, and Syllogism to solve numerical and logical problems effectively.
CO2	Analyze and solve reasoning-based problems involving Seating Arrangements, Puzzles, and Direction Sense using systematic problem-solving approaches.
CO3	Demonstrate professional communication and employability skills through presentation skills, grooming, body language, group discussions, and interview techniques for effective participation in hiring processes.
CO4	Develop career readiness skills by preparing professional resumes, optimizing LinkedIn profiles, and applying networking strategies such as cold calling for internship and job opportunities.

Syllabus:

Module	**Contents**	**Lecture Hours**
I	Partnership Average	**5**
II	Seating Arrangements Puzzles	**5**
III	Syllogism Direction	**5**
IV	Presentation Skills Grooming & Body Language	**5**
V	Resume Writing LinkedIn Cold Calling	**5**
VI	Group Discussion Interview	**5**
	Total Lecture Hours	**30**

Text Books

1. R.S. Agarwal S Chand Quantitative Aptitude, 2019
2. R.S. Agarwal S Chand Verbal & Non-verbal Reasoning, 2010
3. P.C. Wren S Chand Wren & Martin (Verbal, Grammar), 2017

Reference Books

1. Face Wiley, APTIPEDIA (Quantitative, Logical, Verbal Aptitude) 2017
2. P.A. Anand Maestro Wiley (Quantitative Aptitude) 2015
3. Meenakshi Upadhyay Arun Sharma (Verbal Ability) McGraw Hill 2020

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Department of Electrical Engineering

Course Information:

Class, Semester	S.Y. B.Tech, Semester - IV					**Category**	**HS**
Course Code, Course Title	**3EEHS114, Communication Skills**					**Type**	**L2**
Prerequisites	-						
Teaching Scheme (per week)	**Lecture**	**Tutorial**	**Practical**	**Self Study**	**Credits**		
	-	-	4	-	2		
Examination Scheme (Marks)	**Theory**	**MSE**	**TA**	**ESE**	**Practical**	**CIA**	**ESE**
		-	**50**	-		-	-

Course Outcomes (COs) :

Upon successful completion of this course, the student will be able to:

CO1	Demonstrate effective Listening, Speaking, Reading and Writing (LSRW) skills for academic and professional communication.
CO2	Create a professional portfolio, résumé, and career plan using appropriate digital tools.
CO3	Compose professional correspondence including emails and job applications using standard formats.
CO4	Present information effectively using MS-Powerpoint and AI-enabled communication tools.
CO5	Demonstrate interpersonal communication skills during group discussions and mock interviews.

List of Experiments with CO Mapping

S.No	Title / Topic of the Experiment	CO Mapped
1	Self - Introduction	CO1
2	SWOT Analysis	CO1
3	Basics of English Pronunciation	CO1
4	Rapid Review of Grammar	CO1
5	Diagnosing Listening and Speaking Skills	CO1
6	Diagnosing Reading and Writing Skills	CO1
7	Presenting my career choices	CO1,CO2
8	Preparing Portfolio	CO1,CO2
9	Describing Technical Charts, Image, and Processes	CO1,CO4
10	Using Language Learning Apps and Tools	CO1,CO4
11	Effective Presentation Skills	CO1,CO4
12	Job Application and Resume Writing	CO1,CO3
13	Email Writing	CO1,CO3
14	Group Discussion	CO1,CO5
15	Mock Interview	CO1,CO2,CO5
Total Practical Sessions	**15**	**Total Practical Hours** **30**

Text Books

1. The Professional: Defining the New Standard of Excellence at Work Subroto Bagchi Penguin Books India Pvt. Ltd. Revised Edition,2011.
2. Cambridge Guide to IELTS. Pauline Cullen, Amanda French, Cambridge University Press, Reprint, 2017.
3. A Practical Course in Effective English Speaking Skills. J. K. Gangal, PHI Learning Pvt. Ltd, New Delhi, Print, 2012
4. English For Engineers. Dr. Shyamaji Dubey, Dr. Manish Kumar. Vikas Publication House Pvt. Ltd.New Delhi, 2020.
5. Personality Development and Soft Skills. Barun K. Mitra, Oxford University Press, New Delhi , 7th impression, 2012.

References:

1. High-school English Grammar and Composition. Wren and Martin, S. Chand and Co., New Delhi, 1st edition, 2015.
2. The Ace of Soft Skills. Ajai Chowdry, Bala Balchandran, Pearson Publication, Delhi, 8th edition, 2017.
3. Effective Technical Communication. M. Ashraf Rizvi, McGraw Hill Education, Chennai,2nd edition, 2017.
4. Business Communication. Hory Sankar Mukerjee, Oxford University Press, New Delhi , 2nd edition, 2013.
5. Communicative English for Engineers and Professionals. Nitin Bhatnagar, Mamta Bhatnagar, Pearson Publication, Delhi, 1st edition, 2013.

Online Learning Resources

1. **Software:** Pronunciation apps (e.g., ELSA Speak, Speak English), grammar checkers (e.g., Grammarly).
2. **Online Platform** Coursera (for basic English courses), Duolingo, BBC Learning English.

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