PROGRAMME GUIDE

BACHELOR OF ENGINEERING

ELECTRICAL ENGINEERING

- **Scheme of Examination (CBCS/ELECTIVE BASED)**
- **Detailed Syllabus**

DR. C.V.RAMAN UNIVERSITY

KARGI ROAD, KOTA, BILASPUR, CHATTISGARH
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DEPARTMENT OF ELECTRICAL ENGINEERING

INTRODUCTION

The Department of Electrical Engineering is a blend of teaching and research activities pertaining to both Electronics and Electrical Engineering. At present the Department offers B.E., Diploma and PhD degrees. The diversity is reflected in the breadth of theoretical and laboratory courses that are on offer and the research activities of the faculty members. The Department firmly believes in imparting a strong hands-on flavour to the courses that a student takes, and therefore places emphasis on the laboratory component, internships and projects.

The Department has a healthy mixture of young and experienced faculty members, all of whom display high levels of enthusiasm and dedication. Apart from teaching and research, the faculties are actively involved in organizing technical workshops, camps and visits at the Institute to create an environment conducive to experiential learning.

The Department with its strong pool of faculty, well-developed laboratories, latest software and hardware facilities, contributes to develop life-long learning skills to its Diploma graduate and PhD students, while producing worthy researchers by offering doctoral research programme.

VISION:

- To evolve as a centre of excellence, to train and develop student knowledge in contemporary technologies.
- To make the electrical engineers to meet the technological challenges for the well being of this nation.
- To develop them as a skilful engineers with human values and professional ethics.

MISSION:

- To ensure that every student is aware of their responsibilities of an engineer in society through exposure to ethics, equity, public and worker safety with also health consideration, together with the concept of sustainable development.
- To provide knowledge base and consultancy services to the rural & tribal community around us of their uplift and well being.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

The five broad EE Program Educational Goals (Objectives) are

1. Have the laboratory skills and the ability to use modern analysis and design techniques and state-of-the-art equipment to solve practical engineering problems
2. Have the professional skills to function effectively in the work environment as well as in the community.
3. Have a solid understanding of professional and ethical responsibility
4. Have a broad education in order to understand contemporary issues and the impacts of technology on society and the environment
5. Have the ability to engage in life-long learning and recognize its importance

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PROGRAM OUTCOMES

1. The ability to apply science, engineering science, and mathematics to solve engineering problems.
2. The ability to put their engineering and design skills into practice.
3. The ability to use industrial-quality laboratory equipment and engineering software for analysis, testing, design, and communication.
4. The ability to design systems, components, and processes that satisfy predetermined constraints.
5. The ability to put engineering problems, put them in solvable form, and develops and evaluates alternative solutions.
6. The ability to communicate their ideas and designs clearly orally, in written form, and graphically.
7. The ability to work as members of a team.
8. had the opportunity to develop leadership skills
9. Understand ethical principles and their role in the engineering profession.
10. Have sufficient knowledge of the humanities and social sciences to understand contemporary issues concerning the interaction between technology and society.
11. Understand that the products they develop and the methods used to manufacture them can affect the environment.
12. Realize that the practice of electrical engineering is constantly evolving and that engineers must have the ability to acquire new knowledge and skills on their own.
13. Have the ability to earn graduate degrees or pursue other continuing education opportunities

PROGRAM SPECIFIC OUTCOMES:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **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, to manage projects and in multidisciplinary environments.
5. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
6. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
7. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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8. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
9. **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.
10. **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.

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BACHELOR OF ENGINEERING

Duration: 48 Months (4 Years)

Eligibility: 12th Pass With PCM

COURSE STRUCTURE OF BE- (GROUP B- CSE/EC/EX/EE) SEMESTER Ist

Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3TBCH201	Basic science course	Engineering Chemistry	100	50	17	20	07	30	15	2	1	0	3
3TBMA102	Basic science course	Mathematics-I	100	50	17	20	07	30	15	2	1	0	3
3TBEG203	Engineering science course	Engineering Graphics	100	50	17	20	07	30	15	2	1	0	3
3TBEE204	Engineering science course	Basic Electrical Engineering	100	50	17	20	07	30	15	2	1	0	3
3TBCS205	Engineering science course	Basic Computer Engineering	100	50	17	20	07	30	15	2	1	0	3
Practical Group				**Term End Practical Exam**				**Sessional**					
3TBCH201	Basic science course	Engineering Chemistry	50	25	12	-	-	25	12	-	-	1	1
3TBEG203	Engineering science course	Engineering Graphics	50	25	12	-	-	25	12	-	-	1	1
3TBEE204	Engineering science course	Basic Electrical Engineering	50	25	12	-	-	25	12	-	-	1	1
3TBCS205	Engineering science course	Basic Computer Engineering	50	25	12	-	-	25	12	-	-	1	1
3TBMP206	Engineering science course	Manufacturing Practices	50	25	12	-	-	25	12	-	-	1	1
3TBED207	Mandatory course	Entrepreneurship development	Grades Will Be Awarded										0
Grand Total			**750**							**10**	**5**	**5**	**20**

Minimum Passing Marks are equivalent to Grade D **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory / Practical Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

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Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3TBPH101	Basic science course	Engineering Physics	100	50	17	20	07	30	15	2	1	0	3
3TBMA202	Basic science course	Mathematics-II	100	50	17	20	07	30	15	2	1	0	3
3TBME103	Engineering science course	Basic Mechanical Engineering	100	50	17	20	07	30	15	2	1	0	3
3TBCE104	Engineering science course	Basic Civil & Engg Mechanics	100	50	17	20	07	30	15	2	1	0	3
3TBCS105	Humanities course	Communication Skills	100	50	17	20	07	30	15	2	1	0	3
Practical Group				**Term End Practical Exam**				**Sessional**					
3TBPH101	Basic science course	Engineering Physics	50	25	12	-	-	25	12	-	-	1	1
3TBME103	Engineering science course	Basic Mechanical Engineering	50	25	12	-	-	25	12	-	-	1	1
3TBCE104	Engineering science course	Basic Civil & Engg Mechanics	50	25	12	-	-	25	12	-	-	1	1
3TBCS105	Humanities course	Communication Skills	50	25	12	-	-	25	12	-	-	1	1
3TBHH106	Mandatory course	Health, Hygiene & Yoga	50	25	12	-	-	25	12	-	-	1	1
3TBRO107	Mandatory course	Rural Outreach	Grades Will Be Awarded										0
Grand Total			**750**							**10**	**5**	**5**	**20**

Minimum Passing Marks are equivalent to Grade D **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory / Practical Exam
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COURSE STRUCTURE OF BE- ELECTRICAL ENGINEERING SEMESTER IIIrd

Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3TBBE- 301	Basic Science Course	Mathematics-III	100	50	17	20	07	30	15	2	1	0	3
3TBEX- 302	Professional Core	Electrical Machine-I	100	50	17	20	07	30	15	2	1	0	3
3TBEX - 303	Professional Core	Network Analysis	100	50	17	20	07	30	15	2	1	0	3
3TBEX -304	Professional Core	Analog Electronics	100	50	17	20	07	30	15	2	1	0	3
3TBEX - 305	Professional Core	Power Systems-I	100	50	17	20	07	30	15	2	1	0	3
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3TBEX - 302	Professional Core	Electrical Machine-I	50	25	12	25	12	-	-	-	-	1	1
3TBEX - 303	Professional Core	Network Analysis	50	25	12	25	12	-	-	-	-	1	1
3TBEX - 304	Professional Core	Analog Electronics	50	25	12	25	12	-	-	-	-	1	1
3TBEX - 306	Professional Core	Electrical Modeling & Simulation-I	50	25	12	25	12	-	-	-	-	1	1
Skill Courses				Term End Practical Exam		Lab Performance		Sessional					
3STEX-307	Skill Enhancement	Skill Elective-I	50	-	-	25	12	25	12	-	-	1	1
Grand Total			**750**							**10**	**5**	**5**	**20**

