



**Scheme of Teaching and Evaluation
for
B. Tech., III & IV semester
Electrical and Electronics Engg.
(2023 scheme)**

Categories of courses for B.Tech. (2023 scheme)



KISHKINDA UNIVERSITY

Main Campus: Mountain view campus, off 28 kms, Ballari, Siruguppa road, Sindhgeri, GP No. 735, Hosalli, Siruguppa Taluk, Ballari District, Karnataka- 583120

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SN	Course Area	Credit Distribution
1.	Humanities Social Sciences including Management (HS)	09
2	Basic Sciences (BS)	20
3.	Engineering Sciences (ES)	26
4.	Professional Core (PC)	54
5.	Professional Electives (PE)	12
6.	Ability Enhancement Course(AEC)	08
7.	Open Electives	09
8.	Project Work(Mini/Major)	10
9.	Internship(INT)	10
10.	Universal Human Values(UHV)	02
11.	Mandatory Non-Credit Course (MNC)	00
	Total	160

CREDIT DISTRIBUTION FOR B. TECH. PROGRAMME

SEM	HS	BS	ES	PC	PE	AEC	OE	PW	INT	UHV	TOTAL
1	2	7	10	-	-	1	-	-	-	-	20
2	2	7	10	-	-	1	-	-	-	-	20
3		3	3	12		1				1	20
4		3	3	12		1				1	20
5	5			9	3	1		2			20
6				9	3	3	3	2			20
7				12	3		3	6			24
8					3		3		10		16
TOTAL	9	20	26	54	12	8	9	10	10	2	160



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III SEMESTER

SN	Course and Course Code		Course Title	Teaching Department (TD) & QP Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	23BB31	Biology for Engineers	CHEM	3	0	0		03	50	50	100	3
2	IPCC	23EE32	Analog Electronic Circuits	EEE	3	0	2		03	50	50	100	4
3	IPCC	23EE33	Digital Electronics	EEE	3	0	2		03	50	50	100	4
4	PCC	23EE34	Electrical machines-I	EEE	3	0	0		03	50	50	100	3
5	PCCL	23EEL35	Electrical machines laboratory-I	EEE	0	0	2		03	50	50	100	1
6	ESC	23EE36	Electric Circuit Analysis	EEE	3	0	0		03	50	50	100	3
7	UHV	23SC37	Social Connect and Responsibility	Any Department	0	0	2		01	100	---	100	1
8	AEC	23EE381	Circuit Laboratory using Pspice	EEE	If the course is a Theory				01	50	50	100	1
					1	0	0						
					If a course is a laboratory				02				
					0	0	2						
9	MC	23NS39	National Service Scheme(NSS)	NSS Coordinator	0	0	2			100	---	100	0
		23PE39	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		23YO39	Yoga	Yoga Teacher									
Total										550	350	900	20

SN	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	23MATDIP31	ADDITIONAL MATHEMATICS-I	MATHS	3	0	0		03	100	00	100	0





Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with Practical of the same course. Credits for IPCC are 04 and its Teaching – Learning hours (L : T : P) can be considered as (3 : 0 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by CIE only and there shall be no SEE.

Engineering Science Course (ESC/ETC/PLC)
Electrical Circuit Analysis

Ability Enhancement Course–III
1. Circuit Laboratory Using Pspice
2. Electrical Machines-I using SCILAB





IV SEMESTER

S N	Course and Course Code		Course Title	Teaching Departmen t (TD) & QP Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC	23MEE41	Applied Mathematics for EEE	MATHS	3	0	0		03	50	50	100	3
2	IPCC	23EE42	Power Electronics	EEE	3	0	2		03	50	50	100	4
3	IPCC	23EE43	Microcontroller	EEE	3	0	2		03	50	50	100	4
4	PCC	23EE44	Electrical machines-II	EEE	3	0	0		03	50	50	100	3
5	PCCL	23EEL45	Electrical machines laboratory-II	EEE	0	0	2		03	50	50	100	1
6	ESC	23EE46	Electromagnetic Field Theory	EEE	3	0	0		03	50	50	100	3
7	AEC / SEC	23PSW47	Professional Skills for the Work Place	TD and PSB: Concerned department	If the course is Theory				01	50	50	100	1
					1	0	0						
					If the course is a lab				02				
					0	0	2						
8	UHV	23UH48	Universal human values course	Any Department	1	0	0		01	50	50	100	1
9	MC	23NS49	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	--	100	0
		23PE49	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		23YO49	Yoga	Yoga Teacher									
Total									500	400	900	20	

SN	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
				Theory Lecture	Tutorial	Practical/ Drawing	Self - Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	T	P	S					
1	23MATDIP41	ADDITIONAL MATHEMATICS-II	MATHS	3	0	0		03	100	00	100	0





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BIOLOGY FOR ENGINEERS			
Course Code	23BB41	CIE Marks	50
Teaching Hours / Week (L:T:P: S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination type (SEE)	Theory		

Course objectives:

- To familiarize the students with the basic biological concepts and their engineering applications.
- To enable the students with an understanding of bio design principles to create novel devices and structures.
- To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems.
- To motivate the students to develop interdisciplinary vision of biological engineering.

Teaching-Learning Process (General Instructions)

These are sample Strategies which teachers can use to accelerate the attainment of the various course outcomes.

1. Explanation via real life problem, situation modelling, and deliberation of solutions, hands-on sessions, reflective and questioning / inquiry-based teaching.
2. Instructions with interactions in classroom lectures (physical / hybrid).
3. Use of ICT tools, including YouTube videos, related MOOCs, AR / VR / MR tools.
4. Flipped classroom sessions (~10% of the classes).
5. Industrial visits, Guests talks and competitions for learning beyond the syllabus.
6. Students' participation through audio-video based content creation for the syllabus (as assignments).
7. Use of gamification tools (in both physical / hybrid classes) for creative learning outcomes.
8. Students' seminars (in solo or group) / oral presentations.

Module-1	8 hours
INTRODUCTION TO BIOLOGY: The cell: the basic unit of life, Structure and function of a cell. The plant cell and animal cell Prokaryotic and Eukaryotic cell. Stem cells and their application. Biomolecules: Properties and functions of Carbohydrates, Nuclei acids, Proteins, lipids. Importance of special Biomolecules. Enzymes (Classification (With one example each), properties and functions), vitamins and hormones.	
Module-2	8 hours
BIOMOLECULES AND THEIR APPLICATIONS (QUALITATIVE): Carbohydrates (cellulose-based water filters, PHA and PLA as bioplastics), Nucleic acids (DNA Vaccine for Rabies and RNA vaccines for Covid19, Forensics – DNA fingerprinting), Proteins (Proteins as food – whey protein and meat analogs, Plant based proteins), lipids (biodiesel, cleaning	



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agents/detergents), Enzymes (glucose-oxidase in biosensors, lignolytic enzyme in bio-bleaching).

Module-3

8 hours

HUMAN ORGAN SYSTEMS AND BIO DESIGNS (QUALITATIVE):

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators). Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).

Module-4

8 hours

NATURE-BIOINSPIRED MATERIALS AND MECHANISMS (QUALITATIVE):

Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Sharkskin (Friction reducing swimsuits), Kingfisher beak (Bullet train). Human Blood substitutes - haemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).

Module-5

8 hours

TRENDS IN BIOENGINEERING (QUALITATIVE):

Bio printing techniques and materials, 3D printing of ear, bone and skin. 3D printed foods. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bio imaging and Artificial Intelligence for disease diagnosis. Self-healing Bio concrete (based on bacillus spores, calcium lactate nutrients and bio mineralization processes), Bioremediation, and Bio mining via microbial surface adsorption (removal of heavy metals like Lead, Cadmium, Mercury, Arsenic).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Elucidate the basic biological concepts via relevant industrial applications and case studies.
2. Evaluate the principles of design and development, for exploring novel bioengineering projects.
3. Corroborate the concepts of biomimetic for specific requirements.
4. Think critically towards exploring innovative bio based solutions for socially relevant problems.

