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Shri Ramdeobaba College of
Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR – 440013

An Autonomous College affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME (NEP-2020)

2023-2024

B. TECH. (ELECTRICAL ENGINEERING)

Salient Features of the Department

- The Department of Electrical Engineering was established in the year 1984 with a sanctioned UG intake of 60 students. The National Board of Accreditation has accredited the UG program five times in succession in the year 2001, 2006, 2012, 2017 and 2020. Presently, the Electrical Engineering Department also has a post graduate program (M. Tech. in Power Electronics and Power Systems) with sanctioned intake of 12, started from 2011. Department is a Recognized Research Centre, approved by RTM Nagpur University for Doctoral program and has sixteen well-equipped laboratories.
- The department has well qualified and experienced faculty with industrial background and comprises of one Professor, three Associate Professors and nine Assistant Professors on roll. They have undertaken many consultancy projects and have been granted patent by government of India. Also, the faculty members are working on various research projects sponsored by different funding agencies including AICTE, RGSTC and UBA.
- The department has a conducive environment for the academic and overall development of students. Two student bodies are active in the department. One is the IEEE Student Joint Chapter and the other one is Electrical Engineering Students Association (EESA). They provide a platform for promoting the curricular, co-curricular and extracurricular students activities. The students of this department actively participate in sports and represent the college at various levels. Students are keenly interested in contributing for social cause and join the National Service Scheme (NSS) activities. Department organizes Seminars, Guest lectures, Value Added courses, Training programs and Product exhibitions for the students. Students get opportunity to enhance their technical skill by participating in the training program like PLC based automation, Photovoltaic Plant Design and Installation, IoT Applications etc. The curricula of both UG & PG programs is designed as per choice based credit system and current requirements of industry.
- There is a provision by which students can qualify and secure the award of Minor Specialization in any other discipline of their interest like Computer Science, Electronics, Mechanical etc. This is in addition to the degree belonging to core branch of Electrical Engineering. Such blend of two qualifications during the same period of four years increases the employability of students multiple times.
- To introduce the graduating students to the latest developments in the industry, the department organizes Technical Workshop cum Exhibition named “EMPOWER". This mega event was organized in the department for five times in year 2012, 2013, 2014, 2017 and 2018. Reputed companies namely ABB Limited, ARCTIC Infra Tech, GRANDSTREAM, Grundfos, Hager, Hioki, KEI Cables, L&T, Powerica, Wipro, Bergen, Biosys, HP, Rockwell Automation, Schneider, Siemens, Texas Instruments, Finolex, Highrise Transformers, TDK, Waree, Gentech, Synergy, VSP aqua mist etc. participated in the exhibition with the wide range of products to display.
- On academic front, the department results are consistently good. The department has an IEntrepreneur Development Cell to develop the entrepreneurial skills among the students. The department highly encourages the industry interaction. Students are permitted to avail one full semester internship in industry without any academic load in the college. So far, every year more than 80% students get placed in different companies through on-campus drive with multiple job-offers in hand even before the completion of final year of graduation. Many students have secured admission at IITs, NITs and other higher ranked institutes including foreign universities for their Masters’ education.

Department Vision

Department of Electrical Engineering endeavors to be one of the best departments in India having expertise to mould the students to cater the needs of society in the field of technology, leadership, administration, ethical and social values.

Department Mission

To provide dynamic and scholarly environement for students to achieve excellence in core electrical and multidisciplinary fields by synergetic efforts of all stake holders of the Electrical Engineering Department and inculcate the ethical and social values.

Program Educational Objectives

PEO1: Our graduates will be able to plan, design, operate and practice in electrical and energy systems.

PEO2: Our graduates will be able to work in multidisciplinary environments including IT applications and adapt themselves as per the emerging technological needs of Industry.

PEO3: Our graduates will be able to progress in their career by demonstrating in practice the technical and communication skills effectively with understanding of ethical and social values.

Program Outcomes

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals to the solution of engineering problems.

PO2. Problem analysis: Identify, formulate, review literature, and analyze complex engineering problems using first principles of mathematics, natural sciences and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineeing problems and design system components or processes that meet the specified needs with appropriate consideration for the public safety, societal and environmental considerations.

PO4. Conduct problem investigations: Use research-based knowledge including experimentation, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Select, and apply appropriate techniques, resources, and modern engineering and IT tools for analyzing the engineering activities with an understanding of the limitations.

PO6. The engineer, industry and society: Apply contextual knowledge to assess industrial, societal and safety related issues and understand consequent relevance to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities such as, being able to understand and write effective reports, make effective presentations and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes

PSO1: Analyze ,design and develop Electrical Engineering systems considering green energy aspects in emerging applications like Electric vehicles, renewable energy etc.

PSO2: Apply the knowledge of modern IT tools to Electrical Engineering applications.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering

Teaching and Evaluation Scheme B.Tech (Electrical Engineering) NEP-2020 based

Sr.No	Verticals	Courses and Abbreviations	
1	Basic and Engineering Science Courses and their Combinations to be offered in Mission Mode	Basic Science Course	**BSC**
		Engineering Science Course	**ESC**
2	Major Core Program Courses	Programme Core Course	**PCC**
		Programme Elective Course	**PEC**
3	Compulsory Multidisciplinary Minor	Multidisciplinary Minor	**MDM**
4	Generic/ Open Elective Courses;	Open Elective Other than a particular program	**OE**
5	Vocational and Skill Enhancement Courses	Vocational Skill Course	**VSC**
		Skill enhancement courses	**SEC**
6	Humanities Social Science and Management (HSSM)	Ability Enhancement Course (AEC -01, AEC-02)	**AEC**
		Research Methodology	**RM**
		Entrepreneurship/Economics/ Management Courses	**HSSM**
		Indian Knowledge System	**IKS**
		Value Education Course	**VEC**
7	Field projects/ internship/ apprenticeship/ community engagement projects corresponding to the Major (core) subject,	Research Methodology	**RM**
		Community Engagement Projects (CEP)/Field Project	**FP**
		Project-I	**Project**
		Internship/Project-II/OJT	**OJT**
8	Co-curricular Courses	Co-curricular Courses	**CCA**

Semester-I

Sr. No.	Code	Course	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Continuous Evaluation	End Sem Exam	Total		
1.	PHT1001	Physics for Electrical Engineers	2	1	0	3	50	50	100	3	BSC
2.	PHP1001	Physics for Electrical Engineers Lab	0	0	2	1	50	--	50	--	BSC
3.	MAT1001	Applied Mathematics-I	2	1	0	3	50	50	100	3	BSC
4.	MAP1001	Computational Mathematics Lab	0	0	2	1	50	--	50	--	BSC
5.	EET1002	Industrial Safety	1	0	0	1	50	--	50	--	BSC
6.	EET1001	Basic Electrical Engineering-I	3	0	0	3	50	50	100	3	PCC
7.	EEP1001	Electrical Workshop	0	0	2	1	50	--	50	--	VSC
8.	HUT1002	English for Professional Communication	2	0	0	2	50	50	100	2	AEC
9.	HUP1002	English for Professional Communication Lab	0	0	2	1	50	--	50	--	AEC
10.	MET1004	Engineering Graphics	2	0	0	2	50	50	100	2	ESC
11.	MEP1004	Engineering Graphics Lab	0	0	2	1	50	--	50	--	ESC
12.	HUT1004	Foundational Course in Universal Human Values	1	0	0	1	50	--	50	--	VEC
13.		Liberal / Performing Art Lab	0	0	2	1	50	--	50	--	CCA
		TOTAL	**13**	**02**	**12**	**21**					

Semester - II

Sr. No.	Code	Course	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Continuous Evaluation	End Sem Exam	Total		
1.	CHT2003	Chemistry for Electrical Engineers	2	0	0	2	50	50	100	2	BSC
2.	CHP2003	Chemistry for Electrical Engineers Lab	0	0	2	1	50	--	50	--	BSC
3.	MAT2001	Applied Mathematics-II	2	1	0	3	50	50	100	3	BSC
4.	EET2002	Programming Skill	3	0	0	3	50	50	100	3	ESC
5.	EEP2002	Programming Skill Lab	0	0	2	1	50	--	50	--	ESC
6.	EET2001	Basic Electrical Engineering-II	3	0	0	3	50	50	100	3	PCC
7.	EEP2001	Basic Electrical Engineering-II Lab	0	0	2	1	50	--	50	--	PCC
8.	HUT2001	Foundational Literature of Indian Civilization	2	0	0	2	50	50	100	2	IKS
9.	PET2001	Sports-Yoga-Recreation	1	0	0	1	50	--	50	--	CCA
10	PEP2001	Sports -Yoga-Recreation Lab	0	0	2	1	50	--	50	--	CCA
11.	EET2003	Analog Electronic Circuits	2	0	0	2	50	50	100	2	ESC
12.	EEP2003	Analog Electronic Circuits Lab	0	0	2	1	50	--	50	--	ESC
		TOTAL	**15**	**01**	**10**	**21**					

Exit option: Award of UG Certificate in Major after the completion of 42 credits and an additional 8 credits.						
Sr. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credits
1	EETE2001	Electrical Maintenance	3	0	0	3
2	EETE2002	Electrical Appliances	3	0	0	3
3	EEPE2003	Internship	Four weeks			2
OR						
1	EEPE2004	Project/ Internship/On-Job Training (OJT)				8

Semester III

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Conti-nuous Evaluation	End Sem Exam	Total		
1.	MAT3006	Mathematics for Electrical Engineering	2	0	0	2	50	50	100	2	ESC
2.	EET3001	Network Analysis	3	1	0	4	50	50	100	3	PCC
3.	EEP3001	Network Analysis Lab	0	0	2	1	50	--	50	--	PCC
4.	EET3002	Electrical Measurements and Instrumentation	2	1	0	3	50	50	100	3	PCC
5.	EEP3002	Electrical Measurements and Instrumentation Lab	0	0	2	1	50	--	50	--	PCC
6.	EET3003	Data Structures and Algorithms	3	0	0	3	50	50	100	3	MDM
7.	EEP3003	Data Structures and Algorithms Lab	0	0	2	1	50	--	50	--	MDM
8.	EET2980	Open Elective-I	2	0	0	2	50	50	100	2	OE
9.	CHT3001	Environmental Science	2	0	0	2	50	50	100	2	VEC
10.	HUT3001	Business Communication	2	0	0	2	50	50	100	2	AEC
		TOTAL	**16**	**02**	**06**	**21**					

Semester IV

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Conti-nuous Evaluation	End Sem Exam	Total		
1.	EET4001	Signals and Systems	2	1	0	3	50	50	100	3	PCC
2.	EET4002	Electrical Machines-I	2	1	0	3	50	50	100	3	PCC
3.	EEP4002	Electrical Machines-I Lab	0	0	2	1	50	--	50	--	PCC
4.	EET4003	Power System-I	3	0	0	3	50	50	100	3	PCC
5.	EET4004	Digital Circuits and Microprocessor	3	0	0	3	50	50	100	3	PCC
6.	EEP4004	Digital Circuits and Microprocessor Lab	0	0	2	1	50	--	50	--	PCC
7.	EET2990	Open Elective-II	3	0	0	3	50	50	100	3	OE
8.	EET4005	Electrical Control Panel Design	1	0	0	1	50	--	50	--	VSC
9.	EEP4005	Electrical Control Panel Design Lab	0	0	2	1	50	--	50	--	VSC
10.	EEP4006	Field Project / Community Engagement Project	0	0	4	2	50	--	50	--	FP/CEP
11.	HUT4004	Constitution of India	2	0	0	2	50	50	100	2	VEC
12.	IDT4510	Creativity, Innovation and Design Thinking	1	0	0	1	50	--	50		SEC
		TOTAL	**17**	**02**	**10**	**24**					

Exit option: Award of UG Diploma in Major after the completion of 87 credits and an additional 8 credits.						
Sr. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credits
1		**Any two of following courses:**	3	0	0	3
	EETE4001 EETE4002 EETE4003 EETE4004	Electrical Energy Conservation and Audit Utilization of Electrical Energy PLC Programming Computer Aided Electrical Engineering Drawing	3	0	0	3
2	EEPE4005	Internship	Four weeks			2
OR						
1	EEPE4006	Project/ Internship/On-Job Training(OJT)				8

Semester V

Sr. No.	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Conti-nuous Evaluation	End Sem Exam	Total		
1.	EET5001	Electrical Machines-II	2	1	0	3	50	50	100	3	PCC
2.	EEP5001	Electrical Machines-II Lab	0	0	2	1	50	--	50	--	PCC
3.	EET5002	Power Electronics	3	1	0	4	50	50	100	3	PCC
4.	EEP5003	Power Converters Lab	0	0	2	1	50	--	50	--	PCC
5.	EET5004	Microcontroller	3	0	0	3	50	50	100	3	PCC
6.	EEP5004	Microcontroller Based Automation Lab	0	0	2	1	50	--	50	--	SEC
7.	EET5005	Program Elective-I	3	0	0	3	50	50	100	3	PEC
8.	EET5006	Object Oriented Programming	3	0	0	3	50	50	100	3	MDM
9.	EEP5006	Object Oriented Programming Lab	0	0	2	1	50	--	50	--	MDM
10.	EET3980	Open Elective-III	3	0	0	3	50	50	100	3	OE
11.	EEP5007	Simulation Lab	0	0	2	1	50	--	50	--	SEC
		TOTAL	**17**	**02**	**10**	**24**					

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Program Elective-I

V Sem	1	Electromagnetic Fields PHT5001	Electrical Energy Conservation and Audit EET5005-1	Utilization of Electrical Energy EET5005-2	Applied Mechanics CET5015	Biology for Engineers IDT5510

Semester VI

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Conti-nuous Evaluation	End Sem Exam	Total		
1.	EET6001	Power System–II	3	0	0	3	50	50	100	3	PCC
2.	EEP6001	Power System–II Lab	0	0	2	1	50	--	50	--	PCC
3.	EET6002	Control Systems	3	1	0	4	50	50	100	3	PCC
4.	EEP6003	Feedback Control Lab	0	0	2	1	50	--	50	--	PCC
5.	EET6004	Database Management Systems	3	0	0	3	50	50	100	3	MDM
6.	EEP6004	Database Management Systems Lab	0	0	2	1	50	--	50	--	MDM
7.	EET6005	Program Elective-II	3	0	0	3	50	50	100	3	PEC
8.	EET6006	Program Elective-III	3	0	0	3	50	50	100	3	PEC
9.	EEP6006	Program Elective-III Lab	0	0	2	1	50	-	50	--	SEC
10.	EET6007	Innovation and Entrepreneurship	2	0	0	2	50	50	100	2	HSSM
11.	EEP6008	Project Phase-I	0	0	2	1	50	--	50	--	Project
		TOTAL	**17**	**01**	**10**	**23**					

Program Elective – II and III

Sem	***Program Elective***	***Power System Track***	***Control, Automation and Drives Track***	***Renewable Energy & Electric Vehicle***
6	II	Power Station Practice EET6005-1	Electric Drives and Control EET6005-2	Non-Conventional Energy Sources EET6005-3
	III(T)	Electrical Machine Design EET6006-1	PLC and SCADA EET6006-2	Photovoltaic System Engineering EET6006-3
	III(L)	Electrical Workshop-II EEP6006-1	PLC and SCADA Lab EEP6006-2	Photovoltaic System Engineering Lab EEP6006-3

Exit option: Award of B.Voc in Major after the completion of 134 credits and an additional 8 credits.						
Sr. No.	Course Code	Course Title	Lecture	Tutorial	Practical	Credits
1		**Any two of following:**	3	0	0	3
	EETE6001 EETE6002 EETE6003	Industrial Electrical Systems Power Quality in Industries Electric Vehicles	3	0	0	3
2	EEPE6005	Internship	Four weeks			2
OR						
1	EEPE6006	Project/Internship/On-Job Training(OJT)				8

Semester VII

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Continuous Evaluation	End Sem Exam	Total		
1.	EET7001	Switchgear and Protection	3	0	0	3	50	50	100	3	PCC
2.	EEP7001	Switchgear and Protection Lab	0	0	2	1	50	--	50	--	PCC
3.	EET7002	Electric Vehicles	3	0	0	3	50	50	100	3	PCC
4.	EET7003	Program Elective-IV	3	0	0	3	50	50	100	3	PEC
5.	EEP7003	Program Elective-IV Lab	0	0	2	1	50	--	50	--	PEC
6.	HUT7001	Principles of Economics and Management	2	0	0	2	50	50	100	2	HSSM
7.	EEP7004	Project Phase-II	0	0	6	3	50	50	100	--	Project
		TOTAL	**11**	**00**	**10**	**16**					

Program Elective-IV

Sem	***Program Elective***	***Power System Track***	***Control, Automation and Drives Track***	***Renewable Energy & Electric Vehicle***
7	IV(T)	High Voltage Engineering EET7003-1	Digital Signal Processing EET7003-2	IoT Applications for Energy EET7003-3
	IV(L)	High Voltage Engineering Lab EEP7003-1	Digital Signal Processing Lab EEP7003-2	IoT Applications for Energy Lab EEP7003-3

Semester VIII

Sr. No.	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)	Category
			L	T	P		Conti-nuous Evaluation	End Sem Exam	Total		
1.	EET8001	Program Elective-V	3	0	0	03	50	50	100	3	PEC
2.	EET8002	Program Elective-VI	3	0	0	03	50	50	100	3	PEC
3.	EEP8003	Project Phase-II	0	0	12	06	100	100	200	---	Project
		TOTAL	6	00	12	12			400		
						OR					
1.	EEP8004	Full Semester Industry Internship /TBI	--	--	--	12	200	200	400		Internship / OJT
						OR					
1	EET8005	Research Methodology	4	0	0	4	50	50	100	3	RM
2.	EEP8006	Research Internship	--	--	--	8	150	150	300		Internship

Program Elective- V and VI

Sem	***Program Elective***	***Power System Track***	***Control, Automation and Drives Track***	***Renewable Energy & Electric Vehicle***
8	V	Modern Electrical Grids EET8001-1	Power Quality EET8001-2	Advance Electrical Drives EET8001-3
	VI	Flexible AC Transmission Systems EET8002-1	Industrial Electrical Systems EET8002-2	Energy Storage and EV Charging Infrastructure EET8002-3

2) Program Elective Tracks and list of courses

Sem	Program Elective No	Courses				
5	I	Electromagnetic Fields PHT5001	Electrical Energy Conservation and Audit EET5005-1	Utilization of Electrical Energy EET5005-2	Applied Mechanics CET5015	Biology for Engineers IDT5510

Sem	*Program Elective*	*Power System Track*	*Control, Automation and Drives Track*	*Renewable Energy & Electric Vehicle*
6	II	Power Station Practice EET6005-1	Electric Drives and Control EET6005-2	Non-Conventional Energy Sources EET6005-3
	III (T)	Electrical Machine Design EET6006-1	PLC and SCADA EET6006-2	Photovoltaic System Engineering EET6006-3
	III (L)	Electrical Workshop-II Lab EEP6006-1	PLC and SCADA Lab EEP6006-2	Photovoltaic System Engineering Lab EEP6006-3
7	IV (T)	High Voltage Engineering EET7003-1	Digital Signal Processing EET7003-2	IoT Applications for Energy EET7003-3
	IV (L)	High Voltage Engineering Lab EEP7003-1	Digital Signal Processing Lab EEP7003-2	IoT Applications for Energy Lab EEP7003-3
8	V	Modern Electrical Grids EET8001-1	Power Quality EET8001-2	Advance Electrical Drives EET8001-3
	VI	Flexible AC Transmission Systems EET8002-1	Industrial Electrical Systems EET8002-2	Energy Storage and EV Charging Infrastructure EET8002-3

3) Honors in "Distributed Energy Generation Systems"

List of Courses

Scheme of Examination												
Sem	**Course code**	**Course Name**	**Hours/week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**	**Category**
			L	**T**	**P**		**Conti-nuous Evaluation**	**End Sem Exam**	**Total**		
III	EETH3100	Renewable and Distributed Energy Sources	3	0	0	3	50	50	100	3	Honors
IV	EETH4100	Energy Storage System	3	0	0	3	50	50	100	3	Honors
V	EETH5100	Distributed Generation and Smart grids OR Equivalent SWAYAM NPTEL course approved by the Department	4	0	0	4	50	50	100	3	Honors
VI	EETH6100	Design of Power Converter for Distributed Generation System OR Equivalent SWAYAM NPTEL course approved by the Department	4	0	0	4	50	50	100	3	Honors
VII	EETH7100	Power Quality Improvement Techniques OR Equivalent SWAYAM NPTEL course approved by the Department OR Project	4	0	0	4	50	50	100	3	Honors
		TOTAL	18	00	00	18					

4) Honors with Research

Desirous students will be required to work on a research project or dissertation in Electrical Engineering for 18 credits in the fourth year (Semester VII and VIII). These credits will be over and above the minimum 162 credits prescribed for the B. Tech. Electrical Engineering Programme.