Minimum Passing Marks are equivalent to Grade D L- Lectures T- Tutorials P- Practical
Major- Term End Theory / Practical Exam
Minor- Pre University Test
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Skill Elective I – Choose any one from the following
3STEX 307A - LT Maintenance
3STEX 307B - Solar Technician

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COURSE STRUCTURE OF BE- ELECTRICAL ENGINEERING SEMESTER IVth														
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits	
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional***		L	T	P	Subject wise Distribution	
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks					
Theory Group														
3TBEX -401	Basic Science Course	Energy, Ecology & Society	100	50	17	20	07	30	15	2	1	0	3	
3TBEX -402	Professional Core	Electrical Measurement & Instrumentation	100	50	17	20	07	30	15	2	1	0	3	
3TBEX - 403	Professional Core	Electromagnetic Fields	100	50	17	20	07	30	15	2	1	0	3	
3TBEX -404	Professional Core	Digital Electronics	100	50	17	20	07	30	15	2	1	0	3	
3TBEX - 405	Professional Core	Power Electronics	100	50	17	20	07	30	15	2	1	0	3	
Practical Group				Term End Practical Exam		Lab Performance		Sessional						
3TBEX - 402	Professional Core	Electrical Measurement & Instrumentation	50	25	12	25	12	-	-	-	-	1	1	
3TBEX - 404	Professional Core	Digital Electronics	50	25	12	25	12	-	-	-	-	1	1	
3TBEX - 405	Professional Core	Power Electronics	50	25	12	25	12	-	-	-	-	1	1	
3TBEX-406	Professional Core	Electrical Modeling & Simulation-II	50	25	12	25	12	-	-	-	-	1	1	
Skill Courses				Term End Practical Exam		Lab Performance		Sessional						
3STEX-407	Skill Enhancement	Skill Elective-II	50	-	-	25	12	25	12	-	-	1	1	
Grand Total			750							10	5	5	20	

Minimum Passing Marks are equivalent to Grade D

L- Lectures T- Tutorials P- Practical

Major- Term End Theory / Practical Exam

Minor- Pre University Test

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Skill Elective II – Choose any one from the following

3STEX- 407A - HT Maintenance

3STEX- 407B - Electrical House Wiring

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COURSE STRUCTURE OF BE- ELECTRICAL ENGINEERING SEMESTER Vth														
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits	
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution	
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks					
Theory Group														
3TBEX -501	Professional Core	Control Systems	100	50	17	20	07	30	15	2	1	0	3	
3TBEX -502	Professional Core	Electrical Machine II	100	50	17	20	07	30	15	2	1	0	3	
3TBEX- 503	Professional Core	Microprocessor & Microcontroller	100	50	17	20	07	30	15	2	1	0	3	
3TBEE-504	Professional Core	Analog & Digital communication	100	50	17	20	07	30	15	2	1	0	3	
3TBEX- 505	Professional Core	Electrical & Electronics Material	100	50	17	20	07	30	15	2	1	0	3	
Practical Group				**Term End Practical Exam**		**Lab Performance**		**Sessional**						
3TBEX -501	Professional Core	Control Systems	50	25	12	25	12	-	-	-	-	1	1	
3TBEX -502	Professional Core	Electrical Machine II	50	25	12	25	12	-	-	-	-	1	1	
3TBEX- 503	Professional Core	Microprocessor & Microcontroller	50	25	12	25	12	-	-	-	-	1	1	
3TBEX-506	Professional Core	Electrical Modeling & Simulation-III	50	25	12	25	12	-	-	-	-	1	1	
Skill Courses				**Term End Practical Exam**		**Lab Performance**		**Sessional**						
3STEX-507	Skill Enhancement	Skill Elective-III	50	-	-	25	12	25	12	-	-	1	1	
Grand Total			**750**							**10**	**5**	**5**	**20**	

Minimum Passing Marks are equivalent to Grade D **L- Lectures T- Tutorials P- Practical**

Major- Term End Theory / Practical Exam

Minor- Pre University Test

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Skill Elective III – Choose any one from the following

3STEX- 507 A - Electrical Load Management

3STEX- 507 B - PLC & SCADA

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COURSE STRUCTURE OF BE- ELECTRICAL ENGINEERING SEMESTER VIth

Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3TBEX -601	Professional Core	Power Systems-II	100	50	17	20	07	30	15	2	1	0	3
3TBEX -602	Professional Core	Digital Signal Processing	100	50	17	20	07	30	15	2	1	0	3
3TBEX- 603	Professional Core	Electronics Device and Circuits	100	50	17	20	07	30	15	2	1	0	3
3TBEE-604	Professional Core	Non Conventional Energy Sources	100	50	17	20	07	30	15	2	1	0	3
3TBEX- 605	Professional Core	FACTS Devices	100	50	17	20	07	30	15	2	1	0	3
Practical Group				**Term End Practical Exam**		**Lab Performance**		**Sessional**					
3TBEX -601	Professional Core	Power Systems-II	50	25	12	25	12	-	-	-	-	1	1
3TBEX -602	Professional Core	Digital Signal Processing	50	25	12	25	12	-	-	-	-	1	1
3TBEX- 603	Professional Core	Electronics Device and Circuits	50	25	12	25	12	-	-	-	-	1	1
3TBEX-606	Professional Core	Electrical Modeling & Simulation-IV	50	25	12	25	12	-	-	-	-	1	1
Skill Courses				**Term End Practical Exam**		**Lab Performance**		**Sessional**					
3STEX-607	Skill Enhancement	Skill Elective-IV	50	-	-	25	12	25	12	-	-	1	1
Grand Total			**750**							**10**	**5**	**5**	**20**

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Major- Term End Theory / Practical Exam
Minor- Pre University Test
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Skill Elective IV – Choose any one from the following
3STEX -607 A- Electrical Machine Maintenance
3STEX- 607 B- Mobile Repairing

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COURSE STRUCTURE OF BE- ELECTRICAL ENGINEERING SEMESTER VIIth														
Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits	
				Major		Minor		Sessional***						
Course Code	Course Type	Course Title	Total Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	L	T	P	Subject wise Distribution	
Theory Group														
3TBEX -701	Professional Core	Power Quality	100	50	17	20	07	30	15	2	1	0	3	
3TBEX -702	Professional Core	Power System Protection	100	50	17	20	07	30	15	2	1	0	3	
3TBEX- 703	Professional Core	Electrical Drives	100	50	17	20	07	30	15	2	1	0	3	
3TBEE-704	Professional Core	Electrical Machines III	100	50	17	20	07	30	15	2	1	0	3	
*	Professional Elective Course	Professional Elective-I	100	50	17	20	07	30	15	2	1	0	3	
Practical Group				Term End Practical Exam		Lab Performance		Sessional						
3TBEX -702	Professional Core	Power System Protection	50	25	12	25	12	-	-	-	-	1	1	
3TBEX- 703	Professional Core	Electrical Drives	50	25	12	25	12	-	-	-	-	1	1	
3TBEE-704	Professional Core	Electrical Machines III	50	25	12	25	12	-	-	-	-	1	1	
3TBEE-706	Project Work	Minor Project	50	50	25	50	25	-	-	-	-	1	1	
3TBEE-707	Project Work	Industrial training/internship/IPR	50	-	-	25	12	25	12	-	-	1	1	
Grand Total			750							10	5	5	20	

