



Established: 1999

Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra

(An Empowered Autonomous Institute)



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) : $\geq 8 / 20$	MSE + ESE (Theory) : $\geq 32 / 80$	TA (Theory) / CIA (Lab) : $\geq 20 / 50$	ESE (Lab) : $\geq 20/50$
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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

Member Secretary-BoS

Chairman -BoS

Member Secretary-AC

Chairman-AC





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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	3EPC115	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) : $\geq 8 / 20$	MSE + ESE (Theory) : $\geq 32 / 80$	TA (Theory) / CIA (Lab) : $\geq 20 / 50$	ESE (Lab) : $\geq 20/50$
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CC Bouquet :

3BSCC121 - Introduction to Yoga and Mindfulness	3BSCC123 - Six-Sigma Happiness and Mind Mechanics	3BSCC125 - Community Engagement through NSS
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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
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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).



Member Secretary-BoS

Chairman -BoS

Member Secretary-AC

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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) : $\geq 8 / 20$		MSE + ESE (Theory) : $\geq 32 / 80$			TA (Theory) / CIA (Lab) : $\geq 20 / 50$			ESE (Lab) : $\geq 20/50$			

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

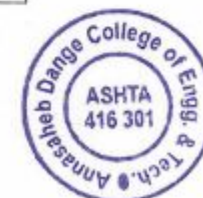
[Level 4.3, UG Certificate] Semester - IV														
Sr. No.	Course Category	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Marks)				
										Theory			Laboratory	
										MSE	TA	ESE	CIA	ESE
01	PC	T1	3EEPC212	Electromagnetic Fields	2	1	-	3	3	40	20	40	-	-
02	PC	LIT1	3EEPC213	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) : $\geq 8 / 20$		MSE + ESE (Theory) : $\geq 32 / 80$		TA (Theory) / CIA (Lab) : $\geq 20 / 50$		ESE (Lab) : $\geq 20/50$		ESE(Theory) : $\geq 40/ 100$				
Foreign Language Bouquet:			3EEHS224 - Foreign Language – German			3EEHS225 - Foreign Language – Japanese								

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Chairman -BoS

Member Secretary-AC

Chairman-AC





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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	I	ES	T1	3EEES104	Introduction to Emerging Technologies	2	-	-	2	2	40	20	40	-	-
02	I	VS	LIT2	3EEVS107	IDEA Lab Workshop	1	-	2	1	2	-	-	-	50	-
03	II	ES	L2	3EEES113	Design Thinking	-	-	2	-	1	-	-	-	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) : $\geq 20/50$			ESE (Theory) : $\geq 40/100$		

- 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.


 Member Secretary-BoS


 Chairman-BoS


 Member Secretary-AC


 Chairman-AC





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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) : $\geq 20/50$			ESE (Theory) : $\geq 40/100$		

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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 Chairman -BoS


 Member Secretary-AC


 Chairman-AC





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ADCEET

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.

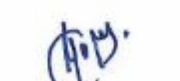
Outcome:

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


Member Secretary-BoS


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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				

Member Secretary-BoS

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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) : $\geq 8 / 20$		MSE + ESE (Theory) : $\geq 32 / 80$		TA (Theory) / CIE (Lab) : $\geq 20 / 50$		ESE (Lab) : $\geq 20/50$		ESE(Theory) : $\geq 40/ 100$				

Member Secretary-BoS

Chairman-BoS

Member Secretary-AC

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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.

Member Secretary-BoS

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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) : $\geq 8 / 20$		MSE + ESE (Theory) : $\geq 32 / 80$			TA (Theory) / CIE (Lab) : $\geq 20 / 50$			ESE (Lab) : $\geq 20/50$			

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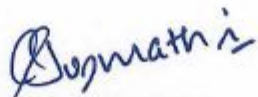
Final Year B. Tech.- Electrical Engineering

[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) : $\geq 8 / 20$		MSE + ESE (Theory) : $\geq 32 / 80$		TA (Theory) / CIE (Lab) : $\geq 20 / 50$		ESE (Lab) : $\geq 20/50$		ESE(Theory) : $\geq 40/ 100$				