Suggested Learning Resources:

Books

- Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022





- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- Biomimetic: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
- 3D Bio printing: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
- Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Web links and Video Lectures (e-Resources):

[https:// nptel.ac.in/courses/121106008](https://nptel.ac.in/courses/121106008)

[https:// freevidelectures.com/course/4877/nptel-biology-engineers-other-non-biologists](https://freevidelectures.com/course/4877/nptel-biology-engineers-other-non-biologists)

[https:// ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009](https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009)

[https:// ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006](https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006)

[https:// www.coursera.org/courses?query=biology](https://www.coursera.org/courses?query=biology)

[https:// onlinecourses.nptel.ac.in/noc19_ge31/preview](https://onlinecourses.nptel.ac.in/noc19_ge31/preview)

[https:// www.classcentral.com/subject/biology](https://www.classcentral.com/subject/biology)

[https:// www.futurelearn.com/courses/biology-basic-concepts](https://www.futurelearn.com/courses/biology-basic-concepts)

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Group Discussion of Case studies
- Model Making and seminar / poster presentations
- Design of novel device / equipment like Cellulose-based water filters, Filtration system



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ANALOG ELECTRONIC CIRCUITS			
Subject Code	23EE32	CIE Marks	50
Number of Lecture Hours/Week	3:0:2	SEE Marks	50
Credits	04	Exam Hours	03
Course Learning Objectives: - Provide the knowledge for the analysis of diode and transistor circuits. - Develop skills to design the electronic circuits like amplifiers and oscillators. ■			
Module-1			08 Hours
Diode Circuits: Diode clipping and clamping circuits. Transistor Biasing and Stabilization: Operating point, analysis and design of fixed bias circuit, self-bias circuit, Emitter stabilized bias circuit, voltage divider bias circuit, stability factor of different biasing circuits. Problems. Transistor switching circuits. ■			
Module-2			08 Hours
Transistor at Low Frequencies: BJT transistor modelling, CE fixed bias configuration, voltage divider bias, emitter follower, CB configuration, collector feedback configuration, analysis using h – parameter model, relation between h – parameters model of CE, CC and CB modes, Millers theorem and its dual. ■			
Module-3			08 Hours
Multistage Amplifiers: Cascade and cascade connections, Darlington circuits, analysis and design. Feedback Amplifiers: Feedback concept, different types, practical feedback circuits, analysis and design of feedback circuits.			
Module-4			08 Hours
Power Amplifiers: Amplifier types, analysis and design of different power amplifiers, Oscillators: Principle of operation, analysis and derivation of frequency of oscillation of phase shift oscillator, Wien bridge oscillator, RF and crystal oscillator and frequency stability.			
Module-5			08 Hours
FETs: Construction, working and characteristics of JFET and MOSFET. Biasing of JFET and MOSFET. Analysis and design of JFET (only common source configuration with fixed bias) and MOSFET amplifiers			
PRACTICAL COMPONENT OF IPCC			
1	Experiments on clippers and clampers		
2	Testing of Half wave rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency.		
3	Testing of Full wave – centre tapped transformer type and Bridge type		





	rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency.
4	Frequency response of single stage BJT RC coupled amplifier and determination of half power points, bandwidth.
5	Design and testing of BJT -RC phase shift oscillator for given frequency of oscillation.
6	Design and testing of Crystal oscillator for given frequency of oscillation
7	Design and testing of Hartley and Colpitt's oscillator for given frequency of oscillation
8	Frequency response of BJT Darlington emitter follower
9	Frequency response of transformer less Class B push pull amplifier
10	Design and simulation of Full wave – centre tapped transformer type and Bridge type rectifier circuits with and without Capacitor filter using MATLAB. Determination of ripple factor, regulation and efficiency.

Course Outcomes: At the end of the course the student will be able to:

- **Analyze** different diode and transistor circuits.
- **Analyze** the operation of transistor at low frequencies.
- **Derive** frequency of oscillations, input and output impedances of amplifier circuits.
- **Analyze** different power amplifiers and oscillators.
- **Analyze** and design JFETs and MOSFETs.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Text Books

1	Electronic Devices and Circuit Theory	Robert L Boylestad Louis Nashelsky	Pearson	11th Edition, 2015
2	Electronic Devices and Circuits	Millman and Halkias	Mc Graw Hill	4th Edition, 2015
3	Electronic Devices and Circuits	David A Bell	Oxford University Press	5th Edition, 2008

Reference Books

1	Microelectronics Circuits Analysis and Design	Muhammad Rashid	Cengage Learning	2nd Edition, 2014
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2	A Text Book of Electrical Technology, Electronic Devices and Circuits	B.L. Theraja, A.K. Theraja,	S. Chand	Reprint, 2013
3	Electronic Devices and Circuits	Anil K. Maini VashaAgarval	Wiley	1st Edition, 2009
4	Electronic Devices and Circuits	S.Salivahanan N.Suresh	Mc Graw Hill	3rd Edition, 2013
5	Fundamentals of Analog Circuits	Thomas L Floyd	Pearson	2nd Edition, 2012



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DIGITAL ELECTRONICS			
Subject Code	23EE33	CIE Marks	50
Number of Lecture Hours/Week	3:0:2	SEE Marks	50
Credits	04	Exam Hours	03
Course Learning Objectives: • Illustrate simplification of Algebraic equations using Karnaugh Maps and Quine-McClusky Techniques. • Design combinational logic circuits. • Design Decoders, Encoders, Digital Multiplexer, Adders, Subtractors and Comparators • Describe Latches and Flip-flops, Registers and Counters. • Analyze Mealy and Moore Models. • Develop state diagrams, Synchronous Sequential Circuits and to understand the basics of various Memories.			
Module-1		08 Hours	
Principles of Combinational Logic: Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps- 3, 4 and 5 variables, Incompletely specified functions (Don't care terms) Simplifying Max term equations, Quine-McCluskey minimization techniques, Reduced prime implicants Tables.			
Module-2		08 Hours	
Design and Analysis of Combinational logic circuits: General approach to combinational logic design, Decoders, BCD decoders, Encoders, digital multiplexers, Using multiplexers as Boolean function generators, Adders and subtractors, Cascading full adders, Look ahead carry, Binary comparators.			
Module-3		08 Hours	
Flip-Flops: Basic Bistable elements, Latches, The master-slave flip-flops (pulse- triggered flip-flops): SR flip-flops, JK flip-flops, Edge triggered flip- flops, Characteristic equations.			
Module – 4		08 Hours	
Flip-Flops Applications: Registers, binary ripple counters, synchronous binary counters, Counters based on shift registers, Design of a synchronous counter, Design of asynchronous MOD-N counter using clocked T, JK, D and SR flip-flops.			
Module – 5		08 Hours	





Sequential Circuit Design: Mealy and Moore models, State machine notation, Synchronous Sequential circuit analysis, Construction of state diagrams.

Memories: Read only and Read/Write Memories, Programmable ROM, EPROM, Flash memory.

PRACTICAL COMPONENT OF IPCC

SN	List of Experiments
1	Simplification, realization of Boolean expressions using logic gates/Universal gates.
2	Realization of Half/Full adder and Half / Full Subtractors using logic gates.
3	Realization of parallel adder / Subtractors using IC7483
4	Realization of Binary to Gray code conversion and vice-versa.
5	Realization of One/Two bit comparator and study of IC7485 magnitude comparator.
6	Truth table verification of Flip-Flops: SR, JK, D and T (Using Universal gates).
7	Design and testing Ring counter/Johnson counter.
8	Realization of a synchronous MOD – N counter design using IC7476, IC7490, IC74192/193.

Course Outcomes: After studying this course, students will be able to:

- Develop simplified switching equation using Karnaugh Maps and QuineMcClusky techniques.
- Design Multiplexer, Encoder, Decoder, Adder, Subtractors and Comparator as digital combinational control circuits.
- Design flip flops, counters, shift registers as sequential control circuits.
- Develop Mealy/Moore Models and state diagrams for the given clocked sequential circuits.
- Explain the functioning of Read only and Read/Write Memories, Programmable ROM, EPROM and Flash memory.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Text Books

1	Digital Logic Applications and Design,	John M Yarbrough,	Thomson Learning	2001, ISBN 981- 240-062-1.
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2	Digital Principles and Design	Donald D. Givone	McGraw Hill	2002 ISBN 978-0- 07-052906-9.
Reference Books				
1	Digital Circuits and Design	D. P. Kothari and J. S Dhillon	Pearson	2016, ISBN:9789332543539
2	Digital Design	Morris Mano	Prentice Hall of India	Third Edition
3	Fundamentals of logic design	Charles H Roth, Jr.,	Cengage Learning.	Fifth Edition



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Electrical Machines – I (Transformers & Generators)			
Subject Code	23EE34	CIE Marks	50
Number of Lecture Hours/Week	3:0:0	SEE Marks	50
Credits	03	Exam Hours	03
Pre-requisites: • Transformer construction, types and working. • 1-Ø supply and 3-Ø supply, phase current and line current, phase voltage and line voltage. • Relation between voltage and current for resistive, inductive and capacitive loads. • Types of power factor, active and reactive power. • Construction and working of DC generator and synchronous generator.			
Module-1			08 Hours
Single phase Transformers: Operation of practical transformer under no-load and on-load with R,L,C phasor diagrams. Open circuit and Short circuit tests, calculation of equivalent circuit parameters and predetermination of efficiency. Voltage regulation. All-day(Energy) efficiency and its significance. Three-phase Transformers: Introduction, Constructional features of three-phase transformers. Choice between single unit three-phase transformer and a bank of three single-phase transformers. Transformer connection for three phase operation– star/star, delta/delta, star/delta, delta/star and V/V, comparative features. Scott connection.			
Module-2			08 Hours
Transformer Tests: Polarity test, Sumpner’s test, separation of hysteresis and eddy current losses. Parallel Operation of Transformers: Necessity and conditions for parallel operation– Single phase and three phase. Load sharing in case of similar and dissimilar transformers. Auto transformers and Tap changing transformers: Introduction to autotransformer-copper economy, equivalent circuit, no load and on load tap changing transformers.			
Module-3			08 Hours
Direct current Generator: construction, principle of operation, classification, emf equation. armature reaction and commutation. Synchronous Generators: Armature windings, winding factors, e.m.f equation. Harmonics–causes, reduction and elimination. Synchronous reactance.			
Module – 4			08 Hours





Voltage regulation methods of synchronous generators: Alternator on load. Voltage regulation. Open circuit and short circuit characteristics. Voltage regulation by EMF, MMF, ZPF methods.