Minimum Passing Marks are equivalent to Grade D L- Lectures T- Tutorials P- Practical
Major- Term End Theory / Practical Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%
*** Professional Elective-I – Choose any one from the following ELECTIVE-I,**

List of Professional Elective Course		
S. No.	Subject Code	Subject Name
1	3TBEE 7101 A	Computer Network
2	3TBEX 7102 B	Advance Communication System
3	3TBEX 7103 C	Power Apparatus System

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COURSE STRUCTURE OF BE- ELECTRICAL ENGINEERING SEMESTER VIIIth

Course Details				External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
3TBEX -801	Professional Core	Computer Application To Power System	100	50	17	20	07	30	15	2	1	0	3
3TBEE -802	Professional Core	EHV AC & DC	100	50	17	20	07	30	15	2	1	0	3
*	Open Subject	Open Elective	100	50	17	20	07	30	15	2	1	0	3
**	Professional Elective Course	Professional Elective-II	100	50	17	20	07	30	15	2	1	0	3
Practical Group				Term End Practical Exam		Lab Performance		Sessional					
3TBEX -801	Professional Core	Computer Application To Power System	50	25	12	25	12	-	-	-	-	1	1
**	Professional Core	Professional Elective-II	50	25	12	25	12	-	-	-	-	1	1
3TBEE-805	Professional Core	Major Project	150	100	50	50	25	-	-	-	-	5	5
3TBEE- 806	Seminar	Tour/Training/Seminar	100	-	-	-	-	50	25	-	-	1	1
Grand Total			**750**							**08**	**4**	**8**	**20**

Minimum Passing Marks are equivalent to Grade D **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory / Practical Exam
Minor- Pre University Test
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***Open Elective-I – Choose any one from the following Open ELECTIVE-I:**
****Professional Elective-II – Choose any one from the following ELECTIVE-II:**

**Professional Elective Course -II			*Open Elective Course -I		
S. No.	Subject Code	Subject Name	S. No.	Subject Code	Subject Name
1	3TBEX-8201 A	High Voltage	1	TBEC-803 A	Principle of Management & Managerial Economics
2	3TBEX-8202 B	Computer Aided Electrical Machine Design	2	TBEX-803 B	Electrical Installation Maintenance & Training

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SEMESTER- 1st
Course: BE EE
SUBJECT: ENGINEERING PHYSICS

Subject Code: 3TBPH101
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The objective of this course is to equip the students with standard concepts and tools or an intermediate to advanced level.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Quantum mechanics: Wave nature of particles and the Schrodinger equation Introduction to Quantum mechanics, Wave nature of Particles, operators, Time-dependent and time-independent Schrodinger equation for wave function, Application: Particle in a One-dimensional Box, Born interpretation, Free-particle wave function and wave-packets, vg and vp relation Uncertainty principle.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Wave optics: Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Introduction to solids: Free electron theory of metals, Fermi level of Intrinsic and extrinsic, density of states, Bloch's theorem for particles in a periodic potential, Kronig-Penney model (no derivation) and origin of energy bands. V-I characteristics of PN junction, Zener diode, Solar Cell, Hall Effect.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers(ruby, Neodymium),Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine. Introduction to Optical fiber, acceptance angle and cone, Numerical aperture, V number, attenuation.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Fiber Optics: Light guidance through optical fibre, types of fibre, numerical aperture, V-Number, Fibre dispersion (through ray theory in step index fibre), block diagram of fibre optic communication system. Nuclear Physics: Nuclear composition, mass defect, binding energy, nuclear force, liquid drop model, elementary idea about nuclear fission and fusion.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

List of Experiments:

Experiments as suggested by the course coordinator.

Course Outcome:

- Gain a knowledge and understanding of fundamental physical concepts in the areas covered in this class.
- Apply an understanding of these concepts to various systems and devises.
- Acquire problem solving skills, mathematical techniques, and the ability to synthesize.
- The ability to formulate, conduct, analyzes and interprets experiments in engineering physics

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List of suggestive core experiments: -

1. Biprism, Newton's Rings, Michelsons Interferometer.
2. Resolving Powers –Telescope, Microscope, and Grating.
3. G.M. Counter
4. Spectrometers-R.I., Wavelength, using prism and grating
5. Optical polarization based experiments: Brewster's angle, polar meter etc.
6. Measurements by LASER-Directionality, Numerical aperture, Distance etc.
7. Uses of Potentiometers and Bridges (Electrical)..
8. Experiments connected with diodes and transistor.
9. Measurement of energy band gap of semiconductor.
10. To study Hall effect.
11. Solar cell.
12. To find the width of s single slit by f He-Ne Laser.
13. To determine the numeral aperture (NA) of a Optical Fibre.
14. To determine plank's constant.

Text Books:-

1. Engineering Physics by Navneet Gupta & S.K. Tiwary.
2. A Text Book of Engg Physics – N. Gupta & S.K. Tiwary , Dhanpat Rai & Co. , Delhi

References Books:

1. Engineering Physics- Purnima Swarup Khare, Laxmi Publication
2. Concepts of Modern Physics- Beiser, TMH
3. Solid State Physics by Kittel ,Wiley India
4. Engineering Physics-Fundamentals and Modern Applications – by Purnima Swarup Khare, Infinity Press Publications

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design Engineer Lab technician	Able to provide knowledge about acoustics and nuclear physics.	Goal04(quality education)	

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SEMESTER- 1st
Course: BE EE
SUBJECT: MATHEMATICS-I

Subject Code: 3TBMA102
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions. To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems. To develop the tool of ordinary differential equation for learning advanced Engineering Mathematics. To familiarize the student with functions of several variables that is essential in most branches of engineering. To develop the essential tool of matrices and linear algebra in a comprehensive manner.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables,Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagranges Multipliers.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Definite Integral as a limit .of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumes of the curves.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations	Classroom teaching ICT tools and Google classroom
Unit – IV	Vector Space, Vector Sub Space, Linear Combination of Vectors, Linearly Dependent, Linearly Independent, Basis of a Vector Space, Linear Transformations.	Classroom teaching ICT tools and Google classroom
Unit - V	Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.	Classroom teaching ICT tools and Google classroom

Course Outcome:
This Syllabus has been designed to equip engineering student s with necessary mathematicaltool's to handle mathematical problem in their core subjects. Through this syllabus theywill learn many thing about calculus specially first order differential equation , Roles,Lagrange's concept about existence of derivatives in some interval ,Expansion of afunction in an infinite series by Maclaurin's and Taylor theorem , partial derivative offunctions through which maxima minima of two variable function application of matricesin solving linear simultaneous equations, Eigen value Eigen vector,Calay-Hamilton theoremto find Inverse of a matrix ,and concept of vector space.

Text Books:-

1. Basic Engineering Mathematics I by H.K. Dass and Verma Ram

References Books:

1. Michael Greenberg, Advanced Engineering Mathematics, Second Edition, Person Education, 2002 (Indian Edition).
2. B.V. Rammana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company, 2007. Potter, Goldberg & Edward, Advanced Engineering Mathematics, Oxford University Press.
3. S.S. Shastry, Engineering Mathematics, PHI Learning.