5) Minors in Electric Vehicles (EV)

List of Courses

Semester	Course code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)	Category
			L	T	P		Continuous Evaluation	End Sem Exam	Total		
III	EETM3100	Basics of Electrical Engineering and EV	3	0	0	3	50	50	100	3	Minors
IV	EETM4100	EV Motors and their Control	3	0	0	3	50	50	100	3	Minors
V	EETM5100	EV Energy Management and Charging Infrastructure	4	0	0	4	50	50	100	3	Minors
VI	EETM6100	EV Communication and Instrumentation	4	0	0	4	50	50	100	3	Minors
VII	EETM7100	EV Policies and Safety Aspects	4	0	0	4	50	50	100	3	Minors
TOTAL			18	00	00	18					

6) Open Elective courses offered by the Department

Scheme of Examination												
Sem	**Course code**	**Course Name**	**Hours/week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**	**Category**
			L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**		
III	EET2980-1	Electrical Engineering: Introduction and Applications	2	0	0	2	50	50	100	2	OE
	EET2980-2	Renewable Energy Systems									
IV	EET2990-1	Electrical Appliances	3	0	0	3	50	50	100	3	OE
	EET2990-2	Energy Storage Systems									
	EET2990-3	Solar Photovoltaic Systems									
V	EET3980-1	Energy Management and Audit	3	0	0	3	50	50	100	3	OE
	EET3980-2	Automation with PLC									
	EET3980-3	Electric Vehicles									

Shri Ramdeobaba College of Engineering and Management,Nagpur Department of Electrical Engineering Semesterwise credit distribution as per NEP2020													
Sr.No	**Vertical**	**Courses and Abbreviations**		**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Actual Credits**	**Actual Total**
1	Basic and Engineering Science Courses and their Combinations to be offered in Mission Mode	Basic Science Course	**BSC**	9	6							15	27
		Engineering Science Course	**ESC**	3	7	2						12	
2	Major Core Program Courses	Programme Core Course	**PCC**	3	4	9	14	12	9	7		58	77/71
		Programme Elective Course	**PEC**					3	6	4	6/0	19/13	
3	Compulsory Multidisciplinary Minor	Multidisciplinary Minor	**MDM**			4		4	4			12	12
4	Generic/ Open Elective Courses;	Open Elective Other than a particular program	**OE**			2	3	3				8	8
5	Vocational and Skill Enhancement Courses	Vocational Skill Course	**VSC**	1			2					3	7
		Skill enhancement courses	**SEC**				1	2	1			4	
6	Humanities Social Science and Management (HSSM)	Ability Enhancement Course (AEC -01, AEC-02)	**AEC**	3		2						5	15
		Entrepreneurship/Economics/ Management Courses	**HSSM**						2	2		4	
		Indian Knowledge System	**IKS**		2							2	
		Value Education Course	**VEC**			2	2					4	
7	Field projects/ internship/ apprenticeship/ community engagement projects corresponding to the Major (core) subject,	Research methodology	**RM**								4	4	16/22
		Comm. Engg. Project (CEP)/Field Project	**FP**				2					2	
		Project-I	**Project**						1	3		4	
		Internship/Project-II/OJT	**OJT**								6/12	6/12	
8	Co-curricular Courses	Co-curricular Courses	**CCA**	2	2							4	4
		Total Credits (Major)		**21**	**21**	**21**	**24**	**24**	**23**	**16**	**12**	**162**	

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: I

Course Code: PHT1001 **Course: Physics for Electrical Engineers**

Core/Elective/Practical/Other: BSC **Credits: 03, L: 02, T: 1, P: 00 Hrs. Per Week**

Course Objectives:

1. To train the student to work with oscillatory phenomena in mechanical, electrical and optical systems and waves;
2. To train student to work with electrostatics, magnetostatics, optics and allied devices.

Course Outcomes:

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

1. Analyze the simple harmonic oscillator, damped oscillator and forced oscillator.
2. Discuss the formation of waves on a string, their reflection at the boundary of a different medium and formation of standing waves
3. To outline basic concepts in electrostatic and magnetostatics.
4. To apply the materials for their application in electrical engineering.
5. To apply the understanding of optoelectronic devices for their applications in the related field.

Module I: Oscillations:

Quick review of simple harmonic motion, mechanical and electrical oscillators, vector and complex numbers, Phasor representation, damped oscillations: under, critical and over damping, forced oscillations, impedance, energy and power supplied by driving force, Q-factor, related numerical/problems.

Module II: Waves:

Correlated harmonic oscillations in space and time, Transverse and Longitudinal waves; Transverse wave on a string, characteristic impedance, reflection and transmission at a string-string boundary, Impedance matching, related numerical/problems.

Module III: Introduction to Electric and Magnetic Fields:

Coulomb's law, electric field intensity, Gauss's law, definition of potential difference and potential, potential gradient, energy density in electrostatic field, ampere's circuital law, related simple numerical/problems.

Module IV: Semiconductors and Solar Photovoltaic Cells:

Band theory of solids, valence band, conduction band, intrinsic semiconductors, doping, extrinsic semiconductors, p-n junction diode.

Solar cell: solar energy spectrum, photovoltaic principle, I-V characteristics, conversion efficiency, irradiance, effect of change in irradiation and temperature on solar PV output, solar cell materials, related numerical/problems.

Module V: Introduction to Electrical Engineering Materials:

Dielectric Materials: Dielectrics, dielectric polarization, dielectric susceptibility, relation between dielectric constant and susceptibility, relation between polarization and electric field intensity, types of

polarization, temperature dependence of polarization, dielectric loss, dielectric breakdown, piezoelectricity, ferroelectricity. A brief outline of Insulators and types of insulation (A, E, B, F, C).
Magnetic materials: Magnetic field, magnetization, magnetic susceptibility, magnetic induction, relationship between b and h absolute permeability, relation between permeability to susceptibility, classification of magnetic materials, soft and hard magnetic materials.

Module VI: LED and Laser Diode:
Interaction of radiation with matter, spontaneous emission, simulated emission, Einstein coefficient, metastable states,
LEDs: Principle, device structure, materials, characteristics.
Laser diode: Principle, components of laser system, injection pumping, population inversion, laser characteristics, related numerical/problems.

Text Book(s):

1. The Physics of Vibrations and Waves (Sixth Edition), H J Pain John-Wiley 2005.
2. Engineering Electromagnetics by H. Hayt, John Buck, Mc Graw Hill Higher Edn, 2006
3. Optoelectronics and Photonics by S. O. Kasap, Pearson, 2009.

References:

1. Applied Physics by S. Jain, G. G. Sahasrabudhe and S. M. Pande, Universities Press 2013.
2. Engineering Physics by M.N. Avadhanulu and Kshirsagar S. Chand, 2019.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: I

Course Code: PHP1001 **Course: Physics for Electrical Engineers Lab**

Core/Elective/Practical/Other: BSC **Credits: 01, L: 00, T: 00, P: 02Hrs. Per Week**

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The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions.

Course Outcomes

After successful completion of the course students will be able to

1. Prepare for measurements used in various experiments and analyze errors involved in the measurements.
2. Explore various methods for finding experimental parameters.
3. Acquire the experimental and graph plotting skills.
4. Prepare laboratory reports on the experimental results.
5. Analyze the characteristics of a device.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program.

1. Measurements, Error analysis and graph plotting.
2. Study of Simple pendulum.
3. To find magnetic field by magnetometer.
4. Frequency, amplitude and phase determination using C.R.O.
5. Study find wavelength of Laser beam.
6. Study of Laser bream characteristics.
7. To find relative permittivity of a dielectric material.
8. Study of PN junction diode.
9. IV characteristics of Solar Cell.
10. Study of LED.
11. Study of Ohm's law.
12. Data analysis using Mathematica.

Suggested References

1. Physics Lab Manual written by the Teaching Faculty of Physics Department, RCOEM. A minimum of 8 experiments are to be performed from the above list of experiments.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: I

Course Code: MAT1001 **Course: Applied Mathematics-I**

Core/Elective/Practical/Other: BSC **Credits: 03, L: 02, T: 01, P: 00Hrs. Per Week**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in Ordinary differential equation, statistics, probability and differential calculus.
It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

On successful completion of the course, the students will able to:

1. Recognize first order ordinary differential equations that can be solved by each of the four methods – Linear DE, exact DE, reducible to linear DE and reducible to exact differential equations and use the appropriate method to solve them.
2. Solve higher order ordinary differential equations with constant and variable coefficients.
3. Find best fit curve by method of least square method and calculate correlation, regressions.
4. Recognize and understand discrete, continuous probability distributions and apply Binomial distribution, Poisson distribution and Normal distribution to appropriate problems.
5. Internalize multivariable calculus and apply it find Jacobians, maxima and minima of function/ Solve numerical integrations by Newton coat formulas and Gauss-Legendre Quadrature.

Syllabus

Module I: First order ordinary differential equations (7 hours)
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type, Applications of First order Differential Equations.

Module II: Ordinary differential equations of higher orders (8 hours)
Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation. Applications of Higher order Differential Equations.

Module III: Statistics: (7 hours)
Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation, Multiple regression and correlation and its application in Engineering.

Module IV: Differential Calculus (10 hours**)**
Taylor's and Maclaurin's series expansions, radius of curvature (Cartesian form), evolutes and involutes, Limit and continuity of functions of several variables and their partial derivatives, Eulers Theorem, chain rule, total derivative, Jacobians, Maxima, minima and saddle points; Method of Lagrange multipliers.

Module V: Probability (8 hours) (**For All Branches except Mechanical Branch**)
Probability spaces, conditional probability, independence, Bay's Theorem, Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution. Relation between binomial, Poisson and Normal distributions.

OR

Module V: Numerical Integration (8 hours*)* (**Only for Mechanical Branch**)
Simpson's 1/3rd rule, 3/8th rule, Trapezoidal rule, Gauss-Legendre Quadrature.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall. India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7.Theory and Problems of probability and statistics : 2nd ed :*J. R. Spiegal ,Schaum series*
8. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune VidhyarthiGrihaPrakashan, Pune-411030 (India).
9.S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: MAP1001 **Course: Computational Mathematics Lab**
Core/Elective/Practical/Other: BSC **Credits: 01, L: 00, T: 00, P: 02Hrs. Per Week**

Course Outcomes:

By using open source software SageMath Students will be able to

CO1: Download SageMath and use it as an advance calculator.

CO2: Sketch and analyze function graphs.

CO3: Apply the concepts of differential calculus to find extreme value of continuous functions and analyze solutions of differential equations

CO4: Evaluate improper integrals and its applications to find length, area, volume, centre of gravity and mass.

CO5: Analyze and calculate eigen values, eigen vectors, rank nullity, and solve system of linear equations of a matrix / linear map.

CO6: Analyze the data to find best fit curve.

Mapping of Course outcomes (COs) with Experiments

Exp. No.	Name of Experiments	Mapped COs
1	To use SageMath as advanced calculator	CO1
2	2D Plotting with SageMath	CO2
3	3D Plotting with SageMath	CO2
4	Differential Calculus with SageMath	CO3
5	Solution of differential equations in SageMath	CO3
6	Basics of Linear Algebra	CO5
7	Curve Fitting by using SageMath	CO6
8	Integral Calculus with SageMath	CO4

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: I

Course Code: EET1002 **Course: Industrial Safety**

Core/Elective/Practical/Other: BSC **Credits: 01, L: 01, T: 00, P: 00 Hrs. Per Week**

Course Outcomes

After the completion of the Course, students will be able to

CO1. Discuss the concepts of industrial safety and industrial safety management

CO2. Explain the method of maintaining accident record and reporting to real life problems

CO3. Evaluate the safety performance of an organization

CO4. Recognize hazards and hazard assessment tools and methods

Syllabus

Module-I: Concept of Safety

Definition and measurement of risk, reliability and hazard potential; elements of risk assessment; – risk analysis techniques – risk reduction resources – industrial safety and risk assessment. - Concepts of disaster control, job safety analysis, safety survey and safety inspection, Basic understanding of Industrial safety: environmental, electrical, dock, transport and nuclear safety; safety in hazardous industries like chemical, mining, construction etc.

Module -II: Hazards and Hazard Assessment

Definition and types of Hazards, difference between Risk and Hazard, Hazard assessment, procedure, methodology; preliminary hazard analysis (PHA), human error analysis, hazard operability studies (HAZOP), Tools for Hazard Identification, Evaluating Hazards.

Module III: Safety Management Systems

Safety management systems in Indian industry; engineering aspects of safety management, Safety legislations, implementation and monitoring of safety programs. Recent Trends of development of safety engineering approaches, Safety training, Introduction to OSHA, ILO standards and guidelines

Text Book

Charles D. Reese, Occupational Health and Safety Management: A Practical Approach,Third Edition, CRC Press, ISBN 9781138749573 - CAT# K32753 201

Reference Books

1. Benjamin O. Ali, Fundamental Principles of Occupational Health And Safety, SecondEdition, ISBN -9221204545, International Labour Office, 2008
2. D. S. S. Ganguly, C. S. Changeriya, Safety Engineering, Chetan Publication; ISBN-13: 978-8193452264, 2016
3. R. K. Jain And Prof. Sunil S. Rao, Industrial Safety, Health And Environment ManagementSystems, Khanna Publishers, ISBN: 978-81-7409-210-6, 2000
4. Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997.
5. Industrial safety management, L M Deshmukh, TATA McGraw Hill, 2010

6. Safety, Reliability and Risk Analysis: Theory, Methods and Applications- Vol 1. Sebastián Martorell, C. Guedes Soares and Julie Barnett, CRC press.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: EET1001 **Course: Basic Electrical Engineering-I**
Core/Elective/Practical/Other: PCC **Credits: 03, L: 03 Hrs. T: 00 P: 00 Hrs Per Week**

Course Outcomes:

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

CO1: Analyse DC circuits and magnetic circuits using fundamental concepts and circuit laws (KVL and KCL).
CO2: Apply the fundamental laws of electrical engineering to solve simple AC circuits.
CO3: Identify different types of wiring system and various safety devices.
CO4: Select illumination requirement for different premises.
CO5: Discuss various power generation sources and draw the single line representation of power system.
CO6: Classify various power converters and list their applications.

Syllabus

Module I: DC Circuits and Magnetic circuits (10 Hours)
Electrical circuit elements, voltage and current sources, Kirchhoff laws, star- delta transformation, Magnetic circuits: Basic terminologies of magnetic circuits, Right hand thumb rule, B-H characteristics and series magnetic circuits.

Module II: Single Phase and Three phase AC Circuits (10 Hours)
Representation of sinusoidal waveforms, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting series and parallel, series resonance, power factor improvement. Three phase balanced circuits, voltage, and current relations in star and delta connections.

Module III: Wiring and Electrical Installations (05 Hours)
Introduction of wiring, selection of wiring, types of wiring, I.E. (Indian Electricity) rules of domestic wiring, testing and installation of domestic wiring, Earthing formats for electrical connections
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, RCCB and Earthing.

Module IV: Illumination (05 Hours)
Types of lamps, illumination schemes for domestic, industrial and commercial premises, lumens required for different categories.

Module V: Introduction to Power system (04 Hours)
Introduction to power generation (Thermal, Hydro, Nuclear, Wind, and Solar) with block schematic presentation only. Single line diagram for Generation, Transmission & Distribution through different voltage levels.

Module VI: Introduction to Power Converters (04 Hours)
Basic schematic, introduction to power converters, types of power converters (DC-DC, DC-AC, AC-DC, AC-AC) and their practical applications.

Textbooks /Reference books-

1. An introduction to Electrical Engineering Materials, C.S. Indulkar, S. Chand Publishing, 2008.

2. Electrical Wiring Estimating and Costing, S. L. Uppal, Khanna Publishers, 1976.
3. A Textbook of Electrical Technology, Volume 1, B. L. Thereja, S. Chand Publications, 2005
4. Basic Electrical Engineering, D. C. Kulshreshtha, McGraw Hill, 2009.
5. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2010
6. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd. Second Edition, 2008.
7. Principles of Power System: V.K. Mehta, S.Chand, 2005
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
10. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: EEP1001 **Course: Electrical Workshop**
Core/Elective/Practical/Other: VSC **Credits: 01, L: 00 T: 00 P: 02 Hrs Per Week**

Course Outcome:

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

CO1. Understand and select appropriate switchgears, wires and cables for various LT installations.
CO2. Understand and design wiring and earthing schemes for various LT installations.
CO3. Understand and draw polar curves for various lamps.
CO4. Perform experiments on basic DC and AC electric circuits and make valid conclusions from observed results.
CO5. Calculate the energy bill and verify the same with that provided by the utility for a specific installation and specific period.
CO6. Write effective reports based on own observations and conclusions.

List of Experiments:

1. To study the different types of switchgears and accessories for LT installations.
2. To study the different types of wires and cables for different applications.
3. To study the symbols of various components used in electrical system and understand simple single line diagrams.
4. To design electrical wiring scheme for residential applications.
5. To design electrical wiring scheme for commercial/industrial applications.
6. To study the meter cubicles for 1-phase and 3-phase AC systems.
7. To verify the quality of earthing by measuring various parameters
8. To find out the luminous efficacy and polar curve of a light source.
9. To verify Kirchhoff's law of DC circuits.
10. To verify Kirchhoff's law of AC circuits.
11. To study the balanced three phase system for star and delta connected load.
12. Improvement of power factor by using static capacitors.
13. To study B-H curve of different magnetic materials
14. Calculation and verification of energy bill of a house.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: HUT1002 **Course: English for Professional Communication**
Core/Elective/Practical/Other: AEC **Credits: 02, L: 02 T: 00 P: 00 Hrs Per Week**

Course Objectives

The main objective of this course is to enhance the employability skills of students as well as prepare them for effective work place communication.

Course Outcomes:

On successful completion of the course the students will be able to achieve thefollowing**:**

CO1. Demonstrate effective use of word power in written as well as oralcommunication.

CO2. Understand the techniques of listening and apply the techniques of readingcomprehension used in professional communication.

CO3. Apply the principles of functional grammar in everyday as well as professionalcommunication.

CO4. Effectively implement the comprehensive principles of written communicationby applying various writing styles.

CO5. Create precise and accurate written communication products.

Syllabus

Module -1: Vocabulary Building

1.1 Importance of using appropriate vocabulary
1.2 Techniques of vocabulary development
1.3 Commonly used power verbs, power adjectives and power adverbs.
1.4 Synonyms, antonyms, phrases & idioms, one-word substitutions and standard abbreviations

Module -2: Listening and Reading Comprehension

2.1 Listening Comprehension: active listening, reasons for poor listening, traits of a good listener, and barriers to effective listening
2.2 Reading Comprehension: types and strategies.