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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	3EERE220	Fundamentals of Electric Vehicles	3	-	2	3	4	40	20	40	50	-
02	V	MM	3EERE309	Battery Technology for Electric Vehicles	3	-	-	3	3	40	20	40	-	-
03	VI	MM	3EERE324	Motor control for Electric Vehicles	3	-	2	3	4	40	20	40	50	-
04	VII	MM	3EERE414	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) : $\geq 8/20$		MSE + ESE (Theory): $\geq 32/80$			TA (Theory) / CIA (Lab) : $\geq 20/50$			ESE (Lab) : $\geq 20/50$			

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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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 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		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 Engineering Mathematics, 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 Engineering Mathematics, 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 on Engineering 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, Interplanar spacing for cubic system, Miller indices, Symmetry elements in cubic crystal, X-ray diffraction, Bragg's law, Bragg's 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, 12 th Edition, S. Chand Publication, 2018		
2. P. K. Palanisamy, Engineering Physics, 2 nd Edition, Sci Tech pub. (P) Ltd. 2018		
3. G Vijayakumari, Engineering Physics, 3 rd Edition, Vikas Pub. House (P) Ltd, 2009		
4. K.K.Chattopadhyay and A.N. Banerjee, Introduction to Nano Science and Nanotechnology, 3 rd , PHI Learning, 2009		
References:		
1. David Halliday, Robert Resnick & Jearl Walker, Fundamentals of Physics, 12 th Edition, 2021.		
2. Resnick Halliday, Krane, Engineering Physics, 8 th Edition, John Wiley & Sons Pub., 2008.		
3. R. K. Gaur & Gupta S. L., Engineering Physics, 8 th Edition, Dhanapat Rai Publication, 2008		
4. Sulbha K. Kulkarni, Nanotechnology Principles and Practices, 4 th Edition, Springer, 2007		
5. Charles Kittel, Introduction to Solid State Physics, 7 th Edition, Wiley India Pvt. Ltd, 2008		
6. V. Raghvan, Materials Science and Engineering, 5 th 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://freevidelectures.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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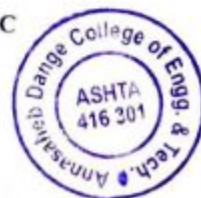

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		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering					
Course Information:							
Class, Semester		FY. B.Tech, Semester - I				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
			40	20	40		50
							ESE
							-
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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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 Kirchhoff's voltage law.	1
3	Simulation and experimental verification of Kirchhoff'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, 4 th Tata McGraw Hill, 2022		
2. Rajendra Prasad Fundamentals of Electrical Engineering 1 st PHI learning pvt ltd, 2005		
3. U.A. Bakshi and U. V. Bakshi Basic Electrical Engineering, 1 st 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=AfmBOoqB5TqQo6tujqS13-3e4x2iQUqf_KxLkR-zalo4_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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 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		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)						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							
II	Mathematics & Astronomy in Ancient India (Lectures 6-10)						5	
	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							
III	Ayurveda and Life Sciences (Lectures 11-15)						5	
	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							
IV	Architectural Knowledge & Engineering Innovations (Lectures 16-20)						5	
	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							

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

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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	Hands 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. Veeanna 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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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 Sheetal (cooling breath).Focus on breath control and emotional regulation.						2, 5	

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11	Pranayam 2 Practice Sitkari and Kapalbhathi. 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. <i>Physical Education: Essential Issues</i> . Hodder Stoughton, 1997.		
2. Sodhi, H. S., and S. K. Sidhu. <i>Physique and Selection of Sportsmen</i> . 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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 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Common for All Branches								
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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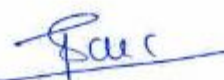

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		AnnasahebDange College of Engineering and Technology Ashta - 416301, Dist. :Sangli, Maharashtra (An Empowered Autonomous Institute) Common for All Branches						
Course Information:								
Class, Semester		FY. B.Tech, Semester - I					Category	CC
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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 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) 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 ,Lezim Listen 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 to classical, 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 , NitinSinghanian 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. Singhanian, 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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Annasaheb Dange College of Engineering and Technology