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4. C.B. Gupta, Engineering Mathematics I & II Mcgraw Hill India, 2015.
5. Engineering Mathematics I by D.C. Agarwal

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Able to provide knowledge about calculus and partial differentiation.	Goal04(quality education)	

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SEMESTER- 1st **Subject Code:** 3TBME103
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: BASIC MECHANICAL ENGINEERING **Theory Min. Marks** : 17

COURSE OBJECTIVE:

- To familiarize with the basic concept of Mechanical Engineering
- To familiarize with the scope of Mechanical Engineering
- To familiarize with the job prospects of Mechanical Engineer.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Materials: Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness , ductility, brittleness , malleability etc. of materials , Tensile test- Stress-strain diagram of ductile and brittle materials, Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Measurement: Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier calliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set. Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry,weldingetc Introduction to Lathe and Drilling machines and their various operations.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Fluids: Fluid properties pressure, density and viscosity etc. Types of fluids , Newton's law of viscosity , Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Thermodynamics: Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy. Steam Engineering: Classification and working of boilers, mountings and accessories of boilers,Efficiency and performance analysis, natural and artificial draught, steam properties, use of steam tables.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Reciprocating Machines: Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams anditsefficiency, working of Two stroke & Four stroke Petrol &Diesel engines. Working principle ofcompressor.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Course outcome:

At the end of this course students will able to:

- Identify engineering materials, their properties, testing and manufacturing methods encountered in engineering practice.
- Understand Concept of measurement by using measuring instrument Vernier calliper, Micrometer, Dial gauge, Slip gauge etc.
- Understand basics of thermodynamics and components of a thermal power plant
- Understand the construction, operation and performance of different IC engines.
- Understand basics of fluids, their properties and laws of fluid Mechanics.

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References Books:

1- Kothandaraman & Rudramoorthy, Fluid Mechanics & Machinery, New Age .
2- Nakra & Chaudhary , Instrumentation and Measurements, TMH.
3- Nag P.K, Engineering Thermodynamics , TMH .
4- Ganesan , Internal Combustion Engines, TMH .
5- Agrawal C M, Basic Mechanical Engineering, Wiley Publication.
6- Achuthan M , , Engineering Thermodynamics ,PHI.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
CAD technician Control & instrumentation engineer	Able to provide knowledge about surfaces.	Goal04(quality education)	

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SEMESTER- 1st
Course: BE EE
SUBJECT: BASIC CIVIL & ENGG MECHANICS

Subject Code: 3TBCE104
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- To introduce to student relevance of civil engineering for various engineering applications.
- To introduce to student various elements of buildings and construction materials.
- To introduce to student various methods of land survey and to make him use surveying equipment
- To make student aware of modern investigation techniques in land survey.
- To introduce to student about the water management and transportation engineering.
- Ability to apply knowledge of mathematics, science, and engineering.
- Solve for the resultants of any force systems.
- Determine equivalent force systems.
- Solve the mechanics problems associated with friction forces.
- Obtain the centroid, first moment and second moment of an area.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Building Materials & Construction Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing. Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Surveying & Positioning: Introduction to surveying Instruments – levels, thedolites, plane tables and related devices.Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal leveling.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Mapping & sensing: Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations, Introduction of remote sensing and its applications.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Engineering Mechanics Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and non-concurrent Co- planner forces, free diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes. Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Course outcome:

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

- Describe the role of civil engineer in the development of the society and explain relationship of civil engineering with other branches of engineering and technology.

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• Discuss types of buildings and select materials of construction.
• Explain the elements of water supply such as dam, canal and elements of transportation structures.
• Measure heights, distances and angles on ground using basic surveying instruments and plot them on paper.
• Explain the advantages of advances in civil engineering like remote sensing techniques, GIS and GPS.
• Determine the resultant force and moment for a given system of forces

Text Books:-

1. Text book of Engineering Mechanics By R.K. Bansal
2. Text Book of Engineering Mechanics by R.S. Khurmi

References Books:

1. J.L.Meriam and L.G. Kraige, Engineering Mechanics, 7th Ed, John Wiley & Sons, 2012.
2. Timoshenko and Young, Engineering Mechanics, 3rd Ed, McGraw Hill Publishers, 2006.
3. Gere and Timoshenko, Mechanics of Materials, 2nd Ed, CBS Publishers, 2011.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Urban & Regional Planner Construction Manager	Able to provide knowledge about building construction.	Goal04(quality education)	

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SEMESTER- 1st **Subject Code:** 3TBCS105
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: COMMUNICATION SKILLS **Theory Min. Marks** : 17

COURSE OBJECTIVE:

The objective of this course is to learn the second language learners ability and to use the four fundamental language skills- reading writing speaking and listening. It will enable the students to speak english correctly and with confidence.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Grammar – Applied Grammar and usage, Parts of Speech, Articles, Tenses, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure, Punctuations.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Vocabulary Development – Using Dictionaries and Thesaurus, Synonyms, Antonyms, Homophones, One Word Substitution, Affixation: Prefixes & Suffixes, Derivation from root words, Jargon, Scientific Jargon.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	COMMUNICATION: Introduction, Meaning and significance, Process of Communication, Oral and Written Communication, 7 C's of communication, Barriers to communication and ways to overcome them, Importance of communication foe Technical students, non verbal communication	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	DEVELOPING WRITING SKILLS: Planning, Drafting, and Editing, Precise Writing, Precise, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of trouble, laboratory Report, Progress Report.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	BUSINESS CORRESPONDENCE: Importance of business Letters, Parts and Layout; Application,Contents of good Resume, guidelines for Writing Resume, Calling /Sending quotation, Order, Complaint,E-mail and Tender.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Topics for the Laboratory:

- Basic grammar & vocabulary practice (synonyms, antonyms, analogies, sentence completion, correctly spelt words, idioms, proverbs, common errors.
- Phonetic symbols, pronunciation
- Listening skills – including listening comprehension
- Extempore and JAM (Just a minute session)
- Role play – I
- Role play – II
- Body Language
- Debate
- Oral presentation – preparation & delivery using audio – visual aids with stress on body language and voice modulations. (Topic to be selected by the instructor)

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Course outcome:

Student will develop knowledge, skills and judgment around human communication that facilitate their ability to work ollaboratively with others. Such skills could include communication competencies such as managing conflict, understanding small group process, active listening, appropriate self disclosure, etc.