Module -3: Functional Grammar and Usage

3.1 Identifying Common Errors in use of: articles, prepositions, modifiers, modal auxiliaries, redundancies, and clichés
3.2 Tenses
3.3 Subject-verb agreement, noun-pronoun agreement
3.4 Voice

Module -4: Writing Skills

4.1 Sentence Structures
4.2 Sentence Types
4.3 Paragraph Writing: Principles, Techniques, and Styles

Module -5: Writing Practices

5.1 Art of Condensation: Précis, Summary, and Note Making
5.2 Correspondence writing techniques and etiquettes – academic writing
5.3 Essay Writing

Books

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: HUP1002 **Course: English for Professional Communication Lab**
Core/Elective/Practical/Other: AEC **Credits: 01, L: 00 T: 00 P: 02 Hrs. Per Week**

Course Objective

To enhance competency of communication in English among learners

Course Outcomes

On completion of English Lab course, students will be able to achieve the following:

CO1: Apply effective listening and speaking skills in professional and everydayconversations.

CO2: Demonstrate the techniques of effective Presentation Skills

CO3: Evaluate and apply the effective strategies for Group Discussions

CO4: Analyse and apply the effective strategies for Personal Interviews

CO5**:** Implement essential language skills- listening, speaking, reading, and writing

Syllabus

List of practical

Computer Assisted + Activity Based Language Learning

Practical 1: Everyday Situations: Conversations and Dialogues – Speaking Skills

Practical 2: Pronunciation, Intonation, Stress, and Rhythm

Practical 3: Everyday Situations: Conversations and Dialogues – Listening Skills

Activity Based Language Learning

Practical 4: Presentation Skills: Orientation & Mock Session

Practical 5: Presentation Skills: Practice

Practical 6: Group Discussions: Orientation & Mock Session

Practical 7: Group Discussions: Practice

Practical 8: Personal Interviews: Orientation & Mock Session

Practical 9: Personal Interviews: Practice

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: MET1004 **Course: Engineering Graphics**
Core/Elective/Practical/Other: ESC **Credits: 02, L: 02, T: 00, P: 00 Hrs. Per Week**

Course Outcomes:

The expected learning outcome is that, the students shall be able to

1. Draw and interpret technical drawings
2. Convert 2-D to 3-D drawing and vice versa.
3. Represent the various positions of planes and solids in different orientations.

Syllabus

Module I: Introduction to Engineering Drawing and Engineering Curves
Principles of Engineering Graphics and their significance, usage of drawing instruments, Lettering and dimensioning, Engineering Curves - Conic sections, Cycloid and Involute etc.

Module II: Orthographic Projections
Theory of Projections, Concept of Projection, First & Third angle projection methods. Orthographic Projections: Conversion of given 3-dimensionalview to 2-dimensional representation.

Module III: Projections of Lines and Planes
Projections of lines (line inclined to both planes), Projections of planes (inclined to both the planes), Concept of auxiliary plane method for projections of the plane.

Module IV: Projections of Solids
Projections of right, regular solids inclined to both the Planes (including Auxiliary Views) – Prism, Pyramid, Cylinder, Cone.

Module V: Isometric Projections
Principles of Isometric projection - Isometric Scale, Isometric Views, Isometric Views of Simple Solids, and Conversion of Orthographic views to Isometric Views / Projection.

Text Books:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishing House Pvt. Ltd.
2. Engineering Drawing with an Introduction to AutoCAD" by D. A. Jolhe Tata McGrawHill Publications
3. Engineering Drawing by R.K. Dhawan, S. Chand Publications
4. Engineering Drawing by K.L. Narayana & P. Kannaiah, SciTech Publication

Reference Books:

1. AutoCAD 14 for Engineering Drawing by P. Nageshwara Rao, Tata McGraw HillPublications.
2. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi.
3. Engineering Drawing and Computer Graphics by M. B. Shah & B.C. Rana, PearsonEducation.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: MEP1004 **Course: Engineering Graphics Lab**
Core/Elective/Practical/Other: ESC **Credits: 01, L: 00, T: 00, P: 02 Hrs. Per Week**

Course Outcomes:

The expected learning outcome is that, the students shall be able to:

1. Draw and interpret technical drawings.
2. Plan the sheet layout for the given drawing.
3. Convert 2-D to 3-D drawing and vice versa
4. Represent the various positions of planes and solids in different orientations.
5. Use & demonstrate drafting package.

Module I: Introduction to Computer Aided Drawing

Introduction, Computer screen, layout of the software, standard tool bar / menu and descriptionof most commonly used tool bars, and navigational tools.

Commands and creation of Lines, coordinate points, axes, poly-lines, square, rectangle, Polygon, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz., tangency, parallelism, inclination and perpendicularity.

Module II:

Drafting and annotation, dimensioning and scale. Electrical and Electronics symbol, Electrical wiring connection, D.C. Motor and Generator, Transformer and Control Panel Wiring etc.

Practical's to be performed from the list as below

Sr. No.	List of Sheets (Based on Theory syllabus)
1	Engineering Curves
2	Orthographic Projection
3	Projection of Straight Lines
4	Projection of Planes
5	Projections of Solids
6	Isometric Projection
7	Drawings related to Electrical Engineering

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: I

Course Code: HUT1004 Course: Foundational Course in Universal Human Values
Core/Elective/Practical/Other: VEC Credits: 01, L: 01, T: 00, P: 00 Hrs. Per Week

Course Objectives

- To help the student see the need for developing a holistic perspective of life
- To sensitize the student about the scope of life – individual, family (inter-personalrelationship), society and nature/existence
- To strengthen self-reflection
- To develop more confidence and commitment to understand, learn and act accordingly

Course outcome

On completion of course, students will be able to achieve the following:CO1: Develop a holistic perspective of life

CO2: Better understanding of inter-personal relationships and relationship withsociety and nature.

CO3: An ability to strengthen self-reflection

Syllabus

Module 1:- Aspirations and concerns
Need for Value Education: Guidelines and content of value education.
Exploring our aspirations and concerns: Knowing yourself, Basic human aspirations Need for a holistic perspective, Role of UHV; Self-Management: harmony in human being

Module II:- Health
Harmony of the Self and Body, Mental and physical health; Health for family, friends and society.

Module III:- Relationships and Society
Harmony in relationships, Foundational values: Trust, Respect, Reverence for excellence, Gratitude and love; harmony in society; harmony with nature.

Reference Material
The primary resource material for teaching this course consists of

Text book:
1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174- 46781-2

Reference books:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W.
6. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
8. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
9. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
10. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Shri Ramdeobaba College of Engineering and Management
Department of Humanities
Liberal/Performing Arts (basket)

Sr. No.	Course Code	Course Name	Sem	Hours /week	Credits	Maximum marks	Department
						Continuous Evaluation	
1)	HUP1003-1/HUP2003-1	Fundamentals of Indian Classical Dance: Bharatnatayam	I/II	2	1	50	Humanities
2)	HUP1003-2/HUP2003-2	Fundamentals of Indian classical Dance: Kathak	I/II	2	1	50	Humanities
3)	HUP1003-3/HUP2003-3	Introduction to Digital Photography	I/II	2	1	50	Humanities
4)	HUP1003-4/HUP2003-4	Introduction to Japanese Language and Culture	I/II	2	1	50	Humanities
5)	HUP1003-5/HUP2003-5	Art of Theatre	I/II	2	1	50	Humanities
6)	HUP1003-6/HUP2003-6	Introduction to French Language	I/II	2	1	50	Humanities
7)	HUP1003-7/HUP2003-7	Introduction to Spanish Language	I/II	2	1	50	Humanities
8)	HUP1003-8/HUP2003-8	Art of Painting	I/II	2	1	50	Humanities
9)	HUP1003-9/HUP2003-9	Art of Drawing	I/II	2	1	50	Humanities
10)	HUP1003-10/HUP2003-10	Nature camp	I/II	2	1	50	Humanities
11)	CHP1008-1/CHP2008-1	Art of Indian traditional cuisine	I/II	2	1	50	Chemistry
12)	CHP1008-2/CHP2008-2	Introduction to Remedies by Ayurveda	I/II	2	1	50	Chemistry
13)	PEP1001-1/PEP2001-1	Disaster Management through Adventure Sports	I/II	2	1	50	Physical Education
14)	PEP1001-2/PEP2001-2	Self-defense Essentials and Basic Knowledge of Defense forces	I/II	2	1	50	Physical Education

Course Code	Course Name	Sem	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-1/HUP2003-1	Fundamentals of Indian Classical Dance: Bharatnatayam	II	2	1	50

Course objective

The course aims to introduce the students to Bharatnatyam, an important element of Indian traditional knowledge system. The course will not only provide the learning and skill to perform this art but would also enhance many mental and physical aspects of the students such as strength, flexibility, discipline, self-confidence, creativity, focus, coordination, etc.

Course Outcomes

On completion of the course, students will be able to achieve the following:

CO1: Understand the importance of dance and Bharatnataym as an Indian dance form

CO2: Develop skills to perform the dance form at its basic level.

CO3: Evaluate their strengths and interest to take bridge course to give *Pratham* (1st level formal exam of Bharatnatayam).

Syllabus

Practical -1: Orientation in Bharatnatayam

Practical-2**:** Tattu Adavu till 8, Naatta Adavu 4 Steps, Pakka Adavu 1 step, Metta Adavu 1 Step, Kuditta Metta Adavu 4 Steps,

Practical -3: Practice sessions

Practical-4: Tatta Kuditta Adavu (Metta), Tatta Kuditta Adavu (Metta) 2 Steps, Tirmanam Adavu 3 Steps, Kattu Adav - 3 Steps, Kattu Adav - 3 Steps

Practical-5: Practice sessions

Practical-6: Tiramanam (front) 3 Steps, Repeat of Tiramanam (Overhead) 3 Steps,

Practical-7: practice sessions

Practical – 8: final practice sessions and performances.

Recommended reading

1. *Introduction to Bharata's Natyasastra*, Adya Rangacharya, 2011
2. *The Natyasastra and the Body in Performance: Essays on the Ancient Text*, edited by Sreenath Nair, 2015
3. *Bharatanatyam How to ... : A Step-by-step Approach to Learn the Classical Form*, Eshwar Jayalakshmi, 2011

Course Code	Course Name	Sem.	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-2 /HUP2003-2	Fundamentals of Indian Classical Dance: Kathak	II	2	1	50

Course objective

The course aims to introduce the students to Kathak, an important element of Indian traditional knowledge system. The course will not only provide the learning and skill to perform this art but would also enhance many mental and physical aspects of the students such as strength, flexibility, discipline, self-confidence, creativity, focus, coordination, etc.

Course Outcomes

On completion of the course, students will be able to achieve the following:

CO1: Understand the importance of dance and Kathak as an Indian dance formCO2: Develop skills to perform the dance form at its basic level.

CO3: Evaluate their strengths and interest to take bridge course to give *Prarambhik* (1^{st} level formal exam of Kathak).

Syllabus

Practical -1: Orientation in Kathak. Correct posture of kathak, Basic Movements and exercise Stepping, Chakkar of 5 count (Bhramari),

Practical -2: practice sessions of practical 1

Practical -3: Hastaks, Hastaks and Steppings, Reciting asamyukta Mudra shloka, Hastak and steppings

Practical -4: practice sessions of practical 3

Practical -5: Todas and Asamyukta hasta mudra shlok, Vandana of Shlok, 2 Todasand Vandana, Ghante Ki Tihai,

Practical -6: practice sessions of practical 5

Practical -7: 2 1 Chakkardar Toda and Ginnti Ki Tihai, 2 Todas and 1 ChakkardarToda, practice sessions

Practical -8: Final performances.

Recommended reading

1. Kathak Volume1 A "Theoretical & Practical Guide" (Kathak Dance Book), Marami Medhi & Debasish Talukdar, 2022, Anshika Publication (13 September 2022)

Course Code	Course Name	Sem.	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-3 /HUP2003-3	Introduction to Digital Photography	II	2	1	50

Course objective

The course aims to develop basic skills of students in digital photography to lay a foundation for them as a hobby and/or a profession.

Course outcome:

At the end of the course the students will be able to achieve the following:
CO1: Develop an understanding of the technical aspects and aesthetics of Photography.
CO2: Apply the rules of digital photography for creating photographs.
CO3: Develop skills to enhance photographs through post processing.
CO4: Create a portfolio of their photographs in selected genre.

Syllabus

Practical 1: **Orientation in digital photography:** Genres, camera handling and settings
Practical 2: **Rules of Composition**
Practical 3: **Rules of Composition**: practice sessions
Practical 4: **Understanding Exposure and Art of Pre-Visualization**
Practical 5: **Rules of Composition and Art of Pre-Visualization:** practice sessions
Practical 6: **Post Processing Photographs and Portfolio creation**
Practical 7: **Post Processing Photographs:** practice sessions
Practical 8: **Portfolio finalization and presentation in selected genre.**

Reference material

1. Scott Kelby (2020) *The Digital Photography Book: The Step-by-Step Secrets for how to Make Your Photos Look Like the Pros*, Rocky Nook, USA
2. Larry Hall (2014) *Digital Photography Guide: From Beginner to Intermediate: A Compilation of Important Information in Digital Photography*, Speedy Publishing LLC, Newark
3. J Miotke (2010) *Better Photo Basics: The Absolute Beginner's Guide to Taking Photos Like a Pro*, AMPHOTO Books, Crown Publishing Group, USA

Course Code	Course Name	Sem	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-4 /HUP2003-4	Introduction to Japanese Language and Culture	II	2	1	50

Course objective

The course aims to develop basic communication skills in Japanese Language and help develop a basic understanding of Japanese culture in cross-cultural communication.

Course outcome

CO1: Gain a brief understanding about Japan as a country and Japanese culture.
CO2: Develop ability to use vocabulary required for basic level communication in Japanese language.
CO3: Able to write and read the first script in Japanese language.
CO4: Able to frame simple sentences in Japanese in order to handle everyday conversations
CO5: Able to write in basic Japanese about the topics closely related to the learner.

Syllabus

Practical-1: Orientation about Japan, its language, and its culture
Practical-2: Communication Skills 1: Vocabulary for basic Japanese language
Practical -3: Practice sessions
Practical-4: Writing Skills 1: Reading and writing first script in Japanese
Practical-5: Practice sessions
Practical- 6: Communication Skills 2: framing sentences
Practical- 7: Practice sessions
Practical- 8: Writing Skills 2: Write basic Japanese and practice

Recommended reading

1. Marugoto Starter (A1) Rikai - Course Book for Communicative Language Competences, by The Japan Foundation, Goyal Publishers & Distributors Pvt. Ltd (ISBN: 9788183078047)
2. Japanese Kana Script Practice Book – Vol. 1 Hiragana, by Ameya Patki, Daiichi Japanese Language Solutions (ISBN: 9788194562900)

rse Code	Course Name	Sem.	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-5 /HUP2003-5	Art of Theatre	II	2	1	50

Course objectives:
The course aims to develop in the students, an actor's craft through physical and mental training.

Course Outcomes:
On completion of the course, students will be able to achieve the following:
CO1: Understand and synthesize the working of the prominent genres of theatre across the world.
CO2: Apply the skill of voice and speech in theatre and public speaking
CO3: Apply the art of acting and also develop generic skills such as confidence, communication skills, self-responsibility, motivation, commitment, interpersonal skills, problem solving, and self-discipline.
CO4: Apply skills acquired related to technical/production aspects of theatre and also develop problem solving and interpersonal skills.

Syllabus

Practical 1: **Orientation in theatre**
Practical 2: **Voice and Speech training**
Practical 3: **Voice and Speech training**: practice sessions
Practical 4: **Art of acting**
Practical 5: **Art of acting:** practice sessions
Practical 6: **Art of script writing**
Practical 7: **Art of script writing:** practice sessionsPractical 8:
Final performances

Reference books:
1. Boleslavsky, R. (2022). *Acting: The First Six Lessons* (1st ed., pp. 1-92). Delhi Open Books.
2. Shakthi, C. (2017). *No Drama Just Theatre* (1st ed., pp. 1-171). Partridge.
3. Bruder, M., Cohn, L. M., Olnek, M., Pollack, N., Previto, R., & Zigler, S. (1986). *APractical Handbook for the Actor* (1st ed.). Vinatge Books New York.

Course Code	Course Name	Sem.	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-6 /HUP2003-6	Introduction to French Language	II	2	1	50

Course objective:

To help build a foundation and interest in French language so that the students can pursue the proficiency levels of the language in higher semesters.

Course outcomes:

On successful completion of the course the students will be able to achieve the following:

CO1. Demonstrate basic knowledge about France, the culture and similarities/differences between India and France

CO2. Learn to use simple language structures in everyday communication.

CO3. Develop ability to write in basic French about themselves and others.

CO4. Develop ability to understand beginner level texts in French

Syllabus

List of Practicals

Practical-1: Orientation about France, the language, and culture
Practical-2: Communication Skills 1: Vocabulary building for everyday conversations
Practical -3: Practice sessions
Practical-4: Reading and writing Skills : Reading and writing simple text in French
Practical-5: Practice sessions
Practical-6: Communication Skills 2: listening comprehension
Practical-7: Practice sessions
Practical-8: Writing Skills: Write basic French and practice

Recommended reading

1. 15-minute French by Caroline Lemoine
2. Cours de Langue et de Civilisation Françaises by G. Mauger Vol. 1.1
3. Cosmopolite I by Natalie Hirschsprung, Tony Tricot

Course Code	Course Name	Sem.	Hours /week	Credits	Maximum marks

					Continuous Evaluation
HUP1003-7 /HUP2003-7	Introduction to Spanish Language	II	2	1	50

Course objective:

To help build a foundation and interest in Spanish language so that the students canpursue the proficiency levels of the language in higher semesters.

Course outcomes:

On successful completion of the course the students will be able to achieve thefollowing:

CO1. Demonstrate basic knowledge about Spain, the culture and similarities/differences between India and France

CO2. Learn to use simple language structures in everyday communication.

CO3. Develop ability to write in basic Spanish about themselves and others.
CO4. Develop ability to read and understand beginner level texts in Spanish

Syllabus

List of Practical

Practical-1: Orientation about Spain, the language, and culture
Practical-2: Communication Skills 1: Vocabulary building for everyday conversations
Practical -3: Practice sessions
Practical-4: Reading and writing Skills : Reading and writing simple text in Spanish
Practical-5: Practice sessions
Practical-6: Communication Skills 2: listening comprehension
Practical-7: Practice sessions
Practical-8: Writing Skills: Write basic Spanish and practice

Recommended reading

1. 15-Minute Spanish by Ana Bremon
2. Aula Internacional 1 by Jaime Corpas ,Eva Garcia, Agustin Garmendia.
3. Chicos Chicas Libro del Alumno by María Ángeles Palomino

Course Code	Course Name	Sem.	Hours/ week	Credits	Maximum marks

					Continuous Evaluation
HUP1003-8 /HUP2003-8	Art of Painting	II	2	1	50

Course objective

Painting is fundamentally about learning to see, and to transport that vision onto paper through a variety of mark making techniques. This course aims to develop basic skills of students in painting to lay a foundation for them as a hobby and/or a profession.

Course outcome:

At the end of the course the students will be able to achieve the following:

CO1: Become familiar with the basic methods, techniques & tools of painting.
CO2: Train the eye and hand to develop sense of balance, proportion and rhythm.
CO3: Develop the ability to observe and render simple natural forms.
CO4: Enjoy the challenging and nuanced process of painting.

Syllabus

Practical 1: **Orientation in Painting tools & basics of lines, shapes, light, shadowsand textures**
Practical 2: **The art of observation** how to see shapes in drawing
Practical 3: **Introduction Water color** how to handle water paints Practical 4:
Introduction to acrylic colors how to handle acrylic paints
Practical 5: **Explore layering paint and capturing the quality of light with paint.**
Practical 6: **Create landscape painting**
Practical 7: **Create Abstract painting**
Practical 8: **Paint on Canvas** (try to recreate any famous painting)

Reference material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Alla Prima II Everything I Know about Painting--And More by Richard Schmid with Katie Swatland
3. Daily Painting: Paint Small and Often To Become a More Creative, Productive, and Successful Artist by Carol Marine

Course Code	Course Name	Sem.	Hours/ week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-9 /HUP2003-9	Art of Drawing	II	2	1	50

Course objective

Drawing is fundamentally about learning to see, and to transport that vision onto paper through a variety of mark making techniques. This course aims to develop basic skills of students in drawing to lay a foundation for them as a hobby and/or a profession.