Ashta - 416301, Dist. : Sangli, Maharashtra
(An Empowered Autonomous Institute)

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
		40	20	40		ESE
						-

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 Engineering Mathematics , 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 Engineering Mathematics , 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 on Engineering 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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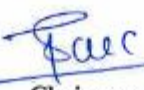

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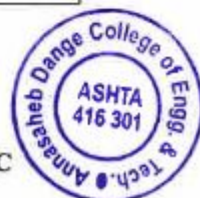


 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		F Y. B.Tech, Semester - II					Category	BS
Course Code, Course 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, 11 th Edition, S. Chand & Co. New Delhi, 2008. 2. Shashi Chawala, A Text book of Engineering Chemistry 3 rd Edition, Dhanpat Rai Publishing Co. New Delhi, 2007 3. Ziyauddin D. Sande, Vijayalaxmi M. Vairat, Pratapsingh V. Gaikwad, A Text book of Applied Chemistry, 1 st Edition, Wiley Publications, 2018		
References:		
1. Jain & Jain, Engineering Chemistry, 16 th Edition, Dhanpat Rai Publishing Co., New Delhi., 2015. 2. Wiley India, Engineering Chemistry, 1 st Edition, Wiley India Pvt. Ltd., New Delhi, 2012. 3. Chatwal and Anand, Instrumental Methods of Chemical Analysis, 5 th Edition, Himalaya Publishing House, Mumbai, 2005. 4. B. K. Sharma, Industrial Chemistry, 10 th Edition, Goel publication (P) Ltd., 1999		
Online Learning Resources		
1. Water Technology-- https://youtu.be/dKWJzp_rrIE 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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 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		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, 15 th 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, 5 th 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, 2 nd 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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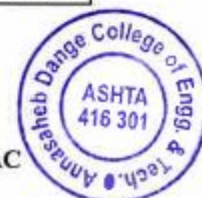

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 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		F.Y. B.Tech – 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 , 3 rd Edition, BPB , 2011. 3. Harvey M. Deitel, Paul J. Deitel, Abbey Deitel , C How to Program ,2 nd Edition, Pearson ,2009. 4. E. Balaguruswamy , Programming in ANSI C , 4 th Edition, BPB Publications, 2008		
References:		
1. D. M. Ritchie, The 'C' Programming Language, 2 nd Edition, Pearson ,1998. 2. Sidnal, C Programming Laboratory: Handbook for Beginners, 1 st Edition, Wiley India Limited, 2012. 3. Yashwant Kanetkar, Understanding Pointers in C, 4 th Edition, BPB Publications,2001. 4. Yashwant Kanetkar, Test Your C Skills, 5 th 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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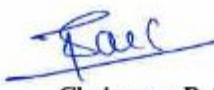

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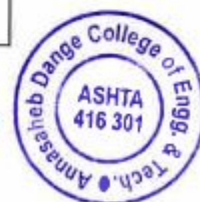

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 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering															
Course Information:																
Class, Semester	F.Y. B.Tech – Semester II	Category ES														
Course Code, Course Title	3EEES113 - Design Thinking	Type L2														
Prerequisites	-															
Teaching Scheme (per week)	<table border="1" style="width: 100%;"> <tr> <th>Lecture</th> <th>Tutorial</th> <th>Practical</th> <th>Self Study</th> <th>Credits</th> </tr> <tr> <td>-</td> <td>-</td> <td>2</td> <td>1</td> <td>1</td> </tr> </table>	Lecture	Tutorial	Practical	Self Study	Credits	-	-	2	1	1					
Lecture	Tutorial	Practical	Self Study	Credits												
-	-	2	1	1												
Examination Scheme (Marks)	<table border="1" style="width: 100%;"> <tr> <th>Theory</th> <th>MSE</th> <th>TA</th> <th>ESE</th> <th>Practical</th> <th>CIA</th> <th>ESE</th> </tr> <tr> <td>--</td> <td>--</td> <td>--</td> <td>--</td> <td></td> <td>50</td> <td>--</td> </tr> </table>	Theory	MSE	TA	ESE	Practical	CIA	ESE	--	--	--	--		50	--	
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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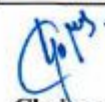