References Books:

1. A. J. Thomson and A.V. Martinet, A Practical English Grammar, Oxford IBH.
2. Pub Sanjay Kumarm Pushp Lata, English for Effective Communication, Oxford.
3. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
4. 'Effective Business Communication', Krizan and merrier (Cengage learning)
5. 'Business Correspondence and Report Writing' R.C. Sharma and Krishna Mohan, (Tata Mcgraw Hill)
6. 'Speaking and Writing for Effective Business Communication', Francis Soundararaj (Macmillan)
7. Effective Technical Communication', M Arshaf Rizvi (Tata Mcgraw Hill)

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Academician Marketing manager	Able to provide speaking skills	Goal04(quality education)	

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SEMESTER- 1st
Course: BE EE
SUBJECT: HEALTH, HYGIENE & YOGA

Subject Code: 3TBHH106
Theory Max. Marks: 25
Theory Min. Marks : 12

COURSE OBJECTIVE:

It is very important for the protection of our health and helps to present the spread of communicable diseases personal hygiene has social and aesthetic values. The provision of hygiene information first impacts on knowledge and then practice. Yoga education helps in self discipline and self control, leading to immense amount of awareness concentration and higher level of consciousness. This course can prepare the students physically & mentally for the integration of their physical, mental and spiritual faculties so that the students can become healthier, saner and more integrated members of the society & of the nation.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Important of nourishment, nourishment and health categorization of nutrients in food, body parts involved in digestion of food nutrients, bad eating habits concept of food nourishment in India. Nutrient value of common Indian food preservation adulteration in food items uncommon food items. Digestible and indigestible food items. Supplement healthy food items.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Introduction to diseases and spondelitis, level spondelitis, acidity, gas, constipation, skin diseases high blood pressure, low blood pressure heat diseases, cough and cold, obesity, diabetes. Diseases of the eye, mental disorder.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Introduction of Patanjali, Role of yoga in personality development role of yoga in physical development of body.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Preneyam, Anlom, Vilom, Bhramni.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Rollingm Warning, Toning of whole body, Asanas – Vajrasan, Shashenkasan, Bakrasen, Gomukhasan, Ardhmatsendrasan, Surya Namaskar, Naukasan, Sarvangasan, Dhanurasan, Chakrasan, Makrasan, Vrikshasan, Mendookasan.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Course Outcome:

- The student to have good health.
- Student have good mental hygiene.
- Possess emotional stability.
- Integrated moral values.
- Attain higher level of consciousness.

References Books:

1. Kirkwood G, Rampes H, Tuffrey V, Richardson J, Pilkington K. Yoga for anxiety: A systematic review of the research evidence.Br J Sports Med.2005
2. Shapiro D, Cook IA, Davydov DM, Ottaviani C, Leuchter AF, Abrams M. Yoga as a complementary treatment of depression: Effects of traits and moods on treatment outcome.Evid Based Complement Alternat Med.2007

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3. Pilkington K, Kirkwood G, Rampes H, Richardson J. Yoga for Depression: The research evidence.J Affect Disord.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Yoga guide	Able to provide yoga instruction	Goal04(quality education)	

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SEMESTER- 1st **Subject Code:** 3TBRO107
Course: BE EE
SUBJECT: RURAL OUTREACH

COURSE OBJECTIVE:

The main objective of introducing this course is to sensitize students about the socio-cultural aspects of the rural areas parochial to their colleges. Students are expected to observe, investigate and learn about the following aspects of the rural region:

i. Demographics, Literacy, Geographical parameters of the Village
ii. Schemes of government of India and State of Chhattisgarh in operation in the villages
iii. Social/ Cultural aspects ranging from popular dance forms, music and customs of the concerned village.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	This course shall be done by the students in a self-study mode. Study methodology shall comprise of combining field visits, case studies, analyzing policy documents from different government departments, discussions with field officers, active NGO's and so on.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	The course will not be listed in the time-table and its activities shall be performed by the student sat any time convenient to them.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	The faculty associated with the course shall evaluate the candidate and grade him.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	For evaluation purpose, students are expected to submit a hand-written summary on the government schemes and policies for the socio-cultural development of the concerned village.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	This shall be followed by final submission of two case studies covering broad spectrum of socio-cultural issues ranging from life in slums, infant mortality, watershed management, portability of water, animal welfare etc. These case studies (handwritten) shall be submitted to the mentor for the final evaluation of the coursework.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Job opportunity	**Employability skill developed**	**Local/National/UNDP Goal Achieved**	**Entrepreneurship Opportunity**
Schemes of government of India and State of Chhattisgarh in operation in the villages	from popular dance forms, music and customs	Goal04(quality education)	

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Kargi Road, Kota
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Deputy Registrar (Academic)
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DR. C.V.RAMAN UNIVERSITY

KARGI ROAD, KOTA, BILASPUR (C.G.)

SEMESTER- 2[d]
Course: BE EE
SUBJECT: ENGINEERING CHEMISTRY

Subject Code: 3TBCH201
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Molecular Structure & Bonding: VSEPR Model, Valance-Bond Theory, Molecular Orbital Theory,Molecular Orbital of Polyatomic Molecules Electrochemistry: Arrhenius theory of electrolytic dissociation, Transport Number, Kohlrausch'sLaw, Solubility Product, Redox Reaction, Electrochemical & Concentration Cells.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Chemical & Phase Equilibria: Phase Diagram for single component system (Water), Phase diagram forBinary Eutectic System (Copper-Silver), Corrosion of metals in acids, Corrosion by Oxygen, Corrosion by Metal Contact. Reaction Dynamics: Order, Molecularity, Rate Law, Methods of determining order of reaction (1st&2nd Order).	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Polymers & Polymerization: Monomers, Polymers, their classification, thermoplastics & thermosetting with examples, Bio-Polymerization, Bio-Degradable Polymerization, Preparation, Properties & Technical Applications of PVC, PVA, Teflon, Nylon6, & Nylon6:6, Polyester, Phenol-Formaldehyde, Urea-Formaldehyde, Natural & Synthetic Rubber, Vulcanization of Rubber.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	(i) Lubricants and Lubrication (4 Lectures) Introduction, Mechanism of lubrication, Classification of lubricants, significance & determination of Viscosity and Viscosity Index, Flash & Fire Points, Cloud & Pour Points, Aniline Point, Acid Number, Saponification Number, Steam Emulsification Number and related numerical problems. (ii) Spectroscopic techniques and application (6 Lectures) Principle, Instrumentation & Applications, electronics spectroscopy, Vibrational & Rotational Spectroscopy of diatomic molecules.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	(i) Water – Analysis, Treatments and Industrial Applications (4 Lectures) Sources, Impurities, Hardness & its units, Determination of hardness by EDTA method, Alkalinity & its determination and related numerical problems. (ii) Boiler problem & softening methods (4 Lectures) Boiler troubles (Sludge & Scale, Priming & Foaming, Boiler Corrosion, Caustic Embrittlement), Softening methods (Lime-Soda, Zeolite and Ion Exchange Methods) and related problems.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

List of Experiments:

As per suggested by the course coordinator

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Course Outcome:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels.

The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- List major chemical reactions that are used in the synthesis of molecules

Text Books:-

1. Engineering Chemistry by S.S. Dara
2. Engineering Chemistry by R. Gopalan & Venkappayya & Nagarajan

References Books:

1. Lee, J. D., Author, Concise Inorganic Chemistry, Oxford University Press Alberty.
2. R.A. Physical Chemistry, John Wiley and Sons.
3. N. Krishnamurthy, P. Vallinayagam, Engineering Chemistry, PHI Learning Pvt. Ltd. Kuriacose J.C. and Rajaram J., Chemistry in Engineering and Technology Tata Msgraw Hill.
4. Polymer Science – Ghosh, Tata McGraw Hill

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Chemist Material Scientist	Able to provide knowledge about industrial chemicals	Goal04(quality education)	

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SEMESTER- 2[d]
Course: BE EE
SUBJECT: MATHEMATICS-II

Subject Code: 3TBMA202
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

Introduced effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes. Introduced Fourier Series & Fourier Transform. Introduced the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems. Acquainted the student with mathematical tools available in vector calculus needed various field of science and engineering.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Ordinary differential Equations: Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Partial Differential Equations: Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients. Method of separation of variable's	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Fourier series: Fourier Series for Continuous & Discontinuous Functions, Expansion of odd and even periodic functions, Half range Fourier series, Half range sine and cosine series, Parseval's theorem, Fourier transform, Fourier sine and cosine transform	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Functions of Complex Variable: Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle)	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Vector Calculus: Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Course Outcome:

Today calculus has become the heart of every engineering stream. Through this syllabus student will learn different techniques of solving different kind of higher order ordinary and partial differential equations. Expansion of periodic function in an infinite series of sine and cosine function through Fourier series, Function of complex variable's based on complex number and also vector calculus based on vectors.