Module – 5

08 Hours

Performance of Synchronous Generators: Effects of saliency, two-reaction theory, Determination of X_d & X_q – slip test, Hunting and damper windings. **Parallel operation of synchronous generator:** Necessity and conditions for synchronization of alternator, synchronizing to infinite bus bars, load sharing. Methods of Synchronization, Synchronizing power.

Course Outcomes: After studying this course, students will be able to:

- **Determine** the efficiency, voltage regulation and equivalent circuit constants of a 1-phase transformer from O.C and S.C test.
- **Compare** the types of 3-phase transformer connections (bank) with respect to advantages, disadvantages and applications.
- **Analyze** the performance characteristics of D.C. generator and synchronous generators
- **Determine** the voltage regulation of a synchronous generator by EMF, MMF and ZPF methods.
- **Analyze** the parallel operation of 1-phase transformer and synchronous generator.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Text Books

1	Electric Machines	D. P. Kothari, et al	McGraw Hill	4 th edition 2011
2	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2 nd edition, 2013
3	Electrical Technology	B.L Theraja	S.Chand, Vol.2	23 rd edition 2002

Reference Books

1	Electrical Technology	J B Gupta	Pustak Kosh	2 nd edition
2	Theory of Alternating Current Machines	Alexander Langsdorf	McGraw Hill	2nd Edition, 2001





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3	Principals of Electrical Machines	V.K Mehta, Rohit Mehta	S Chand	2nd edition, 2009
4	Electrical Machines	S.K. Sahadev	Cambridge University Press	ISBN:978-7-108-43106-4.



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Electrical Machines Laboratory – I			
Course Code	23EEL35	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	03
Total Hours of Pedagogy	40	Total Marks	100
List of experiments			
Sl no	Experiments		
1	Open Circuit and Short circuit tests on 1- Φ transformer and pre determination of (i) Efficiency (ii) % of Regulation (iii) Calculation of equivalent circuit parameters.		
2	Sumpner’s test on similar transformers and determination of combined and individual transformer efficiency.		
3	Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load.		
4	Ratio and Polarity test on single-phase transformer.		
5	Comparison of performance of 3 single-phase transformers in delta – delta and V – V (open delta) connection under load.		
6	Scott connection with balanced and unbalanced loads.		
7	Separation of hysteresis and eddy current losses in single phase transformer.		
8	Voltage regulation of an alternator by EMF and MMF methods.		
9	Slip test – Measurement of direct and quadrature axis reactance and predetermination of regulation of salient pole synchronous machines.		
10	Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice - versa.		
	Open ended experiments		
1	Determination of efficiency and voltage regulation of a 1-phase transformer by direct loading.		
2	Determination of sequence impedances of synchronous generators.		
Course outcomes:			
1. Determine the efficiency, voltage regulation and equivalent circuit constants of a 1- Φ transformer by conducting O.C and S.C tests.			





2. **Perform** parallel operation of two different kVA transformers to determine the load shared by each transformer.
3. **Conduct** experiments on 3-phase transformer connections (Bank) to determine the efficiency.
4. **Determine** voltage regulation of a 3-phase synchronous generator using EMF and MMF methods by conducting O.C and S.C tests.
5. **Analyze** the performance of synchronous generator by connecting it to the infinite bus bar.





ELECTRIC CIRCUIT ANALYSIS			
Course Code	23EE36	CIE Marks	50
Teaching Hours/Week	3:0:0	SEE Marks	50
Credits	03	Exam Hours	03
Total Hours of Pedagogy	40	Total Marks	100
Course Learning Objectives: - To familiarize the basic laws, source transformations, theorems and the methods of analyzing electrical circuits. - To explain the use of network theorems and the concept of resonance. - To familiarize the analysis of three-phase circuits, two port networks and networks with non-sinusoidal inputs. - To explain the importance of initial conditions, their evaluation and transient analysis of R-L and R-C circuits. - To impart basic knowledge on network analysis using Laplace transforms.			
Module-1			08 Hours
Basic Concepts: Active and passive elements, Concept of ideal and practical sources. Source transformation and Source shifting,. Analysis of networks by (i) Network reduction method including star – delta transformation, (ii) Mesh and Node voltage methods for ac and DC circuits with independent and dependent sources. Duality, (iii) Concept of Super-Mesh and Super node analysis			
Module-2			08 Hours
Network Theorems: Super Position theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and Millman's theorem. Analysis of networks, with dependent AC and DC sources.			
Module-3			08 Hours
Resonant Circuits: Analysis of simple series RLC and parallel RLC circuits under resonances. Bandwidth, Quality factor, cutoff frequency, selectivity, relation between resonance and cut off frequency, relation between bandwidth and cutoff frequency. Transient Analysis: Transient analysis of RL and RC circuits under DC excitations: Behavior of circuit elements under switching action ($t = 0$ and $t = \infty$), Evaluation of initial conditions.			
Module-4			08 Hours
Laplace Transformation: Laplace transformation (LT), LT of Impulse, Step, Ramp, Sinusoidal signals and shifted functions. Waveform synthesis. Initial and Final value theorems.			
Module-5			08 Hours





Unbalanced Three Phase Systems: Analysis of three phase systems, calculation of real and reactive Powers by direct application of mesh and nodal analysis.

Two Port networks: Definition, Open circuit impedance, Short circuit admittance and Transmission parameters and their evaluation for simple circuits, relationships between parameter sets.

Course Outcomes: At the end of the course the student will be able to:

1. Understand the basic concepts, basic laws and methods of analysis of DC and AC networks and reduce the complexity of network using source shifting, source transformation and network reduction using transformations.
2. Solve complex electric circuits using network theorems.
3. Discuss resonance in series and parallel circuits and also the importance of initial conditions and their evaluation.
4. Synthesize typical waveforms using Laplace transformation.
5. Solve unbalanced three phase systems and also evaluate the performance of two port networks.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Sl. No.	Title of the Book	Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Engineering Circuit Analysis	William H Hayt et al	Mc Graw Hill	8th Edition, 2014
2	Network Analysis	M.E. Vanvalkenburg	Pearson	3rd Edition, 2014
3	Fundamentals of Electric Circuits	Charles K Alexander Matthew N O Sadiku	Mc Graw Hill	5th Edition, 2013
Reference Books				
1	Engineering Circuit Analysis	J David Irwin et al	Wiley India	10th Edition, 2014
2	Electric Circuits	Mahmood Nahvi	Mc Graw Hill	5th Edition, 2009





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3	Introduction to Electric Circuits	Richard C Dorf and James A Svoboda	Wiley	9th Edition, 2015
4	Circuit Analysis; Theory and Practice	Allan H Robbins Wilhelm C Miller	Cengage	5th Edition, 2013
5	Basic Electrical Engineering	V K Mehta, Rohit Mehta	S Chand	6th Edition 2015



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SOCIAL CONNECT & RESPONSIBILITY

Course Code	23SC37	CIE Marks	100
Teaching Hours / Week (L:T:P: S)	0:0:2	SEE Marks	--
Total Hours of Pedagogy	40 hour Practical Session +15 hour Planning	Total Marks	100
Examination nature (No SEE – Only CIE)	For CIE Assessment - Activities Report Evaluation by College NSS Officer / HOD / Sports Dept. / Any Dept.		
Credits	01		

Course objectives:

The course will enable the students to:

1. Provide a formal platform for students to communicate and connect to the surrounding.
2. Create a responsible connection with the society.
3. Understand the community in general in which they work.
4. Identify the needs and problems of the community and involve them in problem – solving.
5. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Contents:

- ♦ The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large.
- ♦ The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:



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Contents
Part I: Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - - Objectives, Visit, case study, report, outcomes.
Part II : Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - Objectives, Visit, Case Study, Report, Outcomes.
Part III : Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.
Objectives, Visit, Case Study, Report, Outcomes. Part IV: Water conservation: Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photoblog presenting the current practices – Objectives, Visit, case study, report, outcomes.
Part V : Food walk: City's culinary practices, food lore, and indigenous materials of the region used in cooking – Objectives, Visit, case study, report, outcomes.

Course outcomes (Course Skill Set): At the end of the course, the student will be able to:

CO1: Communicate and connect to the surrounding.

CO2: Create a responsible connection with the society.

CO3: Involve in the community in general in which they work.

CO4: Notice the needs and problems of the community and involve them in problem – solving.

CO5: Develop among themselves a sense of social & civic responsibility & utilize their





knowledge in finding practical solutions to individual and community problems.

CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Activities:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs / social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversational will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

DURATION:

A total of 40 - 50 hours engagement per semester is required for the 3rd semester of the B.E. / B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic, and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines of scheme & syllabus.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE):

After completion of the course, the student shall prepare, with daily diary as reference, a





comprehensive report in consultation with the mentor / s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and / or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the social connect Information / Data collected during the social connect Analysis of the information / data and report writing Considering all above points allotting the marks as mentioned below

Excellent: 80 to 100

Good: 60 to 79

Satisfactory: 40 to 59 Unsatisfactory and fail : <39

Special Note:

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Pedagogy – Guidelines:

It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

SN	Topic	Group size	Location	Activity Execution	Reporting	Evaluation of the Topic
1.	Plantation and adoption of a tree:	May be individual or team	Farmers land / parks / Villages / roadside / community area / College campus etc.	Site Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
2.	Heritage walk and crafts corner:	May be individual or team	Temples / monumental places / Villages / City Areas / Grama panchayat	Site Selection / Proper Consultation / Continuous Monitoring /	Report should be submitted by individual to the concerned	Evaluation as per the rubrics Of scheme and syllabus by



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			/ public associations / Government Schemes officers etc.	Information Board	evaluation authority	Faculty
3.	Organic farming and waste management:	May be individual or team	Farmers land / parks / Villages visits / roadside / community area / College campus etc.	Group Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
4.	Water conservation: & conservation techniques	May be individual or team	Villages / City Areas / Grama panchayat / public associations / Government Schemes officers / campus etc.	Site Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
5.	Food walk: Practices in society	May be individual or team	Villages / City Areas / Grama panchayat / public associations / Government Schemes officers / campus etc.	Group Selection / Proper Consultation / Continuous Monitoring / Information Board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

SN	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress





4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study based Assessment, Individual performance
9	Sector / Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assigned activity progress and its completion.
- At last consolidated report of all activities, compiled report should be submitted as per the instructions and scheme.





Name of the Laboratory: Circuit Laboratory using Pspice (Ability Enhancement Course)

AEC Course Code	23EE381	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	02
Total Hours of Pedagogy	20	Total Marks	100

List of Experiments:

SN	Experiments
1	Simulation and verification of Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2	Simulation and verification of Super Position theorem.
3	Simulation and verification of Reciprocity theorem.
4	Simulation and verification of Thevenin's and Norton's theorem.
5	Simulation and verification of Maximum Power Transfer theorem.
6	Simulation and verification of Millman's theorem.
7	Simulation and analysis of resonant circuits.

Course outcomes:

1. **Analyze** Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. **Verify** Super Position theorem.
3. **Analyze** Reciprocity theorem.
4. **Verify** Thevenin's and Norton's theorem.
5. **Analyze** Maximum Power Transfer theorem, Millman's theorem Resonant circuits.





Course Name: NATIONAL SERVICE SCHEME (NSS) - (3rd to 6th)

Course Code	23NS39	CIE Marks	100
Teaching Hours / Week (L:T:P)	0:0:3	SEE Marks	-
Total Hours of Pedagogy	40 hour Practical Session +15 hour Planning	Total Marks	100
Examination nature (SEE)	Activities Report Evaluation by College NSS Officer at the end of every semester (3 rd to 6 th Semester)		
Credits	NCMC – Non Credit Mandatory Course (Completion of the course shall be mandatory for the award of degree)		

Course objectives:

National Service Scheme (NSS) will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem – solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.

General Instructions - Pedagogy:

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
2. State the need for NSS activities and its present relevance in the society and Provide real-life examples.
3. Support and guide the students for self-planned activities.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills.





National Service Scheme (NSS) – Contents:

1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.
2. Waste management– Public, Private and Govt organization, 5 R's.
3. Setting of the information imparting club for women leading to contribution in social and economic issues.
4. Water conservation techniques – Role of different stakeholders– Implementation.
5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
6. Helping local schools to achieve good results and enhance their enrolment in Higher / technical / vocational education.
7. Developing Sustainable Water management system for rural areas and implementation approaches.
8. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swatch Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.,
9. Spreading public awareness under rural outreach programs.(minimum 5 programs).
10. Social connect and responsibilities.
11. Plantation and adoption of plants. Know your plants.
12. Organize National integration and social harmony events / workshops / seminars. (Minimum 02 programs).
13. Govt. school Rejuvenation and helping them to achieve good infrastructure.

NOTE:

- Student / s in individual or in a group should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department.
- At the end of every semester, activity report should be submitted for evaluation.



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Semester wise from 3rd to 6th semester

DISTRIBUTION OF ACTIVITIES

Semester	Topics / Activities to be Covered
3 rd Sem.	1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing. 2. Waste management– Public, Private and Govt organization, 5 R's. 3. Setting of the information imparting club for women leading to contribution in social and economic issues.
4 th Sem.	4. Water conservation techniques – Role of different stakeholders– Implementation.5 5. Preparing an actionable business proposal for enhancing the village income and approach for implementation. 6. Helping local schools to achieve good results and enhance their enrolment in Higher / technical / vocational education.
5 th Sem.	7. Developing Sustainable Water management system for rural areas and implementation approaches. 8. Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc., 9. Spreading public awareness under rural outreach programs.(minimum5 programs). 10.Social connect and responsibilities.
6 th Sem.	11.Plantation and adoption of plants. Know your plants. 12.Organize National integration and social harmony events / workshops / seminars. (Minimum 02 programs). 13.Govt. school Rejuvenation and helping them to achieve good infrastructure.



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Pedagogy – Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

SN	Topic	Group size	Location	Activity execution	Reporting	Evaluation of the Topic
1.	Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.	May be individual or team	Farmers Land / Villages / Roadside / Community Area / College Campus Etc.,	Site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
2.	Waste management– Public, Private and Govt. organization, 5 R's.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
3.	Setting of the information imparting club for women leading to contribution in social and economic issues.	May be individual or team	Women Empowerment Groups / Consulting NGOs & Govt. Teams / College Campus Etc.,	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
4.	Water conservation techniques – Role of different stakeholders– Implementation.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government	site selection / proper consultation / Continuous monitoring / Information	Report should be submitted by individual to the concerned	Evaluation as per the rubrics Of scheme and syllabus by NSS officer





			Schemes Officers / Campus Etc.,	board	evaluation authority	
5.	Preparing an actionable business proposal for enhancing the village income and approach for implementation.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
6.	Helping local schools to achieve good results and enhance their enrolment in Higher / technical / vocational education.	May be individual or team	Local Government / Private / Aided Schools / Government Schemes Officers / Etc.,	School selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
7.	Developing Sustainable Water management system for rural areas and implementation approaches.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	site selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer



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8.	Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.,	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
9.	Spreading public awareness under rural outreach programs (minimum 5 programs) / Social connect and responsibilities.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Group selection / pro per consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
10.	Plantation and adoption of plants. Know your plants.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Place selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer





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11.	Organize National integration and social harmony events / workshops / seminars. (Minimum 02 programs).	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government Schemes Officers / Campus Etc.,	Place selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
12.	Govt. school Rejuvenation and helping them to achieve good infrastructure.	May be individual or team	Villages / City Areas / Grama Panchayat / Public Associations / Government/ Schemes Officers / Campus Etc.,	Place selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer



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Plan of Action (Execution of Activities for Each Semester)

SN	Practice Session Description
1	
2	
3	
4	
5	
6	
7	
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9	
10	
11	
12	

- In every semester from 3rd semester to 6th semester, Each student should do activities according to the scheme and syllabus.
- At the end of every semester student performance has to be evaluated by the NSS officer for the assigned activity progress and its completion.
- At last in 6th semester consolidated report of all activities from 3rd to 6th semester, compiled report should be submitted as per the instructions.

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1: Understand the importance of his / her responsibilities towards society.

CO2: Analyse the environmental and societal problems / issues and will be able to design

solutions for the same.

CO3: Evaluate the existing system and to propose practical solutions for the same for sustainable development.

CO4: Implement government or self-driven projects effectively in the field.

CO5: Develop capacity to meet emergencies and natural disasters & practice



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national integration and social harmony in general.

SUGGESTED LEARNING RESOURCES:

Books:

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



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Course Name: PHYSICAL EDUCATION (SPORTS & ATHLETICS) – I

Course Code	23PE39	CIE	100 Marks
Credits: L:T:P	0:0:2		
Total Hours	30 P		

Course Outcomes:

At the end of the course, the student will be able to

1. Comprehend the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Create a foundation for the professionals in Physical Education and Sports
4. Participate in the competition at regional / state / national / international levels.
5. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module I: Orientation

05

Hours

a. Lifestyle
b. Fitness
c. Food & Nutrition
d. Health & Wellness
e. Pre-Fitness test.

Module II: General Fitness & Components of Fitness

15

Hours

a. Warming up (Free Hand exercises)
b. Strength – Push-up / Pull-ups
c. Speed – 30 Mtr Dash
d. Agility – Shuttle Run
e. Flexibility – Sit and Reach
f. Cardiovascular Endurance – Harvard step Test

Module III: Recreational Activities

10

Hours

a. Postural deformities.
b. Stress management.
c. Aerobics.
d. Traditional Games.





YOGA FOR A BETTER LIFE (3rd to 6th)

Course Code	23YO39	CIE Marks	100 / Sem.
Teaching Hours / Week (L:T:P)	0:0:2	SEE Marks	---
Total Hours of Pedagogy per semester	24 - 28 hours (Theory + practical)	Total Marks	100 / Sem.
Examination nature (SEE):	Objective type Theory / Practical / Viva-Voce		

Course objectives:

1. To enable the student to have good health.
2. To practice mental hygiene.
3. To possess emotional stability.
4. To integrate moral values.
5. To attain higher level of consciousness.

The Health Benefits of Yoga

The benefits of various yoga techniques have been supposed to improve

- body flexibility,
- performance,
- Stress reduction,
- attainment of inner peace, and
- self-realization.