Course outcome:

At the end of the course the students will be able to achieve the following:
CO1: Become familiar with the basic methods, techniques & tools of drawing.
CO2: Train the eye and hand to develop sense of balance, proportion and rhythm.
CO3: Develop the ability to observe and render simple natural forms.
CO4: Enjoy the challenging and nuanced process of drawing.

Syllabus

Practical 1: **Orientation in Drawing tools & basics of lines, shapes, light, shadowsand textures**
Practical 2: **The art of observation** how to see shapes in drawing
Practical 3: **One/two-point basic linear perspective**
Practical 4: **Nature drawing and landscapes**
Practical 5: **Gestalt principles of visual composition**
Practical 6: **Figure drawing**: structure and proportions of human body
Practical 7: **Gesture drawing:** expression and compositions of human figures
Practical 8: **Memory drawing:** an exercise to combine the techniques learnt

Reference material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Perspective Made Easy (Dover Art Instruction) by Ernest R. Norling

Course Code	Course Name	Sem.	Hours /week	Credits	Maximum marks
					Continuous Evaluation
HUP1003-10 /HUP2003-10	**Nature camp**	II	2	1	50

Course Objective: To create an opportunity for the students to develop affinity with nature and thussubsequently impact their ability to contribute towards sustainability of nature.

Course Outcome:
After the completion of the course the students will be able to do the following:
CO1: Develop an affinity with nature by observing and understanding it marvels with guidance fromexperts
CO2: Develop an understanding of the challenges and solutions associated with nature and its conservation.

Course Content
In collaboration with the Forest Department and/or a local NGO working in the field of environment conservation, this course would be conducted in 24 hours. Students will be taken to a tiger reserve in Vidrabha region or Forest fringe villages or work with an NGO from Vidarbha region working on natural resource management. The camps (for 2 days) will cover any one of the following topics as decided by the course coodinator:

1. Awareness about each element of biodiversity (camps on moths, butterflies, birds, other wildlifeetc)
2. Environment management (water, forest, wildlife) – practices of Forest Department in managing atiger reserve, and other aspects of water and forest conservation.
3. Sustainable natural resource management - initiatives by rural communities and local NGOs
4. Man-animal conflict and solutions (socio-economic and technical) – role of local communities andForest Department
5. Traditional practices in environment conservation – role of local communities and local NGOs

Course Code	CHP1008-1/CHP2008-1				
Category	Basket of Liberal Learning Course				
Course Title	**Art of Indian Traditional Cuisine**				
Scheme& Credits	L	T	P	Credits	Semester I/II
	0	0	2	1	

Course outcome:

At the end of the course the students will be able to achieve the following:

CO1: Understand the factors that affect regional eating habits and the unique ingredients found in variousstates of India

CO2: Get insight to prepare popular dishes from various regions of India. ·

Modules:

Module 1: Indian Regional foods and snacks - factors effecting eating habits.

Module 2: Indian gravies – ingredients, their importance

Module 3: Indian Sweets - ingredients, their importance

Module 4: Presentation of Indian Meals, Menu Planning, Food Costing

Module 5: Food Preservatives and Safety

List of experiments:

1) Introduction to cookery : dos and don'ts
2) Introduction to Indian cuisine, philosophy and classification.
3) Regional influence on Indian Food- factors affecting eating habits
4) Preparation of Garam masala and or Chat masala with ingredients and their importance
5) Preparation of different gravies such as white, yellow or brown gravies with ingredients and theirimportance
6) Preparation of Indian sweets like Besan ke laddu with ingredients and their importance
7) Presentation of meal, Menu planning and Food costing
8) Common chemical food preservatives and their safety standards.

Reference books

[1] Arora, K.,; Theory of cookery; First Edition, Frank Brothers Company (Pub) Pvt. Ltd., 2008 ISBN:9788184095036, 8184095031

[2] Philip, Thangam . E.,; Modern Cookery: Vol. 1; Sixth Edition, Orient BlackSwan., 2008 ISBN:9788125040446, 8125040447ali

[3] Parvinder S;Quantity Food Production Operations and Indian Cuisine (Oxford Higher Education); FirstEdition; Oxford University Press, 2011 ISBN 10: 0198068492 ISBN 13: 9780198068495

[4] Singh, Yogesh; A Culinary Tour of India; First Edition I.K. International Publishing House Pvt. Ltd. ISBN 978-93-84588-48-9

[5] Singh Shakesh;Simplifying Indian Cuisine;First Edition, Aman Publications, ISBN81-8204-054-X

[6] Dubey Krishna Gopal; The Indian Cuisine;PHI Learning Pvt. Ltd.ISBN978-81 203-4170-8

Course Code	**CHP1008-2/CHP2008-2**				
Category	Basket of Liberal Learning Course				
Course Title	**Introduction to Remedies by Ayurveda**				
Scheme& Credits	L	T	P	Credits	Semester I/II
	0	0	2	1	

Course outcome:

At the end of the course the students will be able to achieve the following

CO1: Know basic principle of Ayurvedic formulations.
CO2: Different types of Natural Remedies.
CO3: Basic idea about their Characterization

Module 1- Introduction to Ayurveda
Module 2- Different types of Ayurvedic formulations: Churn, Bhasma, Vati, Tailum
Module 3- Introduction to Methods of preparation
Module 4 -Characterization, applications

Practical based on above syllabus

1) Preparations of some medicinal oils like Bramhi tel, Bramhi Awala, Vatnashak Tel, Bhurngraj Teletc.
2) Preparation of Churn, like Trifala Churn, Hingastak Churn, Trikut Churn etc.
3) Preparation of some Bhasmas and vati

Books

1) Chemistry and Pharmacology of Ayurvedic Medicinal Plants by Mukund Sabnis, ChaukhambhaAmarbharati Prakashan.
2) Everyday Ayurveda by Shailesh Rathod
3) A text Book of Rasashastra by Vikas Dhole and Prakash Paranjpe
4) A text Book of Bhaiajya Kalpana Vij¯nana

Course Code	**PEP1001-1/PEP2001-1**				
Category	Basket of Liberal Learning Course				
Course Title	**Disaster Management Through Adventure Sports**				
Scheme& Credits	L	T	P	Credits	Semester I/II
	0	0	2	1	

Objectives of the Course:

To enable the student:

1. To inculcate rational thinking and scientific temper among the students.
2. To develop critical awareness about the social realities among the students.
3. To build up confidence, courage and character through adventure sports.

Course Outcomes:

On completion of the course, students will be able to:

1. Understand the meaning and importance of Adventure sports.
2. Learn the various types of adventure sports, the equipment and resources required to practicedisaster Management activities.
3. Learn the safety measures about different risk and their management.
4. To apply Disaster management theory to institutional & Societal problems and situations.

Course Content:

1. Basic adventure
2. First AID
3. various types of knots
4. Shelter making
5. Disaster management
6. Team building and goal setting
7. Realization of fear, risk and their roles and analysing safety Management Plan

Course Code	PEP 1001-2/2001-2				
Category	Basket of Liberal Learning Course				
Course Title	**Self-defense Essentials and Basic Knowledge of Defense forces**				
Scheme& Credits	L	T	P	Credits	Semester I/II
	0	0	2	1	

Course Outcomes:
On completion of the Course the student will be able to:

• Understand the meaning, need and fitness requirements to implement self-defense
• Learn the basic techniques of selected combative sports.
• Learn to prepare basic Physical Training for Defense forces.
• Implement survival techniques during
emergencies.

Course Content:

• General conditioning and self-defense specific conditioning
• Applications of techniques of combative sports for self-defense.
• Self-defense techniques for specific situations: chain snatching, knife or stick attack, holding fromback or front etc.
• Basic Military Knowledge and exposure making students Confident, bold, disciplined and trains themto join Armed Forces.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: II

Course Code: CHT2003 **Course: Chemistry for Electrical Engineers**

Core/Elective/Practical/Other: BSC **Credits: 02, L: 02, T: 00, P: 00 Hrs. Per Week**

Course Outcomes

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

CO1 Investigate the chemical properties of materials for various technological applications.

CO2 Apply the knowledge of material property and energy to analyse environmental issues.

CO3 Apply the knowledge of molecular interactions, rationalise bulk properties and process using thermodynamic considerations. and energy to analyse environmental issues.

CO4 Analyze the impurities present in the water and suggest the methodology for its removal

Syllabus

Module I: Nano-material (7 Hours)

Nanomaterials: Introduction, Classification and size dependent properties (surface area, Optical and catalytic properties). Synthesis of nano-materials (Top down and Bottom up approach).

Carbon nanomaterials: Introduction, types, synthesis by modified CVD method, functionalization and applications of CNT and Graphene. Applications of Nanomaterials

Module II: Battery Technology (7 Hours)

Introduction to electrochemistry: Types of battery, characteristics of battery and applications of battery, battery ageing, battery waste management and recycling.

Module III: Chemical Thermodynamics and Corrosion Science (7 Hours)

Thermodynamic functions: Energy, work, entropy, enthalpy and free energy, numericals based on these thermodynamic functions.

Corrosion: Introduction, mechanisms of corrosion, types of corrosion and prevention measures.

Module IV: Water Technology [8 Hours]

Impurities in natural water, hardness and alkalinity, Disadvantages of hardness i. e. sludge and scale formation, softening of water using lime-soda, numerical on Lime Soda calculations and ion-exchange method, advantages and limitations of these water softening processes, Desalination of water using Reverse Osmosis.

Text Books

1. A. K. Das and M. Das, An introduction to nanomaterials and nanoscience, CBS Publishers and Distributors

2. Smart nanomaterials for sensor application, Li S, Ge Y, Li H, 2012, Bentham Science Publishers, ISBN: 9781608055425.

3. C. N. Rao, A Muller and A. K. Cheetam, The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Wiley-VCH, 2004.

4. e- Waste recycling and management: present scenarios and Environmental issues by Khan, Anish, and Abdullah M. Asiri. 2019, Springer, Vol.33. ISBN: 978-3-030-14186-8

5. Michael J. Moran and Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, Fifth Edition, John Wiley and Sons, 2006.

6. Donald L. Pavia, Gary M. Lampman, George S. Kriz, and James R. Vyvyan, Introduction to

Spectroscopy, Fifth Edition, Cengage Learning, 2009.
7. P. C. Jain and Monica Jain, **Engineering Chemistry**, Dhanpat Rai Publication.
8. S. S. Dara, **A Textbook of Engineering Chemistry**, S. Chand Publications.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: II

Course Code: CHP2003 **Course: Chemistry for Electrical Engineers Lab**

Core/Elective/Practical/Other: BSC **Credits: 01, L: 00, T: 00, P: 02 Hrs. Per Week**

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

The students will be able to:

1. Estimate the amount of different impurities present in the water/waste samples.
2. Investigate molecular/system properties such as acid value, saponification value, surface tension, viscosity of aqueous or industrial important liquids/mixtures etc.
3. Synthesize a polymer or nanomaterial.

List of Experiments for Chemistry Lab

1. Introduction of volumetric analysis and Material safety MSDS data sheet.
2. To find out types of alkalinity and estimation of their extent in the water sample.
3. Estimation of temporary, permanent and total hardness present in the water sample using complex metric titration method.
4. Estimate the amount of ferrous and ferric ions present in the given $Fe^{2+/}Fe^{3+}$ solution.
5. Determination of relative and kinematic viscosities of aqueous solutions of Poly-ethylene glycol (Polymeric Liquid) using Redwood Viscometer (type I or II) at different temperatures.
6. To study effect of bonding of water molecules with electrolyte (NaCl/KCl) and non-electrolyte solute (Soap) in the solution through Surface Tension Determination.
7. Determination of acid value of given lubricating/ fuel oil.
8. Determination of saponification value of given lubricating/ fuel oil.
9. Synthesis a polymer / drug molecule / Nano-material. (Demonstration Experiment)

Text Books/Reference Books

1. A Textbook on Experiments and Calculations in Engineering Chemistry by S. S. Dara, S. Chand Publications.
2. Advanced Practical Physical Chemistry by J. B. Yadav, Krishna's Prakashan Media(P)Limited.
3. Collection of Interesting General Chemistry Experiments, A by A. J. Elias, Universities Press Publications.
4. College Practical Chemistry by V. K. Ahluwalia, S. Dhingra and A. Gulati, Universities Press Publications.
5. Advanced Practical Medicinal Chemistry by Ashutosh Kar, New Age International Publisher.
6. Applied Chemistry by Dr. A.V. Bharati, Das Ganu Publications.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B.Tech Semester: II

Course Code: MAT2001 **Course: Applied Mathematics II**

Core/Elective/Practical/Other: BSC **Credits: 03, L: 02, T: 01, P: 00 Hrs. Per Week**

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in Calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, the students will able to:

1. Interpret the solutions of system of linear equations and use the concepts of Eigen values, Eigen vectors to find diagonalization of matrices, reduction of quadratic form to canonical form.
2. Evaluate definite and improper integrals using Beta, Gamma functions. Also trace cartesian curves.
3. Solve multiple integration by change of order, change of variable methods and apply it to find area, volume, mass and center of gravity.
4. Understand geometric meaning of gradient, curl, divergence
5. Perform line, surface and volume integrals of vector-valued functions./Analyze and compare different sets of data and classify the data by means of diagrams and graph.

Syllabus

Module I: Matrices: (8 hours)
Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms, Introduction to n-dimensional space.

Module II: Integral Calculus: (8 hours)
Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Tracing of curves (Cartesian form)

Module III: **Multiple Integrals** (10 hours)
Multiple Integration: Double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: area, mass and volume by double integration, Center of mass and Gravity (basic concepts).

Module IV: Vector Calculus (Differentiation)(7hours)
Scalar point function, Vector point function, vector differentiation, gradient, divergence and curl, directional derivatives with their physical interpretations, solenoidal and irrotational motions, Scalar potential function.

Module V: Vector Calculus (Integration) (7 hours**) (All Branches except Biomedical Engineering)**
Vector integration: Line integrals, work done, conservative fields, surface integrals and volume integrals, Stoke's theorem, Gauss divergence theorem, Green's theorem and their simple applications.

OR

Module V: Descriptive Statistics (07- Lectures) (Only for Bio-Medical Engineering)
Types of statistical data: categorical, ranked, discrete, and continuous. Distinction between univariate, bi-variate, and multivariate statistics, Visualization techniques such as joint contingency tables, scatter plots, 2D histograms and line graphs, Measures of central tendency and Dispersion .

Topics for self-learning

Rolle's theorem, Mean value theorems, Indeterminate forms, Applications of definite integrals to evaluate perimeter, area, surface areas and volumes of revolutions.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Volume I & II, Pune VidhyarthiGrihaPrakashan, Pune-411030 (India).
6. Biomedical Statistics -Shantikumar Yadav , Sompal Singh, Ruchika Gupta
7. Theory and Problems of Probability and Statistics - M.R. Spiegal (Mc Graw Hill) Schaum Series

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: EET2002 **Course: Programming Skill**
Core/Elective/Practical/Other: ESC **Credits: 03, L: 03, T: 00, P: 00 Hrs. Per Week**

Course Outcomes

On successful completion of course student will learn:

CO1: To formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors.

CO2: To implement conditional branching, iteration and recursion, to decompose a problem into functions and synthesize a complete program using divide and conquer approach.

CO3: To use arrays, pointers, structures and I/O operations for the formulation of algorithms and programs.

CO4: To apply programming to solve matrix addition, multiplication problems and searching & sorting problems.

Syllabus

Module I: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: Steps to solve logical and numerical problems. Representation ofAlgorithm: Flowchart / Pseudocode with examples. Arithmetic expressions and precedence

Module II: C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case, Loops and Writing and evaluation of conditionals and consequent branching.

Module III: Arrays and Basic Algorithms

Arrays: 1-D, 2-D, Character arrays and Strings.

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definitionrequired)

Module IV: Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module V: Pointers and Structures

Structures, Defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Module VI: File handling

Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Readingand writing the file, Closing the files, using fflush().

Text Books

1. Programming in ANSI C : E. Balguruswami McGraw Hill
2. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill

Reference Books

1. Programming with C: Byron Gottfried, Schaums Outline Series.
2. Let Us C: Yashwant Kanetkar, BPB Publication

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: EEP2002 **Course: Programming Skill Lab**
Core/Elective/Practical/Other: ESC **Credits: 01, L: 00 T: 00, P: 02 Hrs, Per week**

Course Outcomes

On successful completion of course student will be able to:

1. Understand the fundamentals of C programming and choose the loops and decisionmaking statements to solve and execute the given problem.
2. Implement different Operations on arrays also design functions to solve the givenproblem using C programming.
3. Understand pointers, structures, unions and apply them to develop programs.
4. Implement file Operations in C programming for a given application.

Shri Ramdeobaba College of Engineering &Management,
NagpurDepartment of Electrical Engineering
B.Tech Semester: II

Course Code: EET2001 **Course: Basic Electrical Engineering-II**
Core/Elective/Practical/Other: PCC **Credits: 03, L: 03 Hrs. T: 00 Hrs, P: 00 Hrs Per Week**

Course Outcomes:

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

CO1. Explain the construction, working and types of DC machine and discuss the characteristics and applications of DC motor.
CO2. Explain the construction, working principle of single-phase transformer and determine its performance at given operating condition.
CO3. Compare the different types of three-phase transformer and discuss their clock-hour marking.
CO4. Explain single phase AC motors and state their applications.
CO5. Discuss various drive train topologies used in electric vehicle and the function of each component.

Syllabus

Module I: DC Machines (08 Hours)
Basic principle & operation of DC generators and DC motors (separately excited, shunt and series), Induced EMF equation, Characteristics of DC motors, speed control of DC motors, Losses & Efficiency, Application of DC motor.

Module II: Transformers: Single Phase (10 Hours)
Ideal and practical transformer, equivalent circuit, losses in transformers, regulation, and efficiency, OC and SC tests.

Module III: Transformer: Three Phase (04 Hours)
Types of construction, Comparison between three phase transformer and a bank of three single phase transformers, Clock hour marking, Connections of three phase transformer, Differences between Power transformer and distribution transformer, Applications.

Module IV: Single phase AC Motors (08 Hours)
Single Phase induction motor, Double revolving field theory Methods of starting using auxiliary winding, capacitor start-run type, capacitor start induction run type, applications. Introduction to universal motor and its applications.

Module V: Introduction to Electric and Hybrid Electric Vehicles
Comparison of electric vehicle with conventional vehicle, main components in electric vehicle, classification of electric and hybrid electric vehicle based on drive train topology, names of motors used in electric vehicle, market scenario of electric vehicle.

Textbooks /Reference books-

1. Electrical Machinery: I. J. Nagrath and D. P. Kothari, Tata McGraw-Hill Education, 2004
2. Electrical Machines, Dr. P.S. Bimbhra, Khanna Publishers, Third Edition,
3. Electrical Machines, Ashfaq Hussain, Dhanpat Rai & Co., Third edition, 2015
4. A Text Book of Electrical Technology, B. L. Theraja (Vol. II), S. Chand, 2005
5. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.
6. Power Electronics: M. Rashid, Pearson Education India, 2004.

Other reference material (e.g. e-resources): In addition to the suggested textbooks, lecture notes shall beprovided for self-study modules

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: EEP2001 **Course: Basic Electrical Engineering Lab-II**
Core/Elective/Practical/Other: PCC **Credits: 01, L: 00 T: 00 P: 02 Hrs., Per week**

Course Outcome:

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

CO1. Draw equivalent circuit and evaluate regulation and efficiency of a transformer byperforming different tests.

CO2. Identify HV/LV windings and discuss different types of three-phase transformerconnections.