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	1. Observation: Note down pain points using observation and informal interviews. 2. Listing: Write a list of problems identified. 3. Shortlisting: Apply criteria like relevance, feasibility, user impact, and alignment with SDGs to shortlist one problem 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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Annasaheb Dange College of Engineering and Technology
 Ashta - 416301, Dist. : Sangli, Maharashtra
 (An Empowered Autonomous Institute)
 Department of Electrical Engineering

**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
		-	-	-		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

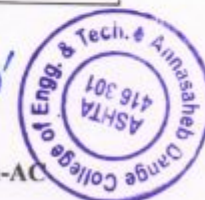
S. No	Title / Topic of the Experiment	CO Mapped
1	Self - Introduction	1
2	SWOT Analysis	1
3	Basics of English Pronunciation	1
4	Rapid Review of Grammar	1
5	Diagnosing Listening and Speaking Skills	1
6	Diagnosing Reading and Writing Skills	1
7	Introduction to MS Office (Word, Excel, PPT)	1
8	Presenting 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.

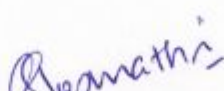
Online Learning Resources

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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 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		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		
- Robert L. Boylestad and Louis Nashelsky, Electronic devices and circuit theory, 11th Edition, PHI/Pearson Education, 2015. - Ramakant A. Gayakwad, Op-Amps & Linear Integrated Circuits, 4th Edition, PHI Publication New Delhi, 2015. P. Ramesh Babu, Electronic Devices & Circuits, 3rd Edition, SciTech Publication, 2009. - V.K. Mehta Rohit Mehta, Principle of Electronics, 10th Edition, S. Chand, 2006.		
References:		
- Millman and Halkias, Satyabratajit, Electronic Devices & Circuits, 3rd Edition, McGraw Hill Education India, 2012. - Albert Malvino and David J. Bates, Electronic Principles, 7th Edition, Tata McGraw Hill, 2014. - Allen Mottershed, Electronic Devices & Circuits, 1st Edition, PHI publication, 1979 - David A. Bell, Operational Amplifiers and linear ICs, 3rd Edition, Oxford University Press, 2011.		
Online Learning Resources		
- NPTEL Course on Analog Circuits, by Prof. Jayanta Mukherjee, IIT Bombay https://nptel.ac.in/courses/108101094 - NPTEL Course on Analog Circuits and Systems, by Prof. Shanthi Pavan, IIT Madras. https://nptel.ac.in/courses/108106188 - NPTEL Course on Analog IC Design, Prof. Aniruddhan S., Prof. Nagendra Krishnapura, IIT Madras. https://nptel.ac.in/courses/108106105		


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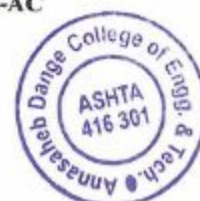
 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		S.Y. B. Tech, Semester - III					Category	BS
Course Code, Course 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, 44 th 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=PLbRMhDVUMngflrZCNOyPZwHUU1pP66vQW> (Unit-IV, Lecture No. 36 – 43)




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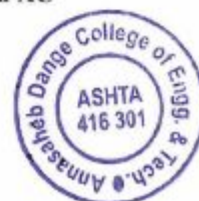
 Established: 1999		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering						
Course Information:								
Class, Semester		S.Y. B.Tech, Semester - III				Category	PC	
Course Code, Course 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.	
5.	Simulation and Experimental Verification of Current in an Unbalanced Bridge Circuit using Thevenin's Theorem	CO2
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 Shyamohan 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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 Ashta - 416301, Dist. : Sangli, Maharashtra
 (An Empowered Autonomous Institute)
 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
		40	20	40		50
						ESE
						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 8051 for arithmetic instructions.	4
10	Assembly language programming of 8051 for 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=KeXaRedKHZJVN3UK