Text Books:-

1. Text Book of Engineering Mathematics 3rd Sem. by N.P. Bali & Manish Goyal

References Books:

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1. Dean G. Duffy, Advanced Engineering Mathematics with MATLAB, CRC Press, 2013. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc.
2. Micheal Greenberg, Advanced Engineering Mathematics, Second Edition, Person Education, 2002 (Indian Edition).
3. B.V. Rammana, Higher Engineering Mathematics, Tata Msgraw Hill Publishing Company, 2007. Shanti Narayan, A Course of Mathematical Analysis. S.Chand & Co.Delhi.
4.Marwaha, Introduction to Linear Algebra, PHI Learning.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Mathematician Financial Analyst	Able to provide knowledge about vector calculus.	Goal04(quality education)	

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SEMESTER- 2[d]
Course: BE EE
SUBJECT: ENGINEERING GRAPHICS

Subject Code: 3TBEG203
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- To familiarize with the construction of geometrical figures.
- To familiarize with the projection of 1D, 2D and 3D elements .
- To familiarize with the sectioning of solids and development of surfaces.
- To familiarize with the Preparation and interpretation of building drawing .

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Orthographic Projections covering, Principles of Orthographic Projections-Conventions -Projections of Points and lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes,Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views, Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors and fixtures such as WC, bath, sink, shower, etc.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Overview of Computer Graphics covering, listing the computer technologies that impact ongraphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area(Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (ButtonBars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used inCAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]Customisation& CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and to learning; Orthographic constraints, Snap to objects manually and automatically, Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles. Use of solid modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling;Introduction to Building Information Modelling (BIM).	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

List of Experiments:

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Drawing for topics covered in the theory as suggested by the course coordinator.

Course outcome:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling
- Exposure to creating working drawings
- Ability to draw projections and analysing multiple views of object.

Text Books:-

1. Engineering Drawing by R.K. Dhawan

References Books:

1. N.D. Bhatt and V. M. Panchal, Engineering Drawing Plane and Solid Geometry, Charotar Publishing House.
2. James Leach, AutoCAD 2015 Instructor, SDC Publications.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Industrial Designer Landscape Architect	Able to get the knowledge of drawing scales and Computer-Aided Design	Goal04(quality education)	

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SEMESTER- 2[d] **Subject Code: 3TBEE 204**
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: BASIC ELECTRICAL ENGINEERING **Theory Min. Marks** : 17

COURSE OBJECTIVE:

1. To provide knowledge of basic concepts related to electrical engineering.
2. To provide knowledge of basic Circuits: 1- phase AC Circuits, 3-phase AC Circuits, Magnetic Circuits, Electrical Machines

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	D.C. Circuits: Units and dimensions, Ohm's Law, Kirchhoff's Law, Superposition theorem, Thevenin's theorem and their application for analysis of series and parallel resistive circuits excited by independent voltage sources, Power & Energy in such circuits. Mesh & nodal analysis, Star Delta circuits.	Lectures. Exercise, flip chart, , posters,
Unit – II	1- phase AC Circuits: Generation of sinusoidal AC voltage, definition of average value, R.M.S. value, form factor and peak factor of AC quantity , Concept of phasor, Concept of Power factor, Concept of impedance and admittance, Active, reactive and apparent power, analysis of R-L, R-C, R-L-C series & parallel circuit.	Lectures. Exercise, flip chart, , posters,
Unit – III	3-phase AC Circuits: Necessity and advantages of three phase systems, Meaning of Phase sequence, balanced and unbalanced supply and loads. Relationship between line and phase values for balanced star and delta connections. Power in balanced & unbalanced three-phase system and their measurements	Lectures. Exercise, flip chart, , posters,
Unit – IV	Magnetic Circuits: Basic definitions, magnetization characteristics of Ferro magnetic materials, self inductance and mutual inductance, energy in linear magnetic systems, coils connected in series, AC excitation in magnetic circuits, magnetic field produced by current carrying conductor, Force on a current carrying conductor. Induced voltage, laws of electromagnetic Induction, direction of induced E.M.F. Single phase transformer- general construction, working principle, e.m.f. equation, open circuit and short circuit test	Lectures. Exercise, flip chart, , posters,
Unit - V	Electrical Machines: D.C. Motor & D.C. Generator, Three phase Induction motor and SynchronousMachines, their general construction, working principle, emf equation and applications.Types of losses occurring in electrical machines	Lectures. Exercise, flip chart, , posters,

Course outcome:

After successful completion of course,
• Students are expected to possess an in-depth understanding and Knowledge of 1- phase AC Circuits, 3-phase AC Circuits, Magnetic Circuits, Electrical Machines
• Develop the concepts of basic electrical engineering for all the undergraduate students of different branches of engineering.

List of Experiments:

• Verifications of Thevenin's Superposition theorem.
• Study of Transformer, name plate rating, determination of rayio and polarity.
• Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
• Separation of resistance and inductance of choke coil.

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• Measurement of various line & phase quantities for a 3-phase circuit.
• Identification of different Electronics components.
• Observing input and output waveforms of rectifiers.
• Transistor application as amplifier and switch.
• Verification of truth table for various gates.

Text Books:-

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.

References Books:

1. Basic Electrical Engineering by S.K. Sahdev & R.K.Chaturvedi
2. S.N. Singh , Basic Electrical Engineering, P.H.I.,2013 .
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall, 2014.
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press,2012.
5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
6. Bharti Dwivedi, Fundamentals of Electrical Engineering, Wilkey India,2013.
7. Sanjeev Sharma, Basic Electrical Engineering, I.K. International.
8. Basic Electrical Engineering by V N Mittle & Arvind Mittal

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In Research and Development Departments of various sectors	Able to define working of various electrical machines.	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Start business Unit (retail and Micro).

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SEMESTER- 2[d]
Course: BE EE
SUBJECT: BASIC COMPUTER ENGINEERING