CO3. Analyze the performance of DC and AC motors

CO4. Study the operation of DC- DC converters

CO5. Write effective reports based on observations and conclusions.

List of Experiments:

1. To determine Regulation and Efficiency of a single- phase transformer using open circuit (O.C.) and short circuit (S.C.) tests
2. To determine Regulation and Efficiency of a single- phase transformer using Direct Loading test
3. To study connection of three phase transformer (star-star, delta-delta, star-delta, delta-star)
4. To study speed control of D.C. shunt motor by:

a) Armature Voltage Control method.

b) Field current control method.

5. To study reversal of rotation of a three phase induction motor
6. To study Buck converter
7. To study Boost converter
8. Demonstration of cut-set of DC machine and three phase induction motor.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: HUT2001 **Course: Foundational Literature of Indian Civilization**
Core/Elective/Practical/Other: IKS **Credits: 02, L: 02 T: 00 P: 00 Hrs., Per week**

Course Outcome

At the end of the course the students will be able to achieve the following:

CO1: Understand the Indian knowledge system and its scientific approach

CO2: Get introduced to the Vedic corpus and recognize the multi-faceted nature ofthe knowledge contained in the Vedic corpus

CO3: Understand the salient features of the philosophical systems of the Vedic andnon-Vedic schools

CO4: Develop a basic understanding of the ancient wisdom recorded in variousIndian literary work

Syllabus

Module I: **Overview of Indian Knowledge System:** Importance of ancient knowledge, defining IKS, IKS classification framework, Historicity of IKS, Some unique aspects of IKS.

Module II: The Vedic corpus: Introduction of Vedas, four Vedas, divisions of four Vedas, six Vedangas, Distinct features of Vedic life.

Module III: Indian Philosophical systems: Development and unique features, Vedic schools of philosophy, Samkhya and Yoga School of philosophy, Nayay and Vaisesika school of philosophy, Purva-mimamsa and Vedanta schools of Philosophy, Non-vedic philosophies: Jainism, Buddhism, and other approaches

Module IV: Indian wisdom through ages: Panchtantras, Purans: contents and issues of interests, **Itihasa:** uniqueness of the two epics (Ramayan and Mahabharata),
Key issues and messages from Ramayana, Mahabharata – a source of worldly wisdom;
Indian ancient Sanskrit literature: Kalidas, Vishakadutta, Bhavbhuti, Shudraka*
***any one text as decided by the course teacher**

Reference material

1. B. Mahadevan, Vinayak Rajat Bhar, Nagendra Pavana R. N., "Introduction to Indian Knowledge System: Concepts and Applications" PHI, 2022

2. S.C. Chatterjee and D.M. Datta, An introduction to Indian Philosophy, University of Calcutta, 1984

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: PET2001 **Course: Sports-Yoga-Recreation**
Core/Elective/Practical/Other: CCA **Credits: 02, L: 01 T: 00 P: 02 Hrs., Per week**

Aim of the Course

The course aims at creating awareness about the fundamentals of Physical Education, Sports, Yoga, Recreation and its effectiveness to promote Health and wellness through Healthy Lifestyle.

Objectives of the Course

1. To impart the students with basic concepts of Sports, Yoga and Recreational activities for health and wellness.

2. To familiarize the students with health-related Exercise and evaluate their Health-related Fitness.

3. To make Overall growth & development with team spirit, social values and leadership qualities among students through various sports, games and Yogic activities.

4. To create Environment for better interaction and recreation among students as neutralizer for stress through various minor and recreational games.

Course Outcomes:

On completion of the course, students will be able to:

1. Understand fundamental skills, basic principle and practices of sports and Yoga.

2. Practically learn the principles of implementing general and specific conditioning of physical exercises and yoga.

3. Develop Health-related fitness and Body-mind co-ordination through various fitness activities, sports, recreational games and yoga.

4. Practice Healthy & active living with reducing Sedentary Life style.

Course Content:

Module I: - Theory: Introduction

- Meaning, Definition and Importance of Health & Wellness
- Dimensions of Health and Wellness
- Factors influencing Health and Wellness
- Physical Fitness, Nutrition, Habits, Age, Gender, Lifestyle, Body Types
- Health & Wellness through Physical Activities, Sports, Games, Yoga and Recreation activities
- Causes of Stress & Stress relief through Exercise and Yoga
- Safety in Sports

Module II: - Practical- Exercises for Health and Wellness

- Warm-Up and Cool Down - General & Specific Exercises
- Physical Fitness Activities
- Stretching Exercises
- General & Specific Exercises for Strength, Speed, Agility, Flexibility, coordinative abilities
- Cardiovascular Exercises
- Assessment of BMI

- Relaxation techniques
- Physical Efficiency Tests

Module III: - Yoga

- Shukshma Vyayam
- Suryanamaskar
- Basic Set of Yogasanas – Sitting, standing, supine and prone position
- Basic Set of Pranayama & Meditation

References:

1. Russell, R.P. (1994). Health and Fitness Through Physical Education. USA: Human Kinetics.
2. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication.
3. AAPHERD "Health related Physical Fitness Test Manual."1980 Published by Association drive Reston Virginia
4. Kumar, Ajith. (1984) Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana.
5. Dr. Devinder K. Kansal, A Textbook of Test Evaluation, Accreditation, Measurements and Standards(TEAMS 'Science)

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: EET2003 **Course: Analog Electronic Circuits**
Core/Elective/Practical/Other: ESC **Credits: 02, L: 02 T: 00 P: 00 Hrs. Per Week**

Course Outcomes

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

CO1: Discuss the operation and analyze the characteristics of semiconductor diodes, and MOSFET.

CO2: Design and analyze electronic circuits containing non-linear elements such as diodes, & MOSFET using the concepts of biasing, load lines, operating point and incremental analysis.

CO3: Analyze inverting and non- inverting configurations of operational amplifier with negative feedback, evaluate performance parameters of operational amplifier.

CO4: Design simple Op-amp circuits.

Syllabus

Module I: (04 Hours)
Diode Circuits: P-N junction diode, V-I characteristics of a diode; half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuit.

Module II: (10 Hours)
MOSFET Circuits: MOSFET structure and V-I characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuit - gain, input andoutput impedances, trans-conductance.

Module III: (08 Hours)]
Feedback amplifier and Op-amp fundamentals: General Feedback amplifier Structure, Properties of Negative Feedback,: Characteristics of operational amplifier, open loop Op- amp, basic inverting and non- inverting Op-amp amplifiers with negative feedback, Op-ampparameters & their analysis.

Module IV: (08 Hours)
Op-amp linear and nonlinear applications: voltage follower, summing amplifiers, integrators and differentiators, difference amplifiers & instrumentation amplifiers, Clipper, Clamper, Comparators, Schmitt trigger circuits, Oscillators and Active filters design.

Textbook:
1. Adel S. Sedra, Kenneth C. Smith, Arun N. Chandorkar, "Microelectronics Circuits:Theory and Applications," Seventh Edition, Oxford University Press, 2017.

2. Sergio Franco,“Design with Operational Amplifiers and Analog Integrated Circuits,”Fourth Edition, McGraw-Hill Education, 2014.

Reference books:

1. Donald Neamen, “Electronic Circuits: Analysis and Design,” Third Edition, McGraw-HillPublication, 2006.

2. Donald Neamen, “Semiconductor Physics and Devices: Basic Principles,” Fourth edition,McGraw-Hill, 2011.

3. Jacob Millman, Christos Halkias, Chetan Parikh, “Millman's Integrated Electronics,”Second edition, McGraw Hill Education, 2017.

4: Ramakant Gayakwad,” OP-AMPS and linear integrated circuits” 4th Edition, PHI

5 D. Roy Choudhary, Shail Jain “Linear Integrated Circuits”, 4th Edition, New Age International

Shri Ramdeobaba College of Engineering &Management,
NagpurDepartment of Electrical Engineering
B.Tech Semester: II

Course Code: EEP2003 **Course: Analog Electronic Circuits Lab**
Core/Elective/Practical/Other: ESC **Credits: 01, L: 00 T:00 P: 02 Hrs. Per Week**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the operating principle of MOSFET differential amplifier and its analysis.

2. To analyze inverting and non- inverting configurations of operational amplifier with negative feedback, evaluate performance parameters of operational amplifier and design basic linear and nonlinear Op-amp circuits.

3. Use operational amplifier in the design of Oscillators, Filters, waveform generators and comparator circuits.

Syllabus:

Experiments are based on syllabus of Analog Electronic Circuits subject.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester II

Course Code: EETE2001 **Course: Electrical Maintenance**
Core/Elective/Practical/Other: I Year Exit Course **Credits: 03, L: 03 T: 00 P:00 Hrs Per week**

Course Outcomes:

The students will be able to demonstrate the skills to

CO1: Prepare maintenance schedules for electrical equipment and follow the various maintenance practices

CO2: Test and maintain rotating electrical machines.

CO3: Test and maintain single phase and three phase transformers.

CO4: Test and maintain insulation systems of electrical equipment

Syllabus

Module I: General Introduction

a) Objectives of particular testing, Significance of ISS, concept of tolerance, routine test, type test, special tests
b) Method of testing, direct, indirect, distractive and non-distractive testing methods.
c) Concept of routine, preventive and breakdown maintenance, advantages of preventive Maintenance, introduction to Total productive maintenance [TPM].
d) Testing Methods: Conceptual understanding to detect the fault by test results of Megger Testing, Resistance Testing, Turns ratio testing, Three phase sequence, Testing.

Module II: Transformer routine maintenance
Testing: Type, Routine and Special Tests as per IS for Distribution and Power Transformer, Radiator choking, Breather silica jell bad condition, leakages from tank joints, Loose connections at terminals. Conservator top-up need, contamination of transformer oil properties, transformer de-hydration need etc. Effect of each reason on transformer.

Module III: Rotating Machine/ Motors maintenance
Testing: Needs and Standards, Tolerance, Types: Routine, Special and Supplementary tests, Methods of Testing: Direct, Indirect and regenerative with advantages and applications, Induction Motor Testing: Routine Type and Special Test of Single and Three Phase Induction motor as per IS.
Alternator and Synchronous motor Testing: Routine Type and Special Test of Three Phase alternator and Synchronous motor as per IS.

Module IV: Maintenance of Electrical Machine Insulation
Factors affecting life of Insulation material, Measurement of Insulation Resistance and Interpretation of condition of Insulation, Transformer Oil: Properties, contamination agents, tests,

Strengthening Insulations: Weakening agents, cleaning, Drying, Re-varnishing, baking impregnation, Filtration.

Module V: Miscellaneous equipment maintenance
Maintenance Solar panel, Battery,

Text Books:

1. A text book of electrical maintenance, M.A. Choudhary, Publisher: Nirali Prakashan
2. Maintenance of electrical equipment, S. M. Choudhari,: Techknowledge publications
3. Maintenance of electrical equipment, by Sonje Swati M.,Publisher: Tech-Neo
4. Testing, Commissioning, Operation and Maintenance of Electrical Equipments, S.Rao,: Khanna publishers
5. Operation and maintenance of electrical equipment Vol.1 and Vol.2, By :B.V.S.Rao, Media Promoters and publishers Pvt.Ltd.

Shri Ramdeobaba College of Engineering &Management, Nagpur
Department of Electrical Engineering
B.Tech Semester: II

Course Code: EETE2002 **Course: Electrical Appliances**
Core/Elective/Practical/Other: I Year Exit Course **Credits: 03, L: 03 Hrs. T: 00 Hrs, P:00 Hrs**

Course Outcomes:

Upon completion of this course, students will be able to.

CO1: Discuss the concept of Energy Efficiency of Electrical appliances & types of powersupply units used in these appliances.

CO2: Explain working principle & application of different electrical motors.

CO3: Describe working principle of appliances used for heating & cooling purpose.

CO4: Identify the different electrical power supply backup equipment like battery,Inverter, UPS, & photovoltaic system.

CO5: Explain construction & working principle of electrical domestic appliances.

CO6: Test & perform maintenance of Consumer Electrical Appliances.

Syllabus

Module I: (06 Hours)
Basics of DC & AC systems, voltage-current-power relationships, AC DC sources for appliances, Star rating, Energy efficiency in Electrical appliances, Importance of IS codes, IE codes.

Module II: (08 Hours)
Introduction to AC/DC Motors for Appliances (FHP Motors) - Single Phase Motors (FHP),DC Motors, BLDC Motors, Universal Motors.

Module III: (08 Hours)]
HVAC Appliances-: Construction, Working Principle, Ratings/Specifications, Control of
a) Resistance heating: Water heaters, Room Heater, Tea/ Coffee Maker, Oven, Toasters, Iron
b) Non Resistive heating: Induction heaters, Microwave oven
c) Cooling Appliances: Construction, Working Principle, Ratings/Specifications, Control ofFans, Desert Coolers, Air conditioner, Refrigerator

Module IV: (08 Hours)
Power supply Equipment: Battery and battery chargers, Switch mode power supply, Inverter, Uninterrupted Power Supply (UPS), Photovoltaic power System

Module V: (06Hours)
Other Consumer appliances: Construction, Working Principle, Ratings/Specifications, Control Mixer, Grinder, Juicer, Vacuum Cleaner, Air Purifier, Washing Machines, Weighing scale, Elevator

Module VI: (06 Hours)
Illumination-Construction, Working Principle, Ratings/Specifications, Control of LED Lights.

Text Book/ Resources:
1) Consumer Electronics by S P Bali, Pearson
2) Handbook of Repair & Maintenance of domestic electronics appliances: BPBPublications
3) Literature available through e-resources.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech III Semester

Course Code: MAT 3006 **Course: Mathematics for Electrical Engineering**
Core/Elective/Practical/Other: ESC **Credits: 02, L: 2 Hrs. T: 1 Hrs, P: 0 Hrs Per Week**

Course Pre-requisite: Ordinary differential equations**.**

Course Outcomes

On successful completion of the course, student will be able to

CO1. Solve problems related to engineering involving partial differential equations.

CO2. Understand Laplace transforms and its properties, and use it to solve ordinary and partial differential equations.

CO3. Demonstrate understanding of various numerical methods and how they are used to obtain approximate solutions to algebraic, transcendental and ordinary differential equations.

Syllabus

Module -I: Partial Differential equations (08 hours)
Partial differential equation of first order first degree i.e. Lagrange's form, Linear homogeneous PDE of nth order with constant coefficient, method of separation of variables, Applications of partial differential equations to solve the problems of transmission lines.

Module-II: Laplace Transforms (10 hours)
Laplace transforms and their properties, inverse Laplace transform, Application for Laplace transform to solve ordinary differential equations including simultaneous differential equations. Solution of partial differential equations by using Laplace transform method.

Module-III: Numerical Methods (09 hours)
Solution of algebraic and transcendental equations using method of False position and Newton-Raphson method, Solution of system of linear equations, Gauss elimination method, Gauss-Seidal method.
Numerical solution of ordinary differential equations by Taylor's series method, Modified Euler's method, Runge-Kutta method.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI, 4th Edition, 2005.
3. T. Veerarajan , Engineering Mathematics for first year, TataMcGraw-Hill, New Delhi,2008.

Reference Books:

1. B. V. Ramana, Higher Engineering Mathematics, TataMcGraw-Hill, New Delhi, 11th Reprint, 2010.
2. N. P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint,2010.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of Electrical Engineering

B. Tech III Semester (NEP)

Course Code: EET3001 **Course: Network Analysis**

Core/Elective/Practical/Other: PCC **Credits: 04, L: 3 Hrs. T: 1 Hrs, P: 0 Hrs Per Week**

Course Outcomes:

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

CO1: Analyse the single phase and three phase circuits using basic mathematical tools

CO2: Apply various network theorems for solving electrical network analysis.

CO3: Apply Laplace transforms and waveform synthesis techniques for electrical circuit analysis.

CO4: Evaluate various network functions and two port electrical network parameters.

CO5: Apply the graphical approach to electrical networks.

Syllabus

Module-I: Equilibrium Equations: (08 Hours)
Equilibrium Equations with Nodal & Mesh Analysis on electrical networks, source transformations, Dot conventions in coupled circuits, Solutions of Mutually coupled Networks, Duality.
Three phase unbalanced circuits and power calculations.

Module-II: Network Theorems: (08 Hours)
Superposition, Reciprocity, Thevenin's, Norton's. Maximum Power Transfer, Compensation, Tellegen's theorem as applied to DC & A.C. circuits.

Module-III: Laplace Transform & Applications: **(10 Hours)**
Evaluation of initial & final condition, Concept of complex frequency, Partial fractions, Singularity functions, Waveforms Synthesis, Steady state and transient state analysis of RL, RC, RLC network with initial & final conditions using Laplace Transformation.

Module- IV: Network Functions: (08 Hours)
Transient Response, Driving points and transfer functions, Poles, Zeros of network function, their properties, Time response from Pole-Zero locations on s-plane, convolution integral solution.

Module-V: Two Port Networks: (07 Hours)
Network Parameters and Inter-connections, Conditions of Reciprocity and Symmetry, Inter-relations between parameter sets.

Module-VI: Network Graph Theory & Resonance: (07 Hours)
Paths and Cycles, Connectivity, Trees, Spanning Sub-graphs, Random graphs. Formation of incidence Matrix, Cut-set Matrix, Tie-set Matrix, Resonance in series & parallel RLC circuits.

Text Books:

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications,1998.
3. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
4. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education,2004.
5. A. Chakrabarty, “Circuit Theory (Analysis & Synthesis)”, Dhanpat Rai & Co. 2006

Reference Books:

1. Allan H. Robbins, Wilhelm C. Miller, “Circuit Analysis Theory and Practice”, Cengage Learning India, 2013.
2. Jegatheesan, R., “Analysis of Electric Circuits,” McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum's series, McGraw- Hill,New Delhi, 2010.
4. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
5. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
6. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of Electrical Engineering

B. Tech III Semester

Course Code: EEP3001 **Course: Network AnalysisLab**

Core/Elective/Practical/Other: PCC **Credits: 01, L: 0 Hrs. T: 0 Hrs, P: 02 Hrs Per Week**

Course Outcomes:

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

CO1. Apply, analyze and co-relate fundamental principles of Engineering with laboratory experimental work.

CO2. Perform the experiment and analyze the observed data.

CO3. Write practical record with effective presentation.

CO4. Verify experimental results with theoretical analysis and make valid conclusion.

List of Experiments

1. Verification of Thevenin's Theorem.
2. Verification of Norton's Theorem.
3. Verification of Superposition Theorem.
4. Verification of Maximom Power Transfer Theorem.
5. Verification of Milliman's Theorem.
6. Verification of Reciprocity Theorem.
7. To Find the Voltage Transfer Ratio of a Two Port, Bridged-T Network.
8. To Find Z-Parameters of a Two Port, T -Network.
9. To Study the Resonance of RLC Series/Parallel Network & Plot the Vr Vs F Curve.
10. To Verify the Network Theorems using MATLAB Simulation.
11. To Find the Voltage Transfer Ratio using MATLAB Simulation.
12. To Find Z-Parameters T-Network using MATLAB Simulation.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B. Tech III Semester

Course Code: EET3002 Course: Electrical Measurements and Instrumentation
Core/Elective/Practical/Other: PCC Credits: 03, L: 2 Hrs. T: 1 Hrs, P: 0 Hrs Per Week

Course Outcomes:

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

CO1. Identify suitable bridge for the measurement of passive electrical elements.

CO2. Describe the operating principle and construction of different types of analog instruments.

CO3. Describe the operating principle and construction of digital instruments for the measurement of electrical quantities.

CO4. Explain the Instrument transformers to calculate various operational parameters.

CO5. Select and compare different transducers for the measurement of various physical quantities.

Syllabus

Module-I: (09 Hours)
Measurement Systems, classification of different measuring Instruments, D.C bridges (Wheat stone, Kelvin and Kelvin's Double bridge) A.C bridges (Schering Bridge, Maxwell-Inductance- Capacitance Bridge, Hay's bridge, Owen's Bridge and DeSauty's Bridge).