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

**Course Information:**

Class, Semester	S.Y. B.Tech, Semester - III				Category	PC
Course Code, Course Title	3EEPC204, Measurement and Instrumentation				Type	LIT1
Prerequisites	3EES105					
Teaching Scheme (per week)	Lecture	Tutorial	Practical	Self Study	Credits	
	2	-	2	2	3	
Examination Scheme (Marks)	Theory	MSE	TA	ESE	Practical	CIA
		40	20	40		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, Eighth 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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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

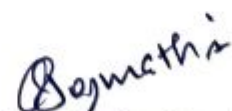
1. <https://nptel.ac.in/courses/106106182/>
2. <https://www.python.org>
3. <http://greenteapress.com/wp/thinkpython/>
4. <https://www.geeksforgeeks.org/python-programming-language/>

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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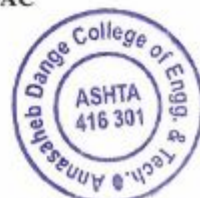
 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering						
Course Information:							
Class, Semester	SY. B. Tech, Semester - III					Category	HS
Course Code, Course 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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 Engineering

**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
		-	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, 42 nd 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 (42 nd , 44 th , 73 rd , 74 th , 86 th and 101 st Amendments), 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 44 th Constitutional Amendment.	3
IV	Government of The Union and States President of India – Election and Powers, Prime Minister of India - Election and Powers, Lok Sabha - Structure, Rajyasabha – Structure, Governor of State, Chief Minister and Council of Ministers in a state.	2
Total Lecture Hours		15

Text Books

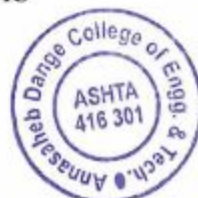
1. M. Laxmikanth, Indian Polity, 7th Edition, McGraw Hill Publications Delhi, 2023.
2. P. M. Bakshi, The Constitution of India, 19th Edition, Lexis Nexis, 2023.
3. Durga Das Basu, Introduction to the Constitution of India, 26th Edition, Lexis Nexis, 2022.
4. M. Laxmikanth, Governance in India, 3rd Edition, 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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 Department of Electrical Engineering

**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
		-	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 environmental 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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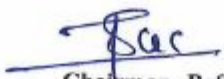


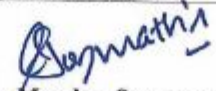
Course Information:									
Class, Semester		S. Y. B. Tech. Semester –III					Category	HS	
Course Code, Course Title		3EEHS209, Psychology					Type	T2	
Prerequisites		----							
Teaching Scheme (per week)		Lecture	Tutorial	Practical	Self-Study	Credits			
		1	-	-	1	1			
Examination Scheme (Marks)		Theory	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								5
	- 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								
II	Understanding Emotional Intelligence								3
	- Understanding emotions and importance - EI vs IQ and 5 Domains of EI - Emotional Intelligence and Personality								
III	Emotional Regulation & Interpersonal Skills								3
	- Impulse control (self-regulation) - Handling criticism (self-management) - Empathy and altruism (social awareness) - Assertiveness (relationship management)								
IV	Procrastination								4
	- Introduction and definition of procrastination - Why do we procrastinate - Time management myths - Techniques to beat procrastination								
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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Annasaheb Dange College of Engineering and Technology
 Ashta - 416301, Dist. :Sangli, Maharashtra
 (An Empowered Autonomous Institute)
 Department of Electrical Engineering

**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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Established: 1999

Annasaheb Dange College of Engineering and Technology
 Ashta - 416301, Dist. : Sangli, Maharashtra
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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
		40	20	40		ESE
						-

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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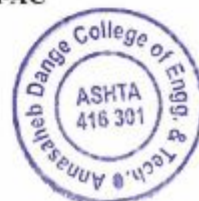
 Established: 1999		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:									
Class, Semester		S.Y. B.Tech, Semester - IV						Category	PC
Course Code, Course 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, 5 th 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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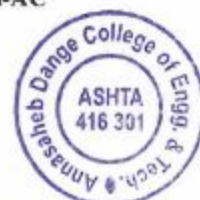
 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		S.Y. B.Tech, Semester - IV					Category	PC
Course Code, Course 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. 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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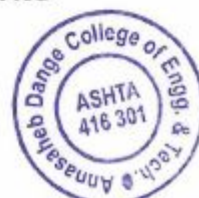
 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		S.Y. B.Tech, Semester – IV					Category	PC
Course Code, Course 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 Oppenheim, Alan S Willsky, "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