Subject Code: 3TBCS205
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

By the end of this course, the student will be able to:-

1. Analysing problems, and designing and implementing algorithmic solutions.
2. Solving problems properly, achieving an implementation that is correct, effective and efficient.
3. Using computers at user level, including operative systems and programming environments.
4. Knowledge of computer equipment, including both hardware and software.
5. Identifying information needs to solve problems, recovering information and applying it to the resolution.
6. Opportunity to learn key concepts of computer, as well as fundamentals and applications of computer.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Computer: Definition, Classification, Organization i.e. CPU, register, Bus architecture, Instruction set, Memory & Storage Systems, I/O Devices, and System & Application Software. Computer Application in e-Business, Bio-Informatics, health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc. Operating System: Definition, Function, Types, Management of File, Process & Memory. Introdcution to MS word, MS powerpoint, MS Excel	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Introduction to Algorithms, Complexities and Flowchart, Introduction to Programming, Categories of Programming Languages, Program Design, Programming Paradigms, Characteristics or Concepts of OOP, Procedure Oriented Programming VS object orientedProgramming.Introduction to C++: Character Set, Tokens, Precedence and Associatively, Program Structure, Data Types, Variables, Operators, Expressions, Statements and control structures, I/O operations, Array, Functions	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Object & Classes, Scope Resolution Operator, Constructors & Destructors, Friend Functions, Inheritance, Polymorphism, Overloading Functions & Operators, Types of Inheritance, Virtual functions. Introduction to Data Structures.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Computer Networking: Introduction, Goals, ISO-OSI Model, Functions of Different Layers. Internetworking Concepts, Devices, TCP/IP Model. Introduction to Internet, World Wide Web, Ecommerce Computer Security Basics: Introduction to viruses, worms, malware, Trojans, Spyware and Anti-Spyware Software, Different types of attacks like Money Laundering, Information Theft, Cyber Pornography, Email spoofing, Denial of Service (DoS), Cyber Stalking, ,Logic bombs, Hacking Spamming, Cyber Defamation , pharming Security measures Firewall, Computer Ethics & Good Practices, Introduction of Cyber Laws about Internet Fraud, Good Computer Security Habits.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Data base Management System: Introduction, File oriented approach and Database approach, Data Models, Architecture of Database System, Data independence, Data dictionary, DBA, Primary Key, Data definition language and Manipulation Languages.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the

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	Cloud computing: definition, cloud infrastructure, cloud segments or service delivery models (IaaS, PaaS and SaaS), cloud deployment models/ types of cloud (public, private, community and hybrid clouds), Pros and Cons of cloud computing	topic

List of Experiment

1. Study and practice of Internal & External DOS commands.
2. WAP to illustrate Arithmetic expressions
3. WAP to illustrate Arrays
4. WAP to illustrate functions.
5. Write program to illustrate Conditional Statements
6. Write program to illustrate Loop Statements..
7. WAP to illustrate constructor & Destructor
8. WAP to illustrate Object and classes
9. WAP to illustrate Operator overloading
10. WAP to illustrate Function overloading
11. WAP to illustrate Derived classes & Inheritance
12. WAP to insert and Delete end Element from the stack
13. WAP to insert and delete end element from the Queue

Course outcome:

By the end of this course, the student will

- Analysing problems, and designing and implementing algorithmic solutions.
- Solving problems properly, achieving an implementation that is correct, effective and efficient.
- Using computers at user level, including operative systems and programming environments.
- Knowledge of computer equipment, including both hardware and software.
- Identifying information needs to solve problems, recovering information and applying it to the resolution.
- Opportunity to learn key concepts of computer, as well as fundamentals and applications of computer.

References Books:

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Introduction of Computers : Peter Norton, TMH
3. Kerninghan & Ritchie "The C programming language", PHI
4. Kanetkar Y. "Let us C", BPB.
5. Microsoft_Office_2007_Illusrated_Windows_XP_Edition_Introductory by David W. Beskeen, Jennifer Duffy.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Program Developer	Computer Networking	Goal04(quality education)	

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SEMESTER- 2[d]
Course: BE EE
SUBJECT: MANUFACTURING PRACTICES

Subject Code: 3TBMP206
Theory Max. Marks: 25
Theory Min. Marks : 12

COURSE OBJECTIVE:

- To familiarizewiththebasicsoftoolsandequipmentsusedinfitting,carpentry,sheetmetal,welding and smithy
- To familiarize with the production of simple models in the above trades.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	FITTING: Tools&Equipments–Practiceinfiling.MakingVeeJoints,Square,Dovetailjoints and Keymaking-plumbing. SuggestedMiniproject–Assembly of simple I.C.engines	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	CARPENTRY: Tools andEquipments- Planning practice.Making HalfLap,Dovetail,Mortise&Tenon joints. SuggestedMiniproject-model of a single door window frame.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	SHEETMETAL: Toolsandequipments–practice.Makingrectangulartray,hopper,scoop,etc. Suggested Mini project-Fabrication of a small cabinet, dust bin, etc.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Toolsandequipments– Arcweldingofbuttjoint,Lapjoint,Teefillet.Demonstrationofgaswelding, TIG & MIG welding.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	SMITHY: Tools and Equipments– Making simple parts like hexagonal headed bolt, chisel. FOUNDRY: Tools and Equipments, Mould making, conducting casting operation of a job.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Course outcome:

- On completion of this course, students will be able to
- Make half lap joint and dovetail joint in carpentry.
- Make welded lap joint, butt joint and T-joint.
- Prepare sand mould for cube, conical bush, pipes and V pulley.
- Fabricate parts like tray, frustum of cone and square box in sheet metal.

References Books:

1. S. Hazara Choudhary, Gopal. T.V. Kumar T and Murali G. "A first course on workshop practice – theory, practice and work book", Suma Publications, Chennai, 2005.
2. Kannaiah. P and Narayanan. K.C. "Manual on workshop practice", Scitech Publications.
3. Venkatachalpathy. V.S. "First year Engineering Workshop Practice", Ramalinga Publications.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity

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Fitter, carpenter	FOUNDRY SMITHY	Goal04(quality education)	

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SEMESTER- 2[d] **Subject Code:** 3TBED207

Course: BE EE

SUBJECT: ENTREPRENEURSHIP DEVELOPMENT

COURSE OBJECTIVE:

Understanding basic concepts of entrepreneurship and key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Entrepreneurship-Definition. Characteristics and importance. Types and functions of an entrepreneur. merits of a good entrepreneur motivational factors of entrepreneurship.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – II	Motivation to achieve targets and establishment of ideas. Setting targets and facing challenges. Resolving problems and creativity. Sequenced planning and guiding capacity, Development of self confidence. Communication skills, Capacity to influence, leadership.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – III	Project Report- Evaluation of selected process. Detailed project report - Preparation of main part of project report pointing out necessary and viability.Selecting the form of Organization: Meaning and characteristics of sole Proprietorship, Partnership and cooperative committees, elements affecting selection of a form of an organization.Economic management -Role of banks and financial institutions banking, financial plans, working capital-evaluation and management, Cost and Price determination, Calculation of Profits, keeping of accounts.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit – IV	Production management - Methods of purchase. Management of movable assets/goods. Quality management. Employee management. Packing.Marketing management Sales and the art of selling. Understanding the market and market policy. Consumer management. Time management.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic
Unit - V	Role of regulatory institutions - district industry centre, pollution control board, food and drug administration, special study of electricity development and municipal corporation. Role of development organizations, khadi & village Commission/ Board, State Finance Corporation, scheduled banks, MP Women's Economics Development Corporation. Self-employment-oriented schemes, Prime Minister's Employment schemes, Golden Jubilee Urban environment scheme, Rani Durgavati Self-Employment scheme, Pt. Deendayal Self- employment scheme.Various grant schemes - Cost-of-Capital grant, interest grant, exemption from entry tax, project report, reimbursement grant, etc. Special incentives for women entrepreneurs, prospects 8s possibilities. Schemes of Tribal Finance Development Corporation, schemes of Antyavasai Corporation, schemes of Backward Class and Minorities Finance Development Corporation.	Usage of ICT (PowerPoint, Pdf and video lectures) and blackboard (traditional) as per the requirement of the topic

Course Outcome:

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Understanding basic concepts in the area of entrepreneurship, understanding the stages of the entrepreneurial process, adopting of the key steps in the elaboration of business ideas, Developing personal creativity and entrepreneurial initiative.