Module-II: (09 Hours)
Analog Measurement Techniques, Principles of permanent magnet moving coil (PMMC) instrument, Moving iron (MI) instrument and Electrodynamometer type instruments. Measurement of three phase and single phase power, loading effect of instruments.

Module-III: (06 Hours)
Digital Measurement Techniques, True RMS measurement, measurement of voltage, Current, Power, Frequency and Energy.

Module-IV: (07 Hours)
Introduction to Instrument transformers and its applications. Working principle of Special Instruments, Insulation Tester, and Earth tester.

Module-V: (09 Hours)
Classification of Transducers, -Electromechanical transducers, Potentiometric resistance Transducers, Inductive type transducers, Variable inductance transducer, , Piezoelectric transducer, Strain gauges, Linear variable differential transformer, Capacitive type transducer, resistance strain gauge, Digital transducers

Module-VI: (07 Hours)
Measurement of temperature, measurement of flow, measurement of motion and measurement of pressure.

Text books:

1. A Course in Electrical and Electronics Measurements and Instrumentation: 11ed. Sawhaney A. K., Dhanpat Rai & Sons, Delhi 1994.

2. Electrical Measurements and Measuring Instruments: 3ed. Golding, E. W., Widdis, F.C.,Wheeler's Student Edition, 1994.
3. Electrical Measurements and Instrumentation: U. A. Bakshi, A.V. Bakshi, Technical Publications, 2009.
4. Electrical and Electronic Measurements and Instrumentation: R.K. Rajput.
5. Instrumentation Measurement and Analysis: B C Nakra, K K Chaudhary

Reference Book:

1. Electronic Measurements and Instrumentation: 3 ed., Cooper, W.D., Helfrick, A.D., Prentice-Hall of India,New Delhi 1991

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B. Tech III Semester

Course Code: EEP3002 Course: Electrical Measurements and Instrumentation Lab
Core/Elective/Practical/Other: PCC Credits: 01, L: 0 Hrs., T: 0 Hrs, P: 02 Hrs., Per Week

Course Outcomes

Upon the completion of this course, students will be able to,
CO1. Understand and correlate the theoretical knowledge of electrical measurements and instrumentation with laboratory experiments.
CO2. Perform the experiment and analyze the observed data.
CO3. Write practical record with effective presentation.
CO4. Measure different physical and electrical parameters and make valid conclusion.

List of Experiment:

Part-A: Based on Electrical Measurements

Part-B: Based on Instrumentation

Part-A: Based on Electrical Measurements

1. Measurement of Resistance
   i. Medium Resistance using Wheatstone Bridge Method
   ii. Low Resistance using Kelvin's Double Bridge method
2. Measurement of Capacitance using
   i. De-Sauty's Bridge and Modified De_Sauty's Bridge
   ii. Schering Bridge
3. Measurement of Inductance using
   i. Hay's Bridge
   ii. Maxwell's Bridge
4. Measurement of reactive power by one wattmeter method
5. Measurement of three phase power using two wattmeter method.
6. Measurement of Energy using Digital Energy meter

Part B: Based on Instrumentation

7. Pressure measurement using Piezo Resistive sensor
8. Flow measurement using Rotameter
9. Temperature measurement using Thermocouple
10. Study of Linear Variable Differential Transformer (L.V.D.T.)

Text books:

1. A Course in Electrical and Electronics Measurements and Instrumentation: 11ed., Sawhaney A. K., Dhanpat Rai & Sons, Delhi 1994.
2. Electrical Measurements and Measuring Instruments: 3ed., Golding, E. W., Widdis, F. C.Wheeler's Student Edition, 1994.
3. Electrical Measurements and Instrumentation: U. A. Bakshi, A.V. Bakshi, Technical Publications,2009.
4. Electrical and Electronic Measurements and Instrumentation: R.K. Rajput.

Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of Electrical Engineering

B. Tech III Semester

Course Code: EET3003 **Course: Data Structures and Algorithms**

Core/Elective/Practical/Other: MDM **Credits: 03, L: 03 Hrs. T: 0 Hrs, P: 0 Hrs Per Week**

Course Outcomes:

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

CO1. Recognize different abstract data structures, operations and complexities and apply basic techniques of writing algorithm.

CO2. Apply the different linear data structures (Stack, Queues, Linked list) to problem solutions.

CO3. Apply appropriate searching and sorting algorithms to access elements.

CO4. Apply various traversal methods on binary trees and implement basic operations on it.

CO5. Demonstrate various traversal and path finding algorithms for Graphs.

Syllabus

Module I: (06 Hours)

Data Structures and Algorithms Basics: Introduction: basic terminologies, elementary data organizations, data structure operations; abstract data types (ADT) and their characteristics.
Algorithms: definition, characteristics, analysis of an algorithm, asymptotic notations, time and space tradeoffs.

Module II: (08 Hours)

Stacks and Queues: Overview of Array ADT.
Stack ADT: Introduction, Representation of Stacks, Stack Operations and Applications of stacks
Queue ADT: Introduction, Operations on Queue, Types of Queues and Applications of Queues.

Module III: (06 Hours)

Linked Lists: Singly Linked Lists: representation in memory, algorithms of several operations: traversing, searching , insertion, deletion, reversal, ordering, etc.

Module IV: (08 Hours)

Searching and Sorting:
Searching: Linear and Binary Search Methods and complexity analysis of search methods.
Sorting: Different approaches to sorting, Bubble sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Heap Sort and their complexity analysis.

Module V: (06 Hours)

Trees: Introduction, basic terminology, binary tree and operations, binary search tree [BST], expression tree, traversing a binary tree, Operations on Binary Search Tree.

Module VI: (06 Hours)

Graphs: Introduction, basic terminology, graph traversal algorithm (DFS, BFS) with complexity analysis, shortest path algorithms.

Text Books:

1. E Balagurusamy , Data Structures Using C,MC Graw Hill, Nineteenth reprint 2023.
2. Ellis Horowitz, Sartaj Sahni& Susan Anderson-Freed, Fundamentals of Data Structures in C, Second Edition, Universities Press, 2008.
3. Mark Allen Weiss; Data Structures and Algorithm Analysis in C; Second Edition;Pearson Education; 2002.
4. G.A.V. Pai; Data Structures and Algorithms: Concepts, Techniques and Application;First Edition; McGraw Hill; 2008.

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein;Introduction to Algorithms; Third Edition; PHI Learning; 2009.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran; Fundamentals of Computer Algorithms; Second Edition; Universities Press; 2008.
3. A. K. Sharma; Data Structures using C, Second Edition, Pearson Education, 2013

Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of Electrical Engineering

B. Tech III Semester

Course Code: EEP3003 **Course: Data Structures and Algorithms Lab**

Core/Elective/Practical/Other: MDM **Credits: 01, L: 0 Hrs., T: 0 Hrs, P: 02 Hrs., Per Week**

Course Outcome:

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

CO1. Understand a systematic approach to organise, write and debug C program.

CO2. Implement linear data structure operations using C program.

CO3. Implement non-linear data structure operations using C program.

CO4. Implement sorting and searching algorithms using relevant data structures.

List of Experiments:

1. Write a program in C to implement control structures and functions.
2. Write a program in C to implement an array.
3. Write a program in C to implement PUSH and POP operations on Stack using array.
4. Write a program in C to check nesting of parentheses using a Stack.
5. Write a program in C to evaluate postfix expression using Stack.
6. Write a program in C to implement a Queue and perform its common operations.
7. Write a program in C to implement a linked list and perform its common operations.
8. Write a program in C to implement binary tree traversal using INORDER, PREORDER and POSTORDER techniques.
9. Write a program in C to implement searching techniques in array.
10. Write a program in C to implement DFS and BFS graph traversal algorithm.
11. Open ended experiment.

Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of Electrical Engineering

Semester: III (NEP)

Course Code: EET2980-1 Course: Electrical Engineering: Introduction and Applications

Core/Elective/Practical/Other: OE Credits: 02, L: 02 Hrs. T: 0 Hrs, P: 0 Hrs Per Week

Course Outcomes

At the end of this course, students will be able to

CO1. Apply the concept of basic laws for solving the DC circuits.

CO2. Analyze the behavior of single phase and three phase AC circuits.

CO3. Discuss the working principle of transformer and calculate its parameters.

CO4. Comprehend the working of Induction motors and BLDC motor.

Syllabus

Module I: DC Circuits (06 Hours)

Circuit elements resistor, inductor and capacitor, Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel circuits excited by independent voltage sources; energy sources, dependent sources, star- delta transformation.

Module II: A.C. Circuits (08 Hours)

Generation of sinusoidal voltage, basic terminologies associated with AC quantity, phasor representation of alternating quantities. Real power, reactive power, apparent power and power factor, Analysis of basic series and parallel AC circuit.

Three Phase A.C. Circuits: Basic concepts; Relationship between line and phase values of balanced star and delta connections; Power in balanced three phase circuits.

Module III: Transformers (08 Hours)

Basic principle and construction of single-phase transformer; Operation under no load and load condition, equivalent circuit, voltage regulation and efficiency.

Module IV: Induction Motors (06 Hours)

: Construction, working principle and applications of single-phase motors. Working principle of three phase induction motor; Introduction to BLDC motors: working principle, construction with its applications.

Text / Reference Books:

1. Kulshreshtha D.C. (2009), Basic Electrical Engineering, Tata McGraw Hill.
2. Electrical Technology: B. L. Thareja, S. Chand Publications.
3. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P.P.H. Pvt. Ltd.
4. Nagrath I.J. and D. P. Kothari (2001), Basic Electrical Engineering, Tata McGraw Hill
5. AICTE's Prescribed Textbook: Basic Electrical Engineering, Khanna Book Publishing.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech III Semester (NEP)

Course Code: EET2980-2 **Course: Renewable Energy Systems**
Core/Elective/Practical/Other: OE **Credits: 02, L: 02 Hrs. T: 0 Hrs, P: 0 Hrs., Per Week**

Course Outcomes:

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

CO1. Understand the necessity and importance of renewable energy sources.

CO2. Discuss the working principle of solar photovoltaic system and its topologies.

CO3. Discuss the operation of wind energy generation.

CO4. Explain the renewable energy sources like Hydel, Tidal, Biomass, Geothermal, Wave, Ocean.

Syllabus

Module I: (04 Hours)
Global and National Energy Scenario: Over view of conventional & renewable energy sources, need, potential & development of renewable energy sources, Global and Indian Energy scenario, Energy for sustainable development, Global climate change, carbon credits and carbon footprint calculation.

Module II: (08 Hours)
Solar Energy: Solar energy system, Solar Radiation, Introduction to photovoltaic solar cell, characteristics and its connections, Different PV topologies.

Module III: (06 Hours)
Wind Energy: Wind Energy Conversion, Potential, Nature of the wind, Types of wind turbines, Wind-Electric Generation.

Module IV: Other Renewable Sources (08 Hours)
Introduction to hydel-power generation, tidal energy, biomass energy, geothermal energy .

Text Books

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH,New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition, 2013.
3. Non-Conventional Energy Sources /G.D. Rai, Khanna Publishers

Reference Books

1. Renewable Energy- Edited by Godfrey Boyle-oxford University, press, 3rd edition, 2013.
2. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific,Si'pore.
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
4. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
5. Non-conventional energy source –B.H. Khan- TMH-2nd edition.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech III Semester

Course Code: CHT3001 **Course: Environmental Science**
Core/Elective/Practical/Other: VES **Credits: 02, L: 02 Hrs. T: 0 Hrs, P: 0 Hrs., Per Week**

Course Outcomes:

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

CO1. Develop an understanding of pollution and its types.

CO2. Learn about different kinds of sources of pollution.

CO3. Explain sustainable development, its goals, targets, challenges and global strategies for sustainable development

CO4. Understand different methods of assessing environmental quality and associated risks.

Syllabus

Module I: Environmental Pollution I
Air pollution: Sources of air pollution; Primary and secondary pollutants; carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter and sulphur dioxide; Other important air pollutants. Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality
Water pollution: Sources of water pollution; marine pollution and groundwater pollution; Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life, treatment scheme for waste water from different industry .

Module II: Environmental Pollution II
Soil pollution and solid waste: Soil pollutants, hazardous wastes and their sources; Impact on human health.
Introduction, types of e-wastes, environmental impact, e-waste recycling, e-waste management rules.
Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health, recent advances in noise pollution control and benefits.
Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.

Module III: Environmental Sustainability
Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs
Green Technology: goals and significance, sustainability

Green chemistry, challenges to green technology, advantage and disadvantages of green processes, Eco mark certification- its importance and implementation

Module IV: Environmental laws and regulation
Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control.
Environmental management system: ISO 14001
Environmental audit and impact assessment; Environmental risk assessment Pollution control and management.

Reference Books:

1. Ahluwalia, V. K. (2015). Environmental Pollution, and Health. The Energy and Resources Institute (TERI).
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut
3. P Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann
4. P.T. Anastas & J.C. Warner, Green Chemistry: Theory & practice, Oxford University Press.
5. Environmental Pollution and its control Techniques by Dr. S.S. Dara.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech III Semester

Course Code: HUT3001 **Course: Business Communication**
Core/Elective/Practical/Other: AEC **Credits: 02, L: 02 Hrs. T: 0 Hrs, P: 0 Hrs., Per Week**

Course Outcomes

On successful completion of the course the students will be able to achieve the following:

CO1: Understand the fundamentals of business communication.

CO2: Apply tools and techniques to create effective workplace correspondence.

CO3: Analyse and apply visual design principles to create business documents.

CO4: Understand and evaluate information to draft reports.

CO5: Apply and evaluate strategies for effective communication for employment.

Syllabus:

Module I: Fundamentals of Business Communication (06 Hours)

Definition of communication, Emergence of communication as a key concept in the Corporate and Global world, Types- Internet, Blogs, E-mails, social media, Channels- Formal and Informal: Vertical, Horizontal, Diagonal, Grapevine, Persuasive Communication- Negotiation Skills, PAC concept

Module II: Business Correspondence (06 Hours)

Planning, Writing, and Completing Business Messages

Personnel Correspondence: Job Application Letter, Letter of Acceptance of Job Offer, Letter of Resignation, Letter of Appointment, Promotion and Termination, Letter of Recommendation

Trade Correspondence: Inquiry, Order, Credit and Status Enquiry, Complaints, Claims, Adjustments, Consumer Grievance Letters

Module III: Visual and Content Creation (06 Hours)

Visual design principles, Ethics of visual communication, selecting visuals for presenting data, Content Creation: Website, Help file, User Guides, Promotional leaflets and fliers

Module IV: Reportsv (04 Hours)

Basic formats and types of reports - Feasibility, Progress, Project, Case Study Evaluation, Agenda, Notices, Minutes of Meeting, Organizational announcements, Statement of Purpose.

Module V: Communication for Employment (04 Hours)

Pre-interview technique- NOISE Analysis, Job Description and Resume, Creating LinkedIn Profile, Effective use of job portals, Business etiquette.

Text Books:

1. Sharon Gerson, Steven Gerson, “Technical Communication: Process and Product”, 2018, Pearson
2. Courtland L Bovee, John V Thill and Roshan Lal Raina “Business Communication Today”, 14th edition Pearson
3. P.D. Chaturvedi and Mukesh Chaturvedi, Fundamentals of Business Communication, Pearson Publications, 2012.

Reference Books

1. Shalini Verma, Business Communication, Vikas Publishing House Pvt. Ltd., 2015.
2. Sanjay Kumar, Pushpa Lata, Communication Skills, 2nd Edition, Oxford Publication, 2018
3. William Strunk Jr. and E.B. White, The Elements of Style, Allyn & Bacon, A Pearson Education Company, 2000

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech III Semester

Course Code: EETH3100 Course: Renewable and Distributed Energy Sources
Core/Elective/Practical/Other: Honors Credits: 03, L: 03 Hrs. T: 0Hrs, P: 0 Hrs., Per Week

Course Outcomes:

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

CO1: Identify & differentiate the renewable and non-renewable sources of energy.

CO2: Discuss the working principle of solar photovoltaic system and its topologies.

CO3: Discuss the operation of wind energy generation.

CO4: Explain the renewable energy sources like Hydel, Tidal, Biomass, Geothermal, Wave, Ocean.
CO5: Identify & apply the concept of distributed generation.

Syllabus

Module I: Introduction (04 Hours)
Conventional power generation: advantages and disadvantages, Energy crises, Non – conventional energy (NCE) resources, Potential and scope

Module II: Solar Photovoltaic System (10 Hours)
Solar energy system, Solar Radiation, Measurement and Estimation, Solar-Electrical Power Generation, general Solar Photo Voltaic (SVP) system, Different configurations, SPV system components and their characteristics, Stand-Alone and Grid Connected SPV systems.

Module III: Wind Energy: (10 Hours)
Wind Energy Conversion, Potential, Nature of the wind, Energy Estimation, Site selection, Types of wind turbines, Wind farms, Wind Generation and Control., offshore wind energy – Hybrid systems.

Module IV: Other Energy Sources (06 Hours)
Brief idea of other sources viz., hydel-power, tidal, biomass, geothermal, etc,

Module VI: Introduction to Distributed Generation (06 Hours)
Concept of distributed generations, topologies, selection of sources, Advantages, issues in DG implementations. Requirements of hybrid/combined use of different renewable and distributed sources, need of energy storage

Text Books:
1. Solar Photovoltaics Fundamentals, Technologies and Applications by Chetan Sing Solanki, Eastern Economy Edition : Third Edition.
2. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers
3. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition,2013.

Reference Books:
1. Renewable Energy- Edited by Godfrey Boyle-oxford University, press, 3rd edition, 2013.

2. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
4. Non-conventional energy source –B.H. Khan- TMH-2nd edition.
5. Integrated energy systems modeling--Karlsson, Kenneth Bernard; Skytte, Klaus Morthorst;
Published in: DTU International Energy Report 2015

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech III Semester

Course Code: EETH3100 **Course: Basics of Electrical Engineering and EV**
Core/Elective/Practical/Other: Minors **Credits: 03, L: 03 Hrs. T: 0Hrs, P: 0 Hrs., Per Week**

Course Outcomes

Upon the completion of this course students will be able to:

CO1: Analyze the basics of ac and dc circuits.

CO2: Discuss the construction and operation of transformer, induction motor and DC Motor.

CO3: Compare electric vehicle with conventional vehicle and its impact on energy supplies.

CO4: Discuss the dynamics of vehicle.

CO5: Discuss the architecture and various topologies of EV and HEVs.

Syllabus

Module I: Introduction to Electric Circuits (06 Hours)
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with DC excitation.

Module II: Single Phase AC Circuits (06 Hours)
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits.

Module III: Introduction to Electric Machines (06 Hours)
Construction and working principle of transformer, induction motor and DC motor.

Module IV: Overview of Electric Vehicle (05 Hours)
History of modern transportation, environmental impact and need of EV, comparison with IC engine, general layout of EV and its component, Electric vehicle Market.

Module V: Vehicle Dynamics (08 Hours)
Introduction, tractive efforts: linear and angular acceleration, aerodynamic drag, rolling resistance and uphill resistance. Power and torque to accelerate, dynamic equation, drive cycle and energy used.

Module VI: Drive train of EV and HEVs (05 Hours)
Basic concept of EVs and HEVs, classification, various drive-train topologies and power flow control.

Text Books:

1. Electrical Technology: B. L. Theraja, S. Chand Publications.
2. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
4. Electric Circuits” James W. Nilsson, Susan Riedel, 9th edition, Prentice hall, 2011
5. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, “Modern Electric, Hybrid

Electric and Fuel Cell Vehicles."

6. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals," CRC Press, 2021
7. James Larminie, John Lowry, "Electric Vehicle Technology Explained", John Wiley & Sons Ltd, 2003.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
3. Electric and Hybrid Vehicles: T. Denton, Routledge, 2016
4. Ali Emadi, "Handbook of Automotive Power Electronics and Drives", CRC publishers, 2012.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EET4001 **Course: Signals and Systems**

Core/Elective/Practical/Other: PCC **Credits: 03, L: 02 Hrs. T: 01 Hrs, P: 0 Hrs., Per Week**

Course Outcomes:

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

CO1: Identify the different types of signals and systems.