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 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		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	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	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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 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	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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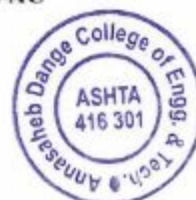


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Textbooks	
1.	J. B. Gupta, Utilization of Electric power and Electric Traction, 10th S. K. Kataria and Sons, 2022
2.	H. Partab, Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Sons, New Delhi, 2015
3.	M. L. Soni, P. V. Gupta, U. 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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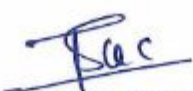

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 Established: 1999		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering						
Course Information:								
Class, Semester		S.Y. B.Tech, 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., <i>Identification Techniques</i> , Tata McGraw-Hill, 1977. 2. Kulakowski B. T., Gardner J. F., Shearer J. L., <i>Dynamic Modeling and Control of Engineering Systems</i> , Cambridge University Press, 2012. 3. Goldstein, H., <i>Classical Mechanics</i> , Addison-Wesley.								


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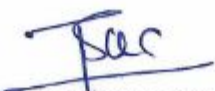

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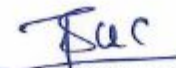
Online Learning Resources

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


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 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		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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 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of ElectricalEngineering							
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. Jack 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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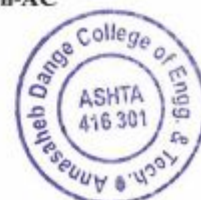
 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		S.Y. B.Tech, Semester - IV					Category	MM
Course Code, Course 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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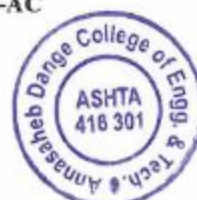

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 Established: 1999	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering							
Course Information:								
Class, Semester		S.Y. B.Tech, 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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 Established:		Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering						
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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|---|
| <ol style="list-style-type: none">1. Netzwerk neu A1 Kursbuch Goyal publishers & Distributors Pvt. Ltd. First Indian reprint 2020 Reprinted 20232. Netzwerk neu A1 Übungsbuch Goyal publishers & Distributors Pvt. Ltd. First Indian reprint 2020 Reprinted 2023 |
|---|

Reference Books

- | |
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| <ol style="list-style-type: none">1. Fit fürs Goethe -Zertifikat A1 Start Deutsch I Hübner |
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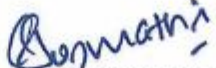
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 Established: 1983	Annasaheb Dange College of Engineering and Technology Ashta - 416301, Dist. : Sangli, Maharashtra (An Empowered Autonomous Institute) Department of Electrical Engineering						
Course Information:							
Class, Semester		S. Y. B. 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	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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 Department of Electrical Engineering

**Course Information:**

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, 5 th Edition, SAGE Publications 3. How to Write and Publish a Scientific Paper, Robert A. Day, Barbara Gastel, 8 th 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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Department of Electrical Engineering

**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
		00	00	00		50
						ESE
						-

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 thinking 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

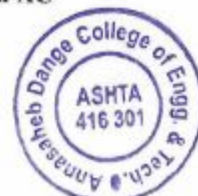
Sr. No	Innovation Prototype Course Activities	Planned Week
01	Introduction to Innovation and Prototyping	Week 1
02	Revising Design Thinking Approach	Week 2
03	Identifying Innovative Problems (Students & Faculty)	Week 3
04	Validating Innovation: Assessing Utility of a Proposed Concept	Week 4
05	Review 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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Course Information:			
Class, Semester	S. Y. B. Tech. Semester – IV		Category
Course Code, Course Title	3EEMA228, Aptitude and Reasoning-II		MA
Prerequisites			Type
Teaching Scheme (per week)	Lecture	Tutorial	Credits
	2	-	-
Examination Scheme (Marks)	Theory	MSE	ESE
	-	50	-
		Practical	CIA
			ESE
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
		-	50	-		ESE

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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