The system has been advocated as a complementary treatment to aid the healing of several ailments such as

- coronary heart disease,
- depression,
- anxiety disorders,
- asthma, and
- extensive rehabilitation for disorders including musculoskeletal problems and traumatic brain injury.

The system has also been suggested as behavioral therapy for smoking cessation and substance abuse (including alcohol abuse).

If you practice yoga, you may receive these physical, mental, and spiritual benefits:

- **Physical**



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1. Improved body flexibility and balance
 2. Improved cardiovascular endurance (stronger heart)
 3. Improved digestion
 4. Improved abdominal strength
 5. Enhanced overall muscular strength
 6. Relaxation of muscular strains
 7. Weight control
 8. Increased energy levels
 9. Enhanced immune system
- **Mental**
 1. Relief of stress resulting from the control of emotions
 2. Prevention and relief from stress-related disorders
 3. Intellectual enhancement, leading to improved decision-making skills
 - **Spiritual**
 1. Life with meaning, purpose, and direction
 2. Inner peace and tranquility
 3. Contentment





Course Name: ADDITIONAL MATHEMATICS-I
(For Lateral Entry Students)

Course Code	23MATDIP31	CIE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	-
Total Hours of Pedagogy	50	Total Marks	100
Credits	00	Exam Hours	-

Pre-requisites:

1. Algebraic formulae
2. Differentiation
3. Integration
4. Trigonometric formulae

Module – 1	08 Hours
Linear Algebra Introduction-Rank of matrix by elementary row operations- Echelon form. Consistency of system of linear equations, Solution of linear equations-Gauss elimination method. Eigen values and Eigen vectors of a square matrix. Problems. Self-Study: Gauss Jordan Method	
Module – 2	08 Hours
Differential Calculus: Review of successive differentiation-Illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobian of order two-problems. Self-Study: Taylor's series expansion.	
Module – 3	08 Hours
Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and Vector point functions. Gradient, Divergence and Curl- Simple problems. Solenoidal and irrotational vector fields-Problems. Self-Study: Angle between two surfaces [RBT Levels: L1, L2,L3]	
Module – 4	08 Hours



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Integral Calculus:

Review of elementary integral calculus. Reduction formulae for $\sin^n x$, $\cos^n x$ (with proof) and $\sin^m x \cos^n x$ (without proof) and evaluation of these with standard limits- Examples. Double and triple integrals-Simple problems.

Self-Study: Change of Order of Integration.

Module – 5

08 Hours

Ordinary Differential Equations:

Introduction-Solutions of first order and first degree differential equation: exact, Equation reducible to exact. Linear differential equations and Bernoulli's equation.

Self-Study: Homogeneous differential equations

Course outcomes: Upon Completion of this course, student will be able to,

1. Make use of matrix theory for solving system of linear equations and compute eigen values and Eigen vectors.
2. Learn the notion of partial differentiation to calculate the rate of change of multivariate functions and solve problems related to composite functions and Jacobians
3. Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors
4. Apply the concept of integration and variables to evaluate multiple integrals and their usage in computing the area and the volumes.
5. Solve first-order linear differential equations analytically using standard methods.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B.S.Grewal	Khanna Publishers	43rd Ed.2015
2	Advanced Engineering Mathematics	E. Kreyszig	John Willy & Sons	10th Ed. (Reprint). 2016
3	Additional Mathematics-1	Dr. Pandurangappa	Sanguine Technical Publishers	4th Ed., 2019.
Reference Books				
1	Higher Engineering Mathematics	B.V. Ramana	Tata McGraw-Hill	11th Edition.2010



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**Scheme of Teaching and Evaluation
for
B. Tech., IV Semester
Electrical and Electronics Engg.
(2023 scheme)**



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Course Name: **Applied Mathematics for Electronics and Electrical Engineering**

Course Code:	23MAT41	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3

Pre-requisites: Knowledge of trigonometry, calculus, Basic concepts of Probability, Addition and Multiplication Theorem, signals and systems properties.

Course objectives: This course will enable students

1. To find the association between attributes and the correlation between two variables
2. Aims to provide essential concepts of elementary probability theory.
3. Testing of hypothesis using t-distribution and chi-square distribution.
4. To differentiate a vector variable and Scalar variable and to find angle between surfaces, unit normal vector, directional derivative.
5. To study differentiation of complex variables and to construct analytic function

Module – 1: Curve Fitting, Correlation and regressions

Principles of least squares, Curve fitting by the method of least squares: fitting a straight line in the form $y = ax + b$, fitting a Parabola in the form of $y = ax^2 + bx + c$ and fitting a geometric curve in the form $y = ax^b$. Correlation, Co-efficient of correlation, lines of regression. Angle between regression lines, rank correlation coefficient.

Self- Study: Fitting of curves in the form $y = ae^{bx}$, $y = ab^x$.

Applications: To fit the given data into different curves, Signal approximation, Noise analysis, predictive maintenance.

(RBT Levels: L1, L2 and L3)

07

Hours

Module – 2: Probability

Probability distributions: Review of probability theory. Random variables (discrete and continuous), probability mass density function. Mean and variance of Binomial and Poisson distribution (with proof) and Normal distribution (without proof)-Problems.

Joint probability distribution: Joint probability distribution for two discrete random



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variables, expectation, standard deviation, covariance and correlation.

Self-study: Baye's theorem.

Applications: Control Engineering, operation research, testing and quality control, Noise analysis, System Reliability, Load forecasting.

(RBT Levels: L1, L2 and L3)

09

Hours

Module – 3: Sampling Theory

Introduction to sampling Theory, type-1, type-II errors, Test of hypothesis - Student's t-distribution and Chi-square distribution as a test of goodness of fit.

Self-study: Point estimation and interval estimation

Applications: Communication systems and quality control, Signal processing, data compression in communication, Power systems.

(RBT Levels: L1, L2 and L3)

08

Hours

Module – 4: Vector Calculus

Review of Vector Algebra, Scalar and Vector Point Functions, Gradient of a scalar field, Divergence and Curl of Vector Field. Solenoidal and irrotational vectors, Vector Identities, Physical Interpretation of Divergence and Curl.

Self- Study: Work done, Velocity and Acceleration

Applications: Electromagnetism, Fluid Dynamics, Control systems

(RBT Levels: L1, L2 and L3)

07

Hours

Module – 5: Complex Variables



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Analytic function, Cauchy-Riemann equations in Cartesian and polar form(with proof), Harmonic functions, determination of analytic function when real part or imaginary part is given using Milne-Thompsons method, related problems,

Self- Study:

geometrical representation of $w=f(z)$ by linear transformations, conformer transformations of $w=z^2$ and $w=z+1/z$. Conformal transformation of $w=e^z$

Applications: Applications to flow problems, Signal analysis, Antenna theory, Thermal analysis.

(RBT Levels: L1, L2 and L3)

09

Hours

Course Out comes: at the end of the course students will be able to

CO1: Apply the correlation and regression analysis to fit a suitable mathematical model for the statistical data.

CO2 Will be able to apply binomial, poisons and normal distributions.

CO3 Will be able to test the goodness of fit of the data using t-distribution and chi-square.

CO4: Apply vector calculus to solve problems of Electromagnetic Field, Fluid Dynamics, etc

CO5: Will be able to analyze and study flow problems.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publications, 44 th Ed.,	2021
References from Grewal Textbook Module-1 Curve fitting introduction Pg. no.: 812(24.1), Fitting a parabola- Pg. no.: 825(24.8) Module-2 Probability Introduction pg. no. 857(26.1), Random Variables pg. no.: 871(26.7), Poissons distribution pg.no. 882(26.15) Binomial Distribution pg. no.: 879(26.14) Module-3 Introduction pg. 897(27.1), Testing of Hypothesis pg. 898(27.3), Students t-distribution pg. 905(27.14), Chi-square distribution pg.911 (27.17).				





	Module-4 Vector calculus- Introduction pg. 315(8.1), Scalar and Vector Point Functions pg. 322(8.4), Module-5: C-R equations pg.673 (20.3), Harmonic functions pg. 677(20.5), Analytic functions pg. 674(20.4).			
2	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons,	10 th Ed., 2018
3	Signals & Systems	Simon Haykin, Berry Van Veen	Wiley	2 nd Edition
4	Engineering Mathematics	N P Bali, Dr. Manish Goyal	Laxmi Publications	Volume II
Reference Books				
1	Signals & Systems	Nagoor Kani	McGraw Hill	1 st Edition
2	Signals & Systems	H.P. Hsu, R Ranjan	Schaum's outline series, TMH	Printed in 2005
3	Engineering Mathematics-III	Complex analysis, probability and statistical methods	Dr. K.S.C	Printed in 2020
4	Engineering Mathematics-III	Transform calculus, Fourier series and Numerical Techniques	Dr. K.S.C	Printed in 2019

e-Resources:

<https://www.youtube.com/playlist?list=PLC210462711083C4>
https://youtube.com/playlist?list=PLDhVjW4Yw3zhxehR_lhusOeyfywv03bok&si=KclTDlRcG74g80HM



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Power Electronics			
Course Code	23EE42	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03

Course objectives:

- 1) To give an overview of applications power electronics, different types of power semiconductor devices, their switching characteristics.
- 2) To explain power diode characteristics, types, their operation and the effects of power diodes on RL circuits.
- 3) To explain the techniques for design and analysis of single phase diode rectifier circuits.
- 4) To explain different power transistors, their steady state and switching characteristics and limitations.
- 5) To explain different types of Thyristors, their gate characteristics and gate control requirements.
- 6) To explain the design, analysis techniques, performance parameters and characteristics of controlled rectifiers, DC- DC, DC -AC converters and Voltage controllers.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.