CO2: Analyze the differential equation in time domain.

CO3: Apply Fourier transforms for continuous-time and discrete-time signals.

CO4: Apply Z-transform to discrete signals and systems.

CO5: Illustrate the sampling process and its various applications.

Syllabus

Module-I: Introduction to signals and systems (08 Hours)
Signals and systems as seen in everyday life and in various branches of engineering and science. Different types and properties of signal and systems. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals.

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Module-II: Behaviour of continuous and discrete-time LTI systems (07 Hours)
Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response

Module-III: Fourier Transform (10 Hours)
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT), the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT).

Module-IV*: Z* Transform (07 Hours)
The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis, various properties of z transforms.

Module-V: Sampling and Reconstruction (06 Hours)
The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Text Books:

1. V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms, and Applications”, Pearson, 2006.
3. H. P. Hsu, “Signals and systems”, Schaum's series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.AICTE Model Curriculum for Undergraduate degree in Electrical Engineering (Engineering & Technology)

Reference Books:

1. V. Oppenheim and R. W. Schafer, “Discrete-Time Signal Processing”, Prentice Hall, 2009.
2. M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
3. B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EET4002 **Course: Electrical Machines-I**
Core/Elective/Practical/Other: PCC **Credits: 03, L: 02 Hrs. T: 01 Hrs, P: 0 Hrs., Per Week**

Course Outcomes

Upon the completion of this course, students will be able to,

CO1: Explain different types of transformers, their tests and evaluate the performance at given operating condition.

CO2: Analyze the parallel operation transformers.

CO3: Explain the construction and operating modes of a 3-phase induction machine and evaluate its performance using given data.

CO4: Explain and compare various methods of induction motor starting and braking.

CO5**:** Explain various method of speed control of three phase induction motor and differentiate them with the help of torque-speed characteristics.

Syllabus

Module-I: Transformer (08 Hours)
Review of single-phase transformer, phasor diagram, percentage resistance, reactance and impedance, parallel operation of single-phase transformer, polarity test, back-to-back test.
Auto-transformer: Construction, comparison with two winding transformers, VA conducted magnetically and electrically.
Accessories of oil immersed transformer (numerical excluded), introduction to dry type transformer, methods of cooling.

Module-II: Three phase Transformer (10 Hours)
Review of three phase transformer, OC & SC test on three phase transformers, calculation of regulation and efficiency, all day efficiency, vector groups, clock notation of 3-phase transformer, three phase to two phase conversion (qualitative analysis), concept of Inrush current, Tap changer (on load and off load).
Parallel operation of three phase transformer: Conditions for parallel operation and load sharing between parallel connected transformer.

Module-III: Three phase Induction Machine (10 Hours)
Construction,3-phase winding, production of rotating magnetic field, slip, equivalent circuit, phasor diagram, torque equation, power flow, torque-slip characteristic in all three modes of operation (motor, generator and braking), No load and blocked rotor tests**,** Double cage Induction motor, calculation of equivalent circuit parameters, losses and efficiency.

Module-IV: Starting, speed control and braking of 3-phase Induction Motor (08 Hours)
Starting methods of 3-phase Induction Motor: DOL starting, Rotor Resistor starting, Auto-transformer starting, Star-Delta starting.
Speed control Methods: By change in input voltage, input frequency, V/F method, rotor resistance control and their effect on torque speed characteristic; consequent pole changing technique.
Braking methods: Plugging, Regenerative braking, DC and AC dynamic braking.

Text Books:
1. Electrical Machines: Dr. P.S. Bimbhra
2. Electrical Machines: Ashfaq Hussain

3. A Text Book of Electrical Technology: B. L. Theraja (Vol. II)
4. Electric Power Transformer Engineering by Charles W. Johnson,3rd Edition,2012 CRC Press

Reference Books:

1. Performance & Design of A.C. Machine: M. G. Say
2. Electrical Machines: I.S. Nagrath & Dr. D.P. Kothari
3. Laboratory Courses in Electrical Engineering: Tarnekar, Kharbanda, Bodkhe & Naik

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EEP4002 **Course: Electrical Machines-I Lab**
Core/Elective/Practical/Other: PCC **Credits: 01, L: 0 Hrs. T: 0 Hrs, P: 02 Hrs., Per Week**

Course Outcomes:
Upon the completion of this course, students will be able to,

CO1. Understand and correlate the theoretical knowledge of three phase induction machines and transformer with laboratory experiments.

CO2. Select the instruments and apparatus of appropriate rating with recognition of machine ratings and connect the circuit to perform the experiment.

CO3. Perform the experiment, take readings, analyze the measured data and make valid conclusions.

CO4. Write effective report with neat and labelled presentation of diagrams, observations, correct calculations and graphs.

Experiments:
Based on the syllabus of course EET4002.

Text Books:

1. Laboratory Courses in Electrical Engineering, S. G. Tarnekar, P. K. Kharbanda, S. B. Bodkhe, S. D. Naik, D. J. Dahigaonkar, S. Chand Publishing, New Delhi.
2. Electrical Machines by Ashfaq Hussain, Dhanpat Rai& Co. (P) Limited
3. Electrical Machinery by I. J. Nagrath and D. P. Kothari, Tata McGraw-Hill Education, 2004.
4. Electrical Machinery by P.S. Bhimbra, Khanna Publishers.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B. Tech IV Semester

Course Code: EET4003 **Course: Power System-I**

Core/Elective/Practical/Other: PCC **Credits: 03, L: 03 Hrs. T: 0 Hrs, P: 0 Hrs Per Week**

Course Outcomes:

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

CO1. Determine per unit values of various power system components.

CO2. Calculate different electrical parameters of transmission line.

CO3. Model different types of transmission line and determine its efficiency and voltage regulation.

CO4. Explain and analyse different types of distribution system and underground cables.

CO5. Understand and analyse mechanical aspects of transmission system.

Syllabus

Module-I: Basic Concepts: **(06 Hours)**
Evolution of Power Systems and Present-Day Scenario. Structure of a power system, Transmission and Distribution Systems, Single line diagram, overhead and underground system, AC and DC transmission, Introduction to per-unit system and per-unit calculations.

Module- II: Transmission Line Parameters (08 Hours)
Transmission line parameters, Electric and Magnetic Fields around conductors, Capacitance and Inductance calculations for symmetrical and unsymmetrical conductor spacing, Transposition of line, Skin and Proximity effect, bundled conductors, Corona.

Module- III: Performance of Transmission Line (10 Hours)
Sinusoidal Steady state representation of Lines: Short, medium and long lines. Performance of transmission line and voltage regulation, Real and reactive power flow in transmission line, Surge Impedance Loading.

Module- IV: Distribution System and Cables (08 Hours)
Types of distribution system and its topologies, Feeders, distributors and service mains, Quantitative analysis of DC and AC distributor. Types of Cables, Capacitance of single-phase and three-phase Cable, Grading of Cable.

Module- V: Mechanical Design of Transmission Line (08 Hours)
Line Supports, Types of towers, Sag Calculation, Effect of Wind and Ice loading, Insulators: Types, Voltage distribution in insulator string, improvement of string efficiency.

Text Books:

1. Electric Power Systems: *C.L.Wadhwa, Wiley Eastern Ltd, New Delhi.*
2. Modern Power System Analysis: *D. P. Kothari and I. J. Nagrath, McGraw Hill Education, 2003.*
3. Principles of Power System: *V.K.Mehta, S.Chand ,2005*

Reference Books:

1. Power System Analysis: *J. Grainger and W. D. Stevenson, McGraw Hill Education,1994.*

2. Electric Energy Systems Theory: *O. I. Elgerd, McGraw Hill Education, 1995.*
3. Power System Analysis: *R. Bergen and V. Vittal, Pearson Education Inc., 1999.*
4. Electric Power Systems: *M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, Wiley, 2012.*

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B. Tech IV Semester

Course Code: EET4004 Course: Digital Circuit and Microprocessor

Core/Elective/Practical/Other: PCC Credits: 03, L: 03 Hrs. T: 0 Hrs, P: 0 Hrs Per Week

Course Outcomes:

At the end of this course, students will be able to

CO1: Discuss the working of various combinational circuits for different applications.

CO2: Identify the different sequential components used in combinational circuits.

CO3: Design and verify functionality of various combinational and sequential circuits.

CO4: Describe the architectural features of 8085 microprocessor and their usage.

CO5: Organize instructions to implement assembly language programs using 8085 microprocessor instruction set.

CO6: Comprehend and incorporate the concepts of Subroutines and Interrupts of 8085 microprocessor in simplifying assembly language programs.

Syllabus:

Module I: Logic Simplification (06 Hours)
Number system, Binary Arithmetic, Boolean algebra and De Morgan's Theorem, Logic Gates, SOP & POS forms, Logic Optimization Technique, Karnaugh maps.

Module II: Combinational logic Design (06 Hours))
Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, Arithmetic Circuit Design.

Module III: Sequential Logic Design (09 Lectures]
Latches Flip flop – S-R, J-K, D, T and Master-Slave JK FF, Counters, Shift registers.

Module IV: Microprocessor Introduction (06 Hours)
Introduction of Intel's 8085A: Architecture, description. Flag structure, concept of PSW, Addressing modes, Timing diagrams.

Module V: Programming (09 Hours)
Instruction Set Stack and Subroutine, Simple and Nested subroutines, Push-Pop, Call-Return instructions, Stack manipulation, (simple programming).

Module VI: Interrupts (06 Hours)]
Interrupt concept& structure in 8085, Interrupt Service Routines (ISR), advanced instructions of Programming of 8085A.

Text books:-

1. Fundamentals of Digital Circuits, A. Kumar, Prentice Hall India, 2016.

2. Modern Digital Electronics, R. P. Jain, McGraw Hill Education, 2009.

3. Microprocessor, Architecture, Programming and Applications with 8085, Ramesh

S.Gaonkar, 5th Edition, Penram International Publications.

Reference books:-

1. Digital logic and Computer design, M. M. Mano, Pearson Education India, 2016.

2. Digital Electronic Principles, By Malvino PHI, 3 Edition.

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B. Tech IV Semester (NEP)

Course Code: EEP4004 Course: Digital Circuit and Microprocessor Lab

Core/Elective/Practical/Other: PCC Credits: 01, L: 0 Hrs., T: 0 Hrs., P: 02 Hrs., Per Week

Course Outcomes:

At the end of this course, students will be able to

CO1. Design and optimize different of Combinational and sequential circuits.

CO2. Understand the instruction set of 8085 and write and debug Assembly language programs on microprocessor 8085.

Experiments are based on the syllabus of course EET4003

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B. Tech IV Semester

Course Code: EET 2990-1 **Course: Electrical Appliances**

Core/Elective/Practical/Other: OE **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes:

At the end of this course, students will be able to

CO1: Understand concept of energy efficiency of electrical appliances and types of power supply used in various appliances.

CO2: Explain the working principle and application of different electrical motors.

CO3: Explain the working principle of appliances used for heating and cooling purpose.

CO4: Describe the construction and working principle of electrical domestic appliances.

CO5: Discuss the illumination system used for domestic and commercial lighting.

Syllabus

Module-I: (06 Hours)
Basics of DC & AC systems, voltage-current-power relationships, AC- DC sources for appliances, Star rating, Energy efficiency in Electrical appliances, Importance of IS codes, IE codes.

Module-II: (08 Hours)
Introduction to AC/DC Motors for Appliances (FHP Motors) - Single Phase Motors (FHP), DC Motors, BLDC Motors, Universal Motors.

Module-III: (08 Hours)
HVAC Appliances-: Construction, Working Principle, Ratings/Specifications and Control of
a) Resistance heating: Water heaters, Room Heater, Tea/ Coffee Maker, Oven, Toasters, Iron
b) Non Resistive heating: Induction heaters, Microwave oven
c) Cooling Appliances: Fans, Desert Coolers, Air conditioner, Refrigerator

Module-IV: (06 Hours)
Other Consumer appliances: Construction, Working Principle, Ratings/Specifications, Control of Mixer, Grinder, Juicer, Vacuum Cleaner, Air Purifier, Washing Machines, Weighing scale.

Module-V: (06 Hours)
Illumination: Construction, Working Principle, Ratings/Specifications, Control of LED Lights.

Text Book/ Resources:
1) Consumer Electronics by S P Bali, Pearson
2) Handbook of Repair & Maintenance of domestic electronics appliances: BPB Publications
3) Literature available through e-resources

Shri Ramdeobaba College of Engineering &Management, Nagpur

Department of Electrical Engineering

B. Tech IV Semester (NEP)

Course Code: EET 2990-2 **Course: Energy Storage Systems**

Core/Elective/Practical/Other: OE **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes

On completion of this course, the students will be able to,

CO1: Identify the requirement of energy storage system to enhance power system flexibility with renewable energy integration.

CO2: Select the battery for specific application and estimate its parameters.

CO3. Compare different types of lithium ion battery as per application.

CO4: Understand the working principle, types and safety related issues of fuel cells.

CO5: Analyze the characteristics of supercapacitors, such as capacitance, energy density, power density, and cycle life.

CO6. Analyze different hybrid storage system as per applications in electric vehicles, smart grid, etc.

Syllabus

Module I: Introduction (06 Hours)
Energy storage system overview, energy storage needs and opportunities of energy, importance of the energy storage system in renewable Energy, electric vehicles, different types of energy storage technologies.

Module II: Battery technology (09 Hours)
Types of Batteries, working principle, important characteristics of batteries, design and selection of battery pack for given application, SoC, SoH, SoE estimation techniques, and introduction to battery management system

Module III: Lithium ion battery (08 Hours)
Introduction, advantages and disadvantages, Safety, Lifetime, Types of lithium ion batteries & their comparison, applications in EV,

Module IV: Fuel Cells (07 Hours)
Introduction to fuel cells, components of fuel cells, Types of fuel cells, fuel cell operation, including electrochemical reactions, proton exchange membrane (PEM) fuel cells, solid oxide fuel cells (SOFCs), alkaline fuel cells (AFCs), and other types of fuel cells. fuel cell stack, efficiency of fuel cell.

Module V: Supercapacitor (04 Hours)
Construction, working principle, types, advantages and disadvantages, diverse applications of supercapacitors across various industries, including electric vehicle, renewable energy, consumer electronics, and grid-level energy storage.

Module VI: Hybrid Energy storage systems (04 Hours)
Introduction, configurations and applications in EV.

Text Books

1) A. R. Pendse, "Energy Storage Science and Technology", SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011.

2) Rahn C. D. and Wang C., Battery Systems Engineering, First Edition, Wiley (2013)
3) Narayan R. and Viswanathan B., Chemical and Electrochemical Energy System, Universities Press (1998)
4) Lithium-Ion Batteries Basics and Applications by Reiner Korthauer, Springer.
5) Lithium-ion Batteries Fundamentals and Applications. by Wu, Yuping, CRC Press, Taylor and Francis.
6) O'hayre, S.W. Cha, W.G. Colella, F.B. Prinz, Fuel Cell Fundamentals, 3rd edition, Wiley publisher.
7) R. P. Deshpande, Ultracapacitors: Future of Energy Storage, McGraw-Hill Education, 2014
8) Genta, G, Kinetic Energy Storage: Theory and Practice of *Advanced Flywheel* Systems eBook

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EET2990-3 **Course: Solar Photovoltaic Systems**
Core/Elective/Practical/Other: OE **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes

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

CO1. Understand the terms related to solar radiations and calculate the average monthly solar insolation from given data

CO2. Discuss the equivalent circuit of PV cell and interpret I-V & P-V curves under different operating conditions.

CO3. Apply the algorithms used for the maximum power point tracking of PV array.

CO4. Describe the principle of power conversions used in PV system

CO5. Design PV system by estimating the load, sizing and selecting the batteries, sizing and selecting the PV modules and other components

Syllabus

Module I: Introduction (04 Hours)

Fossil fuel energy usage and global warming, role of renewable energy in sustainable development, renewable energy sources; global potential for solar electrical energy systems.

Module II: Solar Radiation (08 Hours)

Extra-terrestrial and terrestrial solar spectrum; clear sky direct-beam radiation; total clear sky insulation on a collecting surface; radiation on the collector in tracking systems; calculation of average monthly insolation from measured data.

Module III: PV Cells and Modules (08 Hours)

Photovoltaic cell and its simple model; I-V and P-V characteristics; PV modules and arrays; effect of shading, use of bypass and blocking diodes; influence of temperature; types of solar cells and their performance; schemes for maximum power point tracking;

Module IV: Maximum Power Point Tracking (06 Hours)

Concept of Maximum Power Point Tracking (MPPT) , Tracking algorithms; Charge controller: types and function.

Module V: Power Converters in Photovoltaic System (06 Hours)

DC - DC converter, DC - AC converter, Types of Solar PV systems.

Module VI: PV System Design and Applications (06 Hours)

Introduction to batteries and its parameters, Design of PV-powered DC load, Design of stand-alone system with Battery and AC or DC load, Introduction to Hybrid PV system.

Text Book

1. Solar Photovoltaic: Fundamentals, Technologies and Applications: Solanki, PHI Learning Pvt Ltd, 2009

Reference Books

1. Renewable and Efficient Electric Power Systems: Gilbert M. Masters, John Wiley & Sons, 2004
2. Photovoltaic Systems Engineering: Roger A. Messenger & Jerry Ventre, CRC Press, 2004, 2nd edition.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
IV Semester

Course Code: EET4005 **Course: Electrical Control Panel Design**
Core/Elective/Practical/Other: VS **Credits: 01, L: 01 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes:

After completion of this course, students shall be able to,

CO1: Identify the various electrical components used in LT control panels.

CO2: Understand the functioning of various types of electrical panel and control circuits.

CO3: Describe the standards and procedure for assembly of electrical panels.

Syllabus

Module-I: Basic components of LT Panels
Overview & Basic Switchgear, Application & Use of Switchgear (Protection & Control), Thermal & what is Magnetic protection, Wires & Cables, Bus-Bar.

Module-II: Introduction to Types of Low Tension panels
Main Low Tension (LT) Panel, Automatic Power Factor Correction Panel (APFC), Power Control Panel (PCC), Auto-mains Failure (AMF) panel, Automatic Transfer Panel(ATS) , Introduction to PLC and VFD Panel, Mimic, Switch Fuse Unit(SFU), Feeder Section Panel(FSP), Motor Starter Protector (MSP) Panel, Metering Cubical.

Module-III: Panel Design:
Panel specification, Panel assembly, General arrangement, Panel drawing

Text Books:

1. Basics of Panel boards: A quick STEP Online Course by Siemens industry, Inc. www.usa.siemens.com/step
2. Electrical installation guide by Schneider Electric
3. The essential guide of Control Panel by Schneider Electric
4. Electrical Assembly Operator – Control Panel Participants Handbook, National Skill Development Corporation,

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
IV Semester Syllabus

Course Code: EEP4005 **Course : Electrical Control Panel Design Lab**
Core/Elective/Practical/Other: VSC **Credits: 01, L: 0 Hrs., T: 0 Hrs., P: 02 Hrs., Per Week**

Course Outcomes:

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

CO1: Interpret the Electrical Panel specifications from the panel drawing.

CO2: Select the switchgears required for the Electrical control panel assembly.

CO3: Design the control wiring of basic control panels.

Laboratory Work:
Laboratory work based on following syllabus:

Understanding of Drawings:
Electric Symbol, Legends & Load Calculations, How to Read Single Line Diagram.

Introduction to Control wiring:
Generals aspects of Panel wiring.
Power & Control Circuit of DOL Starter: DOL with Current & Voltage Sensing Single Phasing Protection, Industrial Panel DOL Starter with different rating motor, Interlock between DOL Starters.
Power & Control Circuit of Star Delta Starter: Manual and Automatic Star-Delta Panel, Interlock between Star Delta Starter

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
IV Semester

Course Code: HUT4004 **Course: Constitution of India**
Core/Elective/Practical/Other: VEC **Credits: 02, L: 02 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes
On successful completion, of course student will be able to do the following

1. Understand the role of constitution in democratic India.
2. Understand constitutional rights and duties to become responsible citizens.
3. Understand the functioning of the three organs of government and accordingly adopt the constitutional values in personal and professional behaviour.
4. Understand and evaluate different case laws so as to develop clear understanding of dynamic nature of Indian society in consonance with constitutional spirit.
5. Understand various systems/levels of governance for effective participation

Syllabus:

Module I: Introduction to the Constitution (04 Hours)

- Meaning of the constitution law and constitutionalism
- Historical perspective of the Constitution of India
- Salient features and characteristics of the Constitution of India

Module II: Constitutional Rights and Duties (04 Hours)
- Scheme of the Fundamental Rights
- The scheme of the Fundamental Duties and its legal status
- The Directive Principles of State Policy –Its importance and implementation

Module III: Federalism in Indian Constitution (08 Hours)
- Federal structure and distribution of legislative and financial powers between the
- Union and the States
- Parliamentary Form of Government in India – The constitution powers and status of the President of India
- Emergency Provisions: National Emergency, President Rule, Financial Emergency
- Union Executive: structure, functions
- Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy & social Justice

Module IV: Amendments and their procedure in the Constitution (06 Hours)

- Amendment of the Constitutional Powers and Procedure
- Major and latest amendments in the constitution based on case laws (any 10 amendments can be taken for the discussion)

Module V: Bureaucracy and local self-governance (04 Hours)

- Local Self Government – Constitutional Scheme in India

- Provisions of civil services: Characteristics, functions, merits and demerits

Text Books

1. Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, 20th Edn, 2011.
2. M. V. Pylee, An Introduction to Constitution of India, Vikas Publishing,2002.

Reference Books

1. Arora & Mukherji, Federalism in India, Origin and Developments, Vikas Publishing House, New Delhi, 1992.
2. D.C. Gupta, Indian Government and Politics, Vikas publishing House, NewDelhi,1975.
3. K B Merunandan, Bharatada Samvidhana Ondu Parichaya, Bangalore, Meragu Publications, 2015
4. K. Sharma, Introduction to the Constitution of India, Prentice Hall of India, New Delhi, 2002.
5. Merunandan, "Multiple Choice Questions on Constitution of India", 2nd Edition, Meraga publication,2007.
6. Shubham Singles, Charles E. Haries and Et al, Constitution of India and Professional Ethics, Cengage Learning India Private Limited, Latest Edition, 2018.
7. S.N. Jha, Indian Political System: Historical Developments, Ganga Kaveri Publishing House, Varanasi, 2005
8. P.M Bakshi, Constitution of India, Universal Law Publishing House, New Delhi, 1999.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: IDT4510 **Course: Creativity Innovation and Design Thinking**
Core/Elective/Practical/Other: SEC **Credits: 01, L: 01 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes

After completion of this course, students will be able to

CO1. Practice thinking as a tool for solving problems

CO2. Generate, compare and evaluate the ideas which are best

CO3. Apply logical thinking in professional and quasi situations

CO4. Transduce the ideas into practically feasible inventions.

CO5. Incorporate design innovation in the product/processes

CO6. Understand the importance of intellectual property

Syllabus

Module-I: Thinking Miracles
Making a case for creativity, Creative thinking as a skill, Valuing diversity in thinking: Thinking preferences, Creativity styles, Creativity in problem solving

Module-II: Ideation
Thinking differently, Lateral thinking, Mind stimulation: games, brain-twisters and puzzles, Idea-collection processes, Brainstorming/Brain-writing, Metaphoric thinking, Outrageous thinking, Mapping thoughts, Attitudes and its types

Module-III:: Logical Thinking
Using Math and Science, Systematic logical thinking, Using math concepts, Eight-Dimensional (8D) Approach to Ideation: Uniqueness, Dimensionality, Directionality, Consolidation, Segmentation, Modification, Similarity, Experimentation

Module-IV: Inventive Thinking
Systematic inventive thinking, Levels of Inventions, The TRIZ methodology, Decision and Evaluation: Focused thinking framework, Six thinking hats, Ethical considerations

Module-V: Design for Innovation
Introduction to design for interaction, nine lessons for innovation, difference in creativity and innovation, Building blocks for innovation, The SCAMPER methods

Module-VI: Intellectual Property
Introduction to intellectual property: Patents, Copyrights, Trademarks, Trade Secret, Unfair Competition

Reference Books:

1. Creative Problem Solving for Managers - Tony Proctor - Routledge Taylor & Francis Group
2. 101 Activities for Teaching creativity and Problem Solving - By Arthur B Vangundy - Pfeiffer

3. H. S. Fogler and S.E. LeBlanc, Strategies for Creative Problem Solving, Prentice Hall
4. E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill,
5. J. Goldenberg and D. Mazursky, Creativity in product innovation. Cambridge University Press, 2002.

Mode of Evaluation:

CIDT Grand Assignment (Individual/Team Based)- 20 marks
End Semester Exam- 30 marks

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EETH4100 **Course: Energy Storage System**
Core/Elective/Practical/Other: Honors **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes:

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

CO1. Analyze the characteristics of energy sources used for storage system.

CO2. Estimate different battery parameters (SoC, SoH and SoE).

CO3. Compare different types of lithium ion battery used in electric vehicles.

CO4. Understand the working, types and safety related issues of fuel cell.

CO5: Analyze the characteristics of supercapacitors and estimate its parameters.

CO6. Analyze different hybrid storage system as per applications.

Syllabus

Module I: Introduction (06 Hour)
Energy availability, Demand and storage, Need for energy storage, Different types of energy storage, Comparison of energy storage technologies.

Module II: Battery Technology (**08 Hour**)
Overview, Battery definitions, terms and terminology, types and their properties, SoC, SoH, SoE estimation techniques.

Module III: Lithium Ion Battery (**07 Hour**)
: Introduction, Components, functions, advantages and disadvantages, Safety, Lifetime, Types to lithium ion battery & their comparison, applications in EV, SoC, SoH, SoE estimation techniques.

Module IV: Fuel Cells (**07 Hour**)
Introduction to fuel cells, components of fuel cells, Types of fuel cells, working principle of fuel cell, performance characteristics of fuel cells, efficiency of fuel cell, fuel cell stack, fuel cell cars and buses.

Module V: Supercapacitor (**08 Hour**)
Construction, working principle, types, advantages and disadvantages, SoC, SoH estimation techniques, application in electric vehicle.

Introduction to Advanced Flywheel, Introduction to Hybrid Energy storage systems: configurations and EV and smart grid applications

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Text Books

1. A. R. Pendse, "Energy Storage Science and Technology", SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011.
2. Rahn C. D. and Wang C., Battery Systems Engineering, First Edition, Wiley (2013)
3. Narayan R. and Viswanathan B., Chemical and Electrochemical Energy System, Universities Press (1998)

4. Lithium-Ion Batteries Basics and Applications by Reiner Korthauer, Springer.
5. Lithium-ion Batteries Fundamentals and Applications. by Wu, Yuping, CRC Press, Taylor and Francis.
6. O'hayre, S.W. Cha, W.G. Colella, F.B. Prinz, Fuel Cell Fundamentals, 3rd edition, Wiley publisher.
7. R. P. Deshpande, Ultracapacitors: Future of Energy Storage, McGraw-Hill Education, 2014
8. Genta, G, Kinetic Energy Storage: Theory and Practice of *Advanced Flywheel* Systems eBook

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EETM4100 **Course: EV Motors and their Control**
Core/Elective/Practical/Other: Minors **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes

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

CO1: Explain the vehicle resistances and major requirements of EV from an electric motor.

CO2: Discuss the construction, working and characteristics of a dc series motor and explain its speed control and reversal.

CO3: Discuss the construction, working and characteristics of a 3-phase induction motor and explain its speed control, reversal and braking.

CO4: Differentiate PMSM and BLDC motor drive and discuss their construction and working.

CO5: Discuss the construction, working and characteristics of a SRM drive.

Syllabus

Module-I: Basics of Electric Vehicle (EV) (08 Hours)
Types of electric traction services; general description of vehicle movement; Vehicle resistance: rolling resistance, aerodynamic drag, grading resistance; dynamic equation of electric vehicle; speed versus vehicle resistance characteristics (or speed versus torque) of traction load; standard characteristics of an electric motor used in EV and HEV, major requirements of electric propulsion from an electric motor used in EV and HEV; types of motors used in EV and HEV.

Module-II: DC Motor (08 Hours)
Types of dc motor; construction and operating principle of dc motor; concept of back emf and its equation; voltage equation; torque equation; dc series motor characteristics, losses and efficiency; starting, speed control, and reversal of dc series motor.

Module-III: Three-Phase Induction Motor (08 Hours)
Construction and operating principle of 3-phase induction motor; synchronous speed and slip; torque equation; stating torque, maximum torque and slip at maximum torque; torque-speed characteristics, power flow; losses; relation between power and torque; reversal, speed control by V/f method; regenerative braking.

Module-IV: Permanent Magnet AC Motor (08 Hours)
Construction of Permanent Magnet Synchronous Motor (PMSM), types of rotor; operating principle; difference between PMSM and Brushless dc Motor (BLDC); properties of permanent magnet (PM) materials used in PMSM: alnico, ferrites, rare-earth type; PMSM torque generation; BLDC motor torque generation; Hall sensors and Inverters for BLDC Motor.

Module-V: Switched Reluctance Motor (08 Hours)
Construction of SRM; concept of reluctance torque; working of the basic SRM drive; idealized inductance, current and torque profile of SRM; torque-speed characteristic of SRM; comparison between dc motor, induction motor, PMSM and SRM for EV application.

Textbooks:

1. Mehrdad Ehsani, Yimin Gao et. al., "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles," CRC Press, Special Indian Edition, 3rd Ed., 2019.
2. Kwang Hee Nam, "AC Motor Control and Electric Vehicle Applications," CRC Press, Special Indian Edition, 2013.
3. B. L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology Vol.-II," S. Chand & Co. Pvt. Ltd., 2015.

References:

1. Mounir Zeraoulia, et.al., "Electric Motor Drive Selection Issues for HEV Propulsion Systems: A Comparative Study," *IEEE Trans. on Vehicular Technology*, Vol. 55, No. 6, November 2006.

2. Zhi Yang, Fei Shang, Ian P. Brown, Mahesh Krishnamurthy, "Comparative Study of Interior Permanent Magnet, Induction and Switched reluctance Motor Drives for EV and HEV Applications," *IEEE Trans. on Transportation Electrification*, Vol. 1, Issue 3, November 2015.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EETE4001 **Course: Electrical Energy Conservation and Audit**
Core/Elective/Practical/Other: Exit Course **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes

Upon the completion of this course, students will be able to,

CO1. Illustrate the basics of energy with material and energy balance.

CO2. Analyze the different financial options of investment and their terminology.

CO3. Classify the different energy saving opportunities in electric motors.

CO4. Evaluate the performance of Compressed Air System and Heating, Ventilation & Air Conditioning (HVAC)

CO5. Find out the energy saving opportunities in Pumps, Pumping System and Cooling Towers.

CO6. Correlate the energy and its effect on environment.

Syllabus

Module-I: Energy Scenario (06 Hours)

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change, Energy Conservation Act-2001 and its features.

Energy Audit: Definition, need, types of energy audit, energy audit instruments.

Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Module-II: Financial Management (06 Hours)

Investment-need, appraisal and criteria, financial analysis techniques - simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs).

Module-III: Electrical Motors (06 Hours)

Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors. Energy efficient motors, soft starters with energy saver, variable speed drives.

Module-IV: Compressed Air System and (HVAC) (07 Hours)

Types of air compressors, compressor efficiency, efficient compressor operation, Heating, ventilation, air conditioning and Refrigeration System:

Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities, pressure drop calculation.

Module-V: Pumps and Pumping System (07 Hours)
Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Energy conservation in boiler feed water pump, pumping systems for municipal drinking water, and sewerage, agriculture pump sets.

Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities assessment of cooling towers.

Module-VI: Energy, Environment and Climate Change (06 Hours)
Energy and environment, air pollution, climate change United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM, Prototype Carbon Fund (PCF). Energy conservation in Buildings and Energy Conservation Building Codes (ECBC): About Energy Conservation Building Codes (ECBC), building envelope, insulation, lighting, Heating, ventilation, air conditioning (HVAC), fenestrations, water pumping, inverter and energy storage/captive generation, elevators and escalators, star labeling for existing buildings, Energy Service Companies based case studies.

Text Books:

1. Archie, W Culp. Principles of Energy Conservation: *McGraw Hill, 1991*.
2. P. O'Callaghan : Energy Management: *McGraw Hill Book Company, 1993.*
3. Handbook of Energy Engineering: *Thuman A and Mehta D Paul, the Fairmount Press*.

Reference Books:

1. Handbook on Energy Audits and Management: *Amit Kumar Tyagi*.
2. Energy Efficient Buildings: *Majumder Milli, TERI.*
3. Energy Management: *Paul O'Callagh, McGraw Hill.4. Bureau of Energy Efficiency Study material for Energy Managers and Auditors Examination: Paper I to IV.*

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EETE4002 **Course: Utilization of Electrical Energy**
Core/Elective/Practical/Other: Exit Course **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes

At the end of this course, students will be able to

CO1. Explain the process and application of different types Electric Heating and Welding equipment.

CO2. Design illumination systems for lighting design by applying the fundamentals and by understanding basics of illumination

CO3. Discuss Electric Traction system with its power supply structure.

CO4. Illustrate the working principles and applications for various electrolytic processes for industrial applications.

CO5. Select proper rating of DG sets depending upon operational factors

CO6. Explain different types of Electrical wiring and cable.

Syllabus

Module-I: Electric Heating and Welding (07 Hrs.)
I) Electric Heating: Types and methods of electrical heating, advantages of electrically produced heat, types & application of electric heating equipment

II) Importance, Advantages & Disadvantages of welding, classification of welding processes, Resistance welding, Electric arc welding, Ultrasonic welding, electron beam welding, laser beam welding.

Module-II: Illumination and Lighting Systems (07 Hrs.)
Nature of light, terms used in illumination, solid angle, laws of illumination, polar curves, basics of CFL, LED & Plasma, Lux level requirements for various applications, classification of light fittings and luminaries, factors affecting the design of indoor lighting installations, total lumen method of calculation, Lighting design for indoor applications, Outdoor lighting system design for street lighting and flood lighting.

Module-III: Electric Traction Supply system (07 Hrs.)
Features of an Ideal Traction System, Advantages and Disadvantages of Electric Traction, System of Traction, Traction Supply System, Transmission system for Traction substation, Feeding and Distribution System on an AC Traction, System of Current Collection, Booster Transformer.

Module-IV: Electrolytic Processes (07 Hrs.)
Fundamental principles, laws of electrolysis, Extraction & Refining of metals, Electro-deposition, Electro plating, Anodizing, manufacture of chemicals, Power supply for electrolytic processes.

Module-V: Diesel Generating Systems (06 Hrs.)
Introduction, selection and installation factors, operational factors, energy performance assessment in DG sets, energy saving measures for DG sets.

Module-VI: Electrical Wiring (06 Hrs.)
Introduction, Basics of Domestic Electrical Wiring, Types of Cables, Flexible Wires Sizes and Current Capacity

Text Books:

1. Utilization of Electric Energy: E. Open shaw Taylor, Orient Longman.
2. Utilization of Electric Power & Electric Traction: J.B. Gupta, Kataria & Sons.
3. Art and Science of Utilization of Electrical Energy: H Partap, Dhanpat Rai & Sons, Delhi

Reference Books:

1. Guide book for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency.
2. Other reference material (e.g. e-resources): Catalogues of wires, lighting accessories.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EETE4003 **Course: PLC Programming**
Core/Elective/Practical/Other: Exit Course **Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week**

Course Outcomes:

Upon the completion of this course, students will be able to.

CO1. Understand automation tools and its components.

CO2. Understand the functioning of PLC.

CO3. Apply knowledge of PLC for design of industrial automation applications.

Syllabus

Module-I: Introduction to Automation
Role of automation in industrial process, History of automation and automation tools.

Module-II: Components used in Automation
Concept of relays, relays wiring and logic gates, switches and its type, types of sensors, control actuators, relay board, contactor, timer, solenoid valve, Hydraulic & pneumatic control, selection of sensor.

Module-III: Programmable Logic Controller
Introduction to PLC & its need in automation, block diagram of PLC, I/O modules in PLC, Addressing in I/O modules, Ladder diagram, and component of Ladder diagram.

Module-IV: Advance Instructions in PLC
Ladder diagram design with advance instruction, interfacing of component & sensors used in automation, PLC communication (Modbus communication, Ethernet, RTU.)

Module-V: Application & Design of Automation
Conveyer belt, starting of induction motor, Automation of water management system

Text Books:

1. Programmable Logic Controllers: William Bolton (Author), ISBN-13: 978-0750681124 4th Edition

Reference Books:

1. PLC Manuals & user guide.

Shri Ramdeobaba College of Engineering and Management, Nagpur
Department of Electrical Engineering
B.Tech IV Semester

Course Code: EETE4004 Course: Computer Aided Electrical Engineering Drawing
Core/Elective/Practical/Other: Exit Course Credits: 03, L: 03 Hrs., T: 0 Hrs., P: 0 Hrs., Per Week

Course Outcomes:

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

CO1. Understand CAD Application package for Electrical Drawing.

CO2. Develop winding diagrams of Electrical Machines.

CO3. Draw Electrical Building Wiring, Panel board wiring, Single line diagrams.

CO4. Design a PCB for a given network.

Syllabus

Module-I (09 Hours)
Introduction to the software: Procedure to be adopted for computer aided drawings, Software packages available, CAD software screen, Standard menus / toolbars, Navigational tools, Zoom, Pan, Co-ordinate systems, Selection of drawing size and scale, Co-ordinate points, Draw commands -line, linetype, circle, arc, rectangle, polygons, array, polyline, text, multitext, explode, hatch, polygons, array, polyline, text, multitext, explode, hatch.

Module-II (09 Hours)
DC armature winding –double layer progressive lap and wave, winding table, sequence diagram.
3 Phase AC stator winding -AC full and short pitched lapwinding.
AC induction motor -Squirrel cage rotor assembly.
AC 3 phase alternator -Stator assembly.
Lighting and power wiring diagram

Module-III Single Line Diagrams (09 Hours)
Single Line Diagrams of Generating Stations and Substations Covering Incoming Circuits, Outgoing Circuits, Busbar Arrangements (Single, Sectionalised Single, Main and Transfer, Double Bus Double Breaker, Sectionalised Double Bus, One and a Half Circuit Breaker Arrangement, Ring Main),Power Transformers, Circuit Breakers, Isolators, Earthing Switches, Instrument Transformers, Surge or Lightning Arresters, Communication Devices (Power- Line Carrier) and Line Trap.

Module-IV (09 Hours)
Computer Aided PCB Design: Overview of software for PCB design, PCB layout of rectifier circuit, PCB layout of amplifier circuit, PCB layout of oscillator circuit

Text books:

1. Computer Aided Electrical Drawing - YOGESH, NAGARAJA,NANDAN

2. Electrical Drafting

3. Electrical Drawing- S.F. DEVALAPUR PHI Publication EEPB- K.L. NARANG

4. Electrical Engineering Drawing – S. K. BHATTACHARYA 5. QCAD -An Introduction to Computer-Aided Design - By Andrew Mustun

e-Resources

1.http://www.faveodesign.co.uk/CAD_Drawings.html

2.http://cad.about.com/od/Learn_CAD/a/The-Fundamentals-Of-Drafting.htm

3. http://transport.itu.edu.tr/PDF/iml332e/Fun