Module-1		08 Hours
Introduction: Applications of Power Electronics, Types of Power Electronic Circuits, Peripheral Effects, Characteristics and Specifications of Switches. Power Diodes: Introduction, Diode Characteristics, Reverse Recovery Characteristics, Power Diode Types, Silicon Carbide Diodes, Silicon Carbide Schottky Diodes, Freewheeling diodes, Freewheeling diodes with RL load. Diode Rectifiers: Introduction, Diode Circuits with DC Source connected to R and RL load, Single-Phase Full-Wave Rectifiers with R load, Single-Phase Full-Wave Rectifier with RL Load.		
Module-2		08 Hours
Power Transistors: Introduction, Bipolar Junction Transistors– Steady State Characteristics, Switching Characteristics, Switching Limits, IGBTs, MOSFET Gate Drive, BJT Base Drive, Isolation of Gate and Base Drives.		
Module-3		08 Hours
Thyristors: Introduction, Thyristor Characteristics, Two-Transistor Model of Thyristor, Methods of Thyristor Turn-On & Turn-Off. Thyristor Types, Series and Parallel Operation of Thyristors, di/dt Protection, dv/dt Protection, Thyristor Firing Circuits, Unijunction Transistor and DIACs.		
Module-4		08 Hours
Controlled Rectifiers: Introduction, Single phase half wave circuit with RL and RLE Load, Freewheeling Diode, Single-Phase Full Converters with RLE Load, Single-Phase Dual Converters, Principle of operation of Three- Phase dual Converters. AC Voltage Controllers: Introduction, Principle of phase control & Integral cycle control, Single-Phase Full-Wave Controllers with Resistive & Inductive Loads, Three-Phase Full-Wave Controllers with loads.		
Module-5		08 Hours
DC-DC Converters: Introduction, principle of step down and step up chopper with RL load, performance parameters, DC-DC converter classification. DC-AC Converters: Introduction, principle of operation single phase bridge inverters, three phase bridge inverters, voltage control of single phase inverters, Harmonic reductions, Current source inverters, single phase power inverter.		
PRACTICAL COMPONENT		
SN	Experiments	





1	Static Characteristics of SCR.
2	Static Characteristics of MOSFET and IGBT.
3	SCR turn on circuit using synchronized UJT relaxation oscillator.
4	SCR digital triggering circuit for a single phase controlled rectifier and ac voltage regulator.
5	Single phase controlled full wave rectifier with R load, R –L load
6	AC voltage controller using TRIAC and DIAC combination connected to R and RL loads.
7	Speed control of DC motor using single semi converter.
8	Speed control of universal motor using ac voltage regulator.
9	Speed control of a separately excited D.C. Motor using an IGBT or MOSFET chopper.
10	Single phase MOSFET/IGBT based PWM inverter.
Open ended experiments	
1	Static Characteristics of TRIAC.
2	Speed control of stepper motor.
Course Outcomes:	
1. Describe the construction, characteristics and applications of power electronics devices. 2. Compare the performance of various power semiconductor devices. 3. Analyze various turn on, turn off and protection methods of thyristors. 4. Design of various single phase converters. 5. Evaluate the performance of choppers and inverters.	
Assessment Details (both CIE and SEE)	
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together	
Continuous Internal Evaluation:	
Three Unit Tests each of 20 Marks (duration 01 hour)	
First test at the end of 5 th week of the semester	
Second test at the end of the 10 th week of the semester	
Third test at the end of the 15 th week of the semester	
Two assignments each of 10 Marks	





Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour)**

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester
4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for 20 Marks (duration 01 hours)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be scaled down to 50 marks

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours**)

- 1) The question paper will have ten questions. Each question is set for 20 marks.
- 2) There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Textbook

- 1) Power Electronics: Circuits Devices and Applications, Mohammad H Rashid, Pearson 4th Edition, 2014.





Reference Books

- 2) Power Electronics, P.S. Bimbhra, Khanna Publishers, 5th Edition, 2012.
- 3) Power Electronics: Converters, Applications and Design, Ned Mohan et al, Wiley 3rd Edition, 2014.
- 4) Power Electronics, Daniel W Hart, McGraw Hill, 1st Edition, 2011.
- 5) Elements of Power Electronics, Philip T Krein, Oxford, Indian Edition, 2008.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Activity Based Learning, Quizzes, Seminars.



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MICROCONTROLLER

IPCC Course Code	23EE43	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	04	Exam Hours	03

Pre-requisites: Students should have basic knowledge of

- Basic ALU Operations and design of adders, subtractors, multiplexers etc.
- Basic CPU architecture and function of a processor
- Basic design and function of microprocessors, memory elements, instructions,
- Programming concepts of C language, data types, and function of the pointer.

Course objectives:

1. To explain the internal organization and working of Computers, microcontrollers and embedded processors.
2. To compare the various members of the 8051 family.
3. To explain the registers SFR's, different addressing modes, Assembly language instructions, data types and assembly programs.
4. To develop 8051C programs for time delay, I/O operations, I/O bit manipulation.
5. To write assembly language programs using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers.
6. To perform interfacing of LCD, sensor, relay, stepper motor and DC motor for controlling the speed.
7. To explain generation of different waveforms using DAC interface.
8. To explain Interfacing External ROM and RAM with 8051 microcontroller.

MODULE – 1	08 hours
8051 Microcontroller Basics: Inside the computer, Microcontrollers and Embedded Processors, Pin details of 8051, Block Diagram of 8051- PC, SP PSW, Internal Memory Organization of 8051- RAM and ROM, SFR's.	
MODULE - 2	08 hours
8051 Addressing modes, Instruction Set and 8051 Assembly Programming: Assembling and running an 8051 program, 8051 Addressing Modes, Data types and Assembler directives. 8051 instruction set and operations. Introduction to 8051 assembly programming: Data transfer programming, Arithmetic programs, Code conversion programs, Call and subroutine operation and programs.	





MODULE - 3	08 hours
8051 Programming in C: Data types and time delay in 8051C, IO programming in 8051C, Logic operations in 8051 C, accessing code ROM space in 8051C, Data serialization using 8051C. 8051 Timer Programming in Assembly and C: Timer registers and modes, Programming 8051 timers 0 and 1 in assembly and in 8051C.	
MODULE - 4	08 hours
8051 Serial Port Programming in Assembly and C: Basics of serial communication, registers and modes, 8051 connections to RS232, 8051 serial port programming in assembly and in 8051C. 8051 Interrupt Programming in Assembly and C: 8051 interrupts and interrupt vector table, interrupt registers, Programming timer interrupts, external hardware interrupts, serial communication interrupt in assembly and 8051C.	
MODULE - 5	08 hours
Output device interfacing: LCD interfacing with 8051. (8051C Programming only) DAC Interfacing: MC 1408 DAC/DAC0808 DAC interfacing and programming (8051C Programming only) Motor Control: motor interfacing: Wave drive 4-step sequence. DC motor interfacing and PWM: DC motor direction control using H-bridge and PWM. (8051C Programming only) 8051 Interfacing with External memory: Memory address decoding, 8031/51 interfacing with external ROM, 8051 data memory space.	

PRACTICAL COMPONENT

SN	Experiments
1	Data Transfer Programs
2	Arithmetic Programs
3	Code Conversion Programs
4	Counters Programs
5	Stepper motor interface
6	DAC interfacing,
7	LCD panel interfacing
8	Elevator interfacing
9	DC motor interfacing

Course Outcomes:

- CO-1 **Illustrate** the 8051 architecture, registers, internal memory organization, addressing modes.
 CO-2 **Demonstrate** the programming proficiency using various addressing modes and instructions.
 CO-3 **Develop** 8051C programs for time delay, I/O operations, I/O bit manipulation, logic





and arithmetic operations, data conversion and timer/counter programming.

CO-4 **Develop** 8051 assembly and embedded C programs for serial data communication and interrupt programming.

CO-5 **Demonstrate** the interfacing of microcontroller with various peripheral devices.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	The 8051 Microcontroller and Embedded Systems Using Assembly and C	Muhammad Ali Mazadi	Pearson/PHI	2nd Edition, 2008.
Reference Books				
1	The 8051 Microcontroller,	Kenneth Ayala	Cengage	3rd Edition, 2005.
2	Microcontrollers: Architecture, Programming, Interfacing and System Design	Raj Kamal	Pearson	1st Edition, 2012





ELECTRICAL MACHINES – II (ELECTRIC MOTORS)			
Subject Code	23EE44	CIE Marks	50
Number of Lecture Hours/Week	3:0:0	SEE Marks	50
Credits	03	Exam Hours	03
Pre-requisites: • Fundamentals of AC and DC circuits. • Constructional details of AC and DC motors. • Construction of 3-phase induction motor			
Module-1		08 Hours	
DC Motors: Principle of operation, Classification, Back emf, significance of back emf and Torque equation, Characteristics of shunt, series & compound motors. Speed control of shunt and series motors. 3 point starter. Losses and Efficiency- Losses in DC motors, power flow diagram, efficiency, condition for maximum efficiency, application of DC motors.			
Module-2		08 Hours	
Testing of DC Motors: Direct & indirect methods of testing of DC motors-Brake test, Swinburne’s test, Retardation test, Hopkinson’s test, Field’s test, merits and demerits of tests. Three Phase Induction Motors: Review concept of rotating magnetic field, Principle of operation, construction, classification: squirrel-cage, slip-ring. Slip, significance of slip, Torque equation, torque-slip characteristic covering motoring, generating and braking regions of operation, Maximum torque.			
Module-3		08 Hours	
Performance of Three-Phase Induction Motor: Phasor diagram of induction motor on no-load and on load, power flow diagram, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the circle diagram and determination of equivalent circuit parameters. Cogging and crawling. High torque rotors-double cage and deep rotor bars. Equivalent circuit and performance evaluation of double cage induction motor. Induction motor working as induction generator.			
Module – 4		08 Hours	
Starting and Speed Control of Three-Phase Induction Motors: Need for starter. Direct on line, Star- Delta and autotransformer starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods. Single-Phase Induction Motor: Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run and shaded pole motors. Comparison of single phase motors and applications.			





Module – 5				08 Hours
Synchronous Motor: Principle of operation, Methods of starting synchronous motors, phasor diagrams, torque and torque angle, effect of change in load, effect of change in excitation, V and inverted V curves. Applications of Synchronous motor, hunting and damping. Special Motors: Construction and operation of Universal motor, BLDC Motor, Permanent Magnet Synchronous Motor (PMSM), Written Pole Motor and stepper motors.				
Course Outcomes: After studying this course, students will be able to: 1. Determine the losses and efficiency of DC machines by direct and indirect tests. 2. Analyze the performance characteristics of 3-Φ induction motors. 3. Discuss the speed control methods of DC and AC motors. 4. Compare construction, operation, characteristics, and applications of 1-Φ induction motors and special motors. 5. Analyze the performance characteristics of synchronous motor.				
Text Books				
1	Electric Machines	D. P. Kothari, et al	McGraw Hill	4 th edition 2011
2	Electric Machines	Ashfaq Hussain	Dhanpat Rai & Co	2 nd edition, 2013
3	Theory of Alternating Current Machines	Alexander Langsdorf	McGraw Hill	2nd Edition, 2001
Reference Books				
1	Electrical Technology	J B Gupta	Pustak Kosh	2nd Edition
2	Theory of Alternating Current Machines	Alexander Langsdorf	McGraw Hill	2nd Edition, 2001
3	Principals of Electrical Machines	V.K Mehta, Rohit Mehta	S Chand	2nd edition, 2009
4	Electrical Machines	S.K. Sahadev	Cambridge University Press	ISBN:978-7-108-43106-4.





Electrical Machines Laboratory – II			
Course Code	23EEL45	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Credits	01	Exam Hours	03
Total Hours of Pedagogy	20	Total Marks	100
List of experiments			
Sl no	Experiments		
1	Load test on DC shunt motor to draw speed–torque and horse power–efficiency characteristics.		
2	To obtain speed control of dc shunt motor using (a) Armature resistance control (b) Field control.		
3	Swinburne's Test on DC motor.		
4	Regenerative test on DC shunt machines (or) Hopkinson's test of dc machine.		
5	Retardation Test.		
6	Load test on three phase induction motor.		
7	No-load and Blocked rotor test on single phase induction motor to draw i) equivalent circuit and ii) circle diagram.		
8	No-load and Blocked rotor test on three phase induction motor to draw i) equivalent circuit and ii) circle diagram.		
9	Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.		
10	Conduct an experiment to draw V curves of the synchronous motor from synchronization of the alternator.		
	Open ended experiments		
1	Reverse rotation of 3-phase induction motor.		
2	Speed control of 3-phase induction motor by stator supply voltage control method.		
Course outcomes:			
1. Conduct an experiment to control the speed of DC Shunt motor by armature and field control methods.			
2. Determine the losses and efficiency of DC machines by conducting direct and indirect loading tests.			
3. Assess performance characteristics of DC shunt motor, 1-Ø induction motor and 3-Ø induction motor by performing load test.			





4. Analyze the performance characteristics of 1- ϕ and 3- ϕ induction motors by conducting No-load and Blocked rotor tests.
5. Perform experiment on synchronous motor to draw V-curves and Inverted V-curves for different loads.





ELECTROMAGNETIC FIELD THEORY			
Course Code	23EE46	CIE Marks	50
Number of Lecture Hours/Week	3:0:0	SEE Marks	50
Credits	03	Exam Hours	03
Course Learning Objectives: - To study different coordinate systems to understand the concept of gradient, divergence and curl of a vector. - To study the application of Coulomb’s Law and Gauss Law for electric fields produced by different charge configurations. - To evaluate the energy and potential due to a system of charges. - To study the behavior of an electric field across a boundary between a conductor and dielectric and between two different dielectrics. - To study the magnetic fields and magnetic materials. - To study the time-varying fields and propagation of waves in different media.			
Module-1		08 Hours	
Vector Analysis: Scalars and Vectors, Vector algebra, , Vector Components and unit vectors. Scalar field and Vector field. Co – ordinate systems: cartesian, cylindrical and spherical, relation between different coordinate systems, Dot product and cross product in three coordinate systems. Electrostatics: Coulomb’s law in vector form, Electric field intensity and its evaluation for (i) point charge (ii) line charge (iii) surface charge (iv) volume charge distributions. Electric flux density, Gauss law and its applications. Maxwell’s first equation (Electrostatics). Divergence theorem.			
Module-2		08 Hours	
Energy and Potential: Energy expended in moving a point charge in an electric field. The line integral. Definition of potential difference and potential. The potential field of a point charge and of a system of charges. Potential gradient. The dipole. Energy density in the electrostatic field. Conductor and Dielectrics: Current and current density. Continuity of current. Metallic conductors, conductor’s properties and boundary conditions. Perfect dielectric materials, capacitance calculations. Parallel plate capacitor with two dielectrics and conductor interface parallel to the conducting plates.			
Module-3		08 Hours	
Poisson’s and Laplace Equations: Derivations and problems, Uniqueness theorem. Steady magnetic fields: Biot - Savart’s law, Ampere’s circuital law. The concept of Curl. Stokes’ theorem. Magnetic flux and flux density. Scalar and vector magnetic potentials.			





Module-4				08 Hours
Magnetic forces: Force on a moving charge and differential current element. Force between differential current elements. Force and torque on a closed circuit.				
Magnetic Materials and Magnetism: Nature of magnetic materials, magnetisation and permeability. Magnetic boundary conditions. Magnetic circuit, inductance and mutual inductance.				
Module-5				08 Hours
Time Varying Fields and Maxwell’s Equations: Maxwell’s equation for static field: Differential and integral form, Faraday’s law, Displacement current. Maxwell’s equations in point form and integral form..				
Uniform plane wave: Wave propagation in free space and in dielectrics. Conduction current and relationship between their Pointing vector, Pointing theorem, power considerations. Propagation in good conductors, skin effect and interinsic impedance.				
Course Outcomes: At the end of the course the student will be able to: • Use different coordinate systems , Coulomb’s Law and Gauss Law for the evaluation of electric fields produced by different charge configurations. • Calculate the energy and potential due to a system of charges & Explain the behavior of electric field across a boundary conditions. • Explain the Poisson’s, Laplace equations and behavior of steady magnetic fields. • Explain the behavior of magnetic fields and magnetic materials. • Asses time varying fields and propagation of waves in different media.				
Question paper pattern: • The question paper will have ten questions. • Each full question is for 20 marks. • There will be 2 full questions (with a maximum of three sub questions in one full question) from each module. • Each full question with sub questions will cover the contents under a module. • Students will have to answer 5 full questions, selecting one full question from each module.				
Text Books:				
1	Engineering Electromagnetics	William H Hayt et al	McGraw Hill	8 th Edition, 2014
2	Principles of Electromagnetics	Matthew N. O. Sadiku	Oxford	6 th Edition, 2015
3	Electromagnetic Field theory	R. A. BARAPATE	TechNeo Publications/Target Publications	ISBN-10 : 9391472826 ISBN-13 : 978-9391472825





Reference Books:

1	Fundamentals of Engineering Electromagnetics	David K. Cheng	Pearson	2014
2	Electromagnetism -Theory (Volume -1) -Applications (Volume-2)	Ashutosh Pramanik	PHI Learning	2014
3	Electromagnetic Field Theory Fundamentals	Bhag Guru	Cambridge	2005
4	Electromagnetic Field Theory	Rohit Khurana	Vikas Publishing	1 st Edition, 2014
5	Electromagnetics	J. A. Edminister	McGraw Hill	3 rd Edition, 2010



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PROFESSIONAL SKILLS FOR THE WORK PLACE

Course Code	23PSW47	CIE Marks	50
Teaching Hours / Week (L:T:P)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	30	Total Marks	100
Credits	01	Exam Hours	01

Pre-requisites:

1. Basic Conversational English
2. Fundamentals of Mathematics
3. Basic Knowledge of Reasoning

Module – 1	06 Hours
Communication Skills Basic Tools of Communication, Listening Skills, Body Language, Voice, Verbal Language, Conversations in Professional Setting	
Module – 2	06 Hours
Presentation Skills Zero Presentation, Individual Presentations, Feedback, Types of Introductions, Captivating the Audience, Interaction Methods, Signing off.	
Module – 3	06 Hours
Verbal & Numerical Ability Vocabulary is Fun, Root Words, Sentence Structures, Bouncing, Similar and Opposite Words, Common Errors, Number System, Factors and Multiples.	
Module – 4	06 Hours
English Language Phonetic and Non-phonetic Languages, sounds in English, IPA, Syllables, Word Stress, Stress patterns in Indian languages vs English, Pausing and Rhythm in English, Sentence Structures, Bouncing, Common Errors.	
Module – 5	06 Hours
Verbal Ability and Verbal Reasoning Similar and Opposite words, Number and Alphabet Series, Human Relations, Direction Tests, Coding Decoding, Clocks and Calendars	

Course Outcomes:

1. Demonstrate communicative ability in a professional environment



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2. Articulate one's ideas and demonstrate them to an audience
3. Transform one's English Vocabulary and Language Structure
4. Interpret international phonetic symbols, stress patterns, and enhance English speech
5. Identify patterns, determine the problem-solving process & validate solutions

Suggested learning resources:

SN	Title of the Book	Name of the Author / s	Name of the Publisher	Edition and Year
Textbooks				
1	Reasoning N' Reasoning - Verbal & Non-verbal Reasoning	Dr. Ravi Chopra	Galgotia	1994
2	Magical Book on Quicker Math	M. Tyra	BSC	I Edition, 2018
3	Communicate With Confidence	Diana Booher	Mc-Graw-Hill	Nov 2011
Reference Books				
1	Cambridge Advanced Learner's Dictionary	Cambridge University Press	CBS	IV Edition, 2013
2	A Modern Approach to Verbal and Non-verbal Reasoning	R S Agarwal	S Chand	II Edition, 2018
3	Word Power Made Easy	Norman Lewis	Goyal Publishers	IV Edition, 2014
4	Speak With Confidence	Diana Booher	Mc-Graw-Hill	I Edition, 2002



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Course Name: Universal Human Values

Course Code	23UH48	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Credits	01	Exam Hours	02
Total Hours of Pedagogy	15	Total Marks	100
Module – 1			03 Hours
Introduction to Value Education Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education). Understanding Value Education, Self-exploration as the Process for Value Education, Continuous. Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations			
Module – 2			03 Hours
Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.			
Module – 3			03 Hours
Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.			
Module – 4			03 Hours
Harmony in the Nature/Existence Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.			
Module – 5			03 Hours
Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.			



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Course outcomes

1. Holistic vision of life.
2. Socially responsible behavior.
3. Environmentally responsible work.
4. Ethical human conduct.
5. Having Competence and Capabilities for Maintaining Health and Hygiene.
6. Appreciation and aspiration for excellence (merit) and gratitude for all.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	2nd Revised Edition, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G		
Reference Books				
1	Jeevan Vidya., Jeevan	E K Parichaya, A Nagaraj	Vidya Prakashan, Amarkantak	1999
2	Human Values,	A.N. Tripathi	New Age Intl. Publishers, New Delhi	2004

Teaching-Learning Process:

Various instructional methods and pedagogical initiatives used for teaching learning process of various courses are: Power point presentations, Videos, Moocs, Demo models, Flipped class rooms, Problem based learning, Project based learning, Collaborative learning, Group discussion.





ADDITIONAL MATHEMATICS-II
(For Lateral Entry Students)

Course Code	23MATDIP41	CIE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	-
Total Hours of Pedagogy	40	Total Marks	100
Credits	0	Exam Hours	-

Pre-requisites:

1. Differentiation
2. Integration
3. Trigonometric formulae
4. Differential equations

Module – 1	08 Hours
Higher Order ODE's Linear Differential equations of second and higher-order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators.[Particular integral restricted to $\phi(x) = e^{ax}, \sin ax, \cos ax$ for $f(D)y = \phi(x)$ Self-Study: Finding particular Integral for $\phi(x) = x^m$	
Module – 2	08 Hours
Partial Differential Equations (PDE's): Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDE involving derivative with respect to one independent variable only. Self-Study: Method of separation of variables	
Module – 3	08 Hours
Laplace Transform: Definition, Laplace transforms of elementary functions. Laplace transform of $e^{at}f(t)$, $t^n f(t)$ (without proof). Laplace transform of Periodic functions (statement only) and Unit-step function- problems. Inverse Laplace Transform: Definition, Inverse Laplace Transform of standard functions. Inverse transform by Partial Fraction Method. Apply the concepts of Laplace Transforms to find the solution of linear differential equations. Self-Study: Convolution Theorem.	
Module – 4	08 Hours
Numerical Methods:	





Solution of algebraic and transcendental equations by Newton-Raphson method and Secant method. Interpolation: Newton's Forward and Backward Interpolation formulae, Newton's divided difference formula, Lagrange's Interpolation formula without proof problems.

Numerical Integration: Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule (without proof) - problems.

Self-Study: Weddle's Rule

Module – 5

08 Hours

Probability:

Introduction, sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes' theorem. Problems.

Self-Study: Applications of Bayes' theorem

Course outcomes:

1. Upon completion of this course, student will be able to,
2. Demonstrate various physical models through higher order differential.
3. Construct a variety of partial differential equations and solution by various methods.
4. Use Laplace Transform and inverse Laplace Transform in solving differential /integral equation arising in network analysis, control systems and other fields of engineering
5. Apply the knowledge of numerical methods in the modeling of various physical and engineering phenomena.
6. Use the concepts of probability in different probability distribution.

Suggested Learning Resources:

SN	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B.S.Grewal	Khanna Publishers	43rd Ed.2015
2	Advanced Engineering Mathematics	E. Kreyszig	Jhon willy & Sons	10th Ed. (Reprint) 2016
3	Additional Mathematics-2	Dr. Pandurangappa	Sanguine Technical Publishers	4Th Ed., 2019.
Reference Books				
1	Higher Engineering Mathematics	B.V.Ramana	Tata McGraw-Hill	11th Edition.2010





SUGGESTED TEACHING-LEARNING PROCESS

The faculty members are suggested to use appropriately the following Teaching Learning methods:

1. Active Learning
2. Chalk and Board for Numerical
3. Demonstration using simulator
4. Laboratory Demonstrations
5. PowerPoint Presentations
6. Problem-based learning
7. Video Lecturers





TEACHING-LEARNING PROCESS

The Course faculty and students are recommended to follow the appropriate strategies to facilitate the teaching and learning process. The following are some of the suggested teaching-learning methods but not limited to:

- ◆ Blackboard presentation
- ◆ PowerPoint Presentation
- ◆ Demonstration through YouTube videos
- ◆ Demonstration through ICT Tools / Simulation tools / Virtual Labs Industrial Visits
- ◆ Self-Study, Case Study
- ◆ Flipped Class Room, Google Class Room

Assessment Details

1. Professional Core / Basic Science /ESC/ETC/PLC courses (Theory):

a) Continuous Internal Evaluation (CIE):

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3	60%	30
(ii)	Alternate Assessment Tools(AAT) (B)	3	40%	20
	Total Marks			50

Final CIE Marks = (A) + (B) = 30 + 20 = 50

b) Semester End Examination (SEE) Question paper pattern:

1. The question paper will have ten full questions carrying equal marks. Each full question will be for 20 marks.
 2. There will be two full questions (with a maximum of four sub- questions) from each module. Each full question will have sub- question covering all the topics under a module.
 3. The students will have to answer five full questions, selecting one full question from each module.
 4. SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE.
- Marks secured will be scaled down to 50.





2. Professional Core Course (PCC) Lab:

Continuous Internal Evaluation (CIE):

	Components	Weightage	Max. Marks
(i)	Lab Work: Conduction of Experiments (A)	40%	20
(ii)	Lab Journal Writing & Submission (B)	10%	05
(iii)	Lab Test (C)	30%	15
(iv)	Open-Ended Experiments (D)	20%	10
Total			50

Semester End Evaluation (SEE):

1. All laboratory experiments are to be included for practical examination
2. Students can pick one experiment from the lot with equal choice to all the students in a batch.
3. Change of experiment is allowed only once and 15% marks allotted to the procedure part to be made zero.
4. Marks distribution: Procedure (15%) + Execution (70%) + Viva Voce (15%)

3. Ability Enhancement Course (AEC)/Skill Enhancement course (SEC) (Theory), Universal human values Course (22UH48):

Assessment Details of CIE

	Components	Number	Weightage	Max. Marks
(i)	Tests (A)	3	60%	30
(ii)	Alternate Assessment Tools (AAT) (B)	3	40%	20
Total Marks				50

Final CIE Marks = (A) + (B) SEE Guidelines for the Courses

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Suggested Alternate Assessment Tools for PCC, IPCC and AEC Courses:





1. Quiz
2. Assignments
3. Seminars / Presentations
4. Paper Publications
5. Mini Projects
6. MOOCs
7. Industrial Visits and Report Writing
8. Self-learning with Certifications and
9. Cooperative and problem based learning.



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