Reference Books:

1. Fundamental of Entrepreneurship : Sangram Kesari Mohanty (PHI Publications)
2. Udhyamita Vikas : U.C Gupta (Kailash Prakashan)
3. Entrepreneurship Dvenelopment : D. Acharya (Himalya Publication House)

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Production manager , Entrepreneur motivator	Production management	Goal04(quality education)	

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SEMESTER- 3rd
Course: BE EE
SUBJECT: MATHEMATICS-III

Subject Code: 3TBBE 301
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- The objective of this course is to fulfil the needs of Engineers to understand the Applications of - Fourier series, Different Transforms,
- Complex Analysis & Vector Calculus in order to enable young technocrats to acquire Mathematical thinking of Formulating,
- Analyzing and solving a wide range of Practical Problems Appearing in Science & EX Engineering.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Fourier series: Fourier series for Continuous & Discontinuous Functions, Expansion of odd and even periodic functions, half range Fourier series, Complex form of Fourier Series.	Lectures. Exercise, flip chart, , posters,
Unit – II	Integral Transforms: Fourier Transform-Complex Fourier Transform, Fourier Sine and Cosine Transforms, Applications of Fourier Transform in Solving the Ordinary Differential Equation.	Lectures. Exercise, flip chart, , posters,
Unit – III	Laplace Transform- Introduction of Laplace Transform, Laplace Transform of elementary Functions, Properties of Laplace Transform, Change of Scale Property, First and Second Shifting Properties, Laplace Transform of Derivatives and Integrals. Inverse Laplace Transform & its Properties, Convolution theorem, Applications of Laplace Transform in solving the Ordinary Differential Equations.	Lectures. Exercise, flip chart, , posters,
Unit – IV	Functions of Complex Variables: Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integrals.	Lectures. Exercise, flip chart, , posters,
Unit - V	Vector Calculus: Differentiation of Vectors, Scalar and Vector Point functions, Gradient, Directional derivative, Divergence and Curl. Line Integral, Surface Integral and Volume Integral, stokes Theorem and Gauss divergence theorem.	Lectures. Exercise, flip chart, , posters,

Course Outcomes:

- The curriculum of the Department is designed to satisfy the diverse needs of students.
- Coursework is designed to provide students the opportunity to learn key concepts of Fourier series, Different Transforms, and Complex Analysis & Vector Calculus.

EVALUATION- Evaluation will be continuous, an integral part of the class as well as through external assessment.

Textbooks

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1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

References Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
2. HC Taneja: Advanced Engineering Mathematics, I.K. International Publishing House Pvt. Ltd.
3. CB Gupta&S R Singh: Engineering Mathematics, McGraw Hill Education.
4. S S Sastri: Engineering Mathematics, PHI
5. Ramana: Advance Eng. Mathematics, TMH NewDelhi
6. Engineering Mathematics by Samnta Pal and Bhutia, Oxford Publication

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In Research and Development Departments of various sectors	Able to define probability and interpret probability by modeling sample spaces, able to understand Fourier series and Fourier transform	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Start business Unit (retail and Micro).

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SEMESTER- 3rd
Course: BE EE
SUBJECT: ELECTRICAL MACHINE-I

Subject Code: 3TBEX 302
Theory Max. Marks: 50
Theory Min. Marks :- 17

COURSE OBJECTIVE:

- To prepare the students to have a basic knowledge of transformers.
- To prepare the students to have a basic knowledge of induction motors.
- The objective of this course is to fulfil the needs of Engineers to understand the Transformer-I, Transformer-II,
- To prepare the students to have a basic knowledge of alternators &Induction Motor.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Transformer-I: Working principle, e.mf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, allday efficiency, Excitation phenomenon. Autotransformer: working, advantages, its equivalent circuit and phasor diagram.	Lectures Demonstration of equipment's. Exercises
Unit – II	Transformer-II: Three phase transformer: its construction, groups and connections, their working and applications; Scott connection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers.	Lectures Demonstration of equipment's. Exercises
Unit – III	Single Phase Motors: Single Phase Induction motor; double revolving field theory, equivalent circuit and its determination, performance calculation, starting methods and types of single phase Induction motors: their working principle and applications, comparison with three phases Induction Motor. Single phase A.C. series motor, Servo motors, Linear Induction Motor	Lectures Demonstration of equipment's. Exercises
Unit – IV	Three Phase Induction Motor- I: Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram	Lectures Demonstration of equipment's. Exercises
Unit - V	Three Phase Induction Motor-II: Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage &Deep bar Indication Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Applications	Lectures Demonstration of equipment's. Exercises

Course Outcome:

- Understand electrical principle, laws, and working of DC machines.
- Analyze the construction and characteristics and application of various types of DC generators.
- Analyze the construction and characteristics and application of various type of DC motors and
- Testing of motors according to Indian standard.

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- Understand electrical principle, laws, and working of 1 phase transformer and losses. And also
- Conduct various tests on the transformer.
- Understand electrical principle, laws, and working of 3 phase transformer and losses. and also
- Conduct various test on the transformer.
- Analyze the transformer and convert 3 phase transformer to multiphase transformer.

List of Experiments (expandable)

Experiments can cover any of the above topics, following is a suggestive list:

- Perform turn ratio and polarity test on 1-phasetransformer
- Perform load test on a 1-phase transformer and plot its load characteristic
- Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit. Also
- Find its efficiency and regulation at different load and power factor.
- Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also
- Find its efficiency and regulation at different load and power factor.
- Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
- Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.
- Perform load test on a 3- phase IM and plot its performance characteristics.
- Study various types of starters used for 3- IMs.
- Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit.

Text Books

1. Electrical Machines by Nagrath and Kothari, McGraw-Hill
2. P.S.Bambara, Electrical Machines, Khanna Publishers
3. Machine Design by R.S. Khurmi & J.K. Gupta

References Books:

1. V. Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc. Englewood Cliffs
2. S K Bhattacharya, Electrical Machines, McGraw-Hill
3. Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co
4. Langs dorf, A.C. Machines, McGraw-Hill
5. Samarajit Ghosh, Electrical Machines, Pearson

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunities in many private sectors as well as government sectors . Opportunities to do work as contractor. Can get the job in power plants.	Identification of several machines. Getting knowledge of complete working of transformers. Achieving the knowledge of speed control.	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	By achieving the good knowledge of several types of machines ,one can start their own business of on traction of several machine parts.

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SEMESTER- 3rd | **Subject Code: 3TBEE 303**
Course: BE EE | **Theory Max. Marks: 50**
SUBJECT: NETWORK ANALYSIS | **Theory Min. Marks : 17**

COURSE OBJECTIVE:

1. This Course introduces examination of electrical &electronic circuit '
2. This course analysis & synthesis tools & techniques such as the Laplace transform,
3. To prepare the students to have nodal analysis & two port network theory.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to circuit elements R, L, C and their characteristics in terms of linearity & time dependent nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis: - Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co- efficient, tuned circuits, Series & parallel resonance.	ICT Based & green board based class room teaching
Unit – II	Network Theorems for AC & DC circuits- Theremins& Norton's, Superposition's, Reciprocity, Compensation, Substitution, Maximum power transfer, and Mill man's theorem, Tellegen's theorem, problems with dependent & independent sources.	ICT Based & green board based class room teaching
Unit – III	Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain	ICT Based & green board based class room teaching
Unit – IV	Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.	ICT Based & green board based class room teaching
Unit - V	Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, NEEssary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, terminated two port networks.	ICT Based & green board based class room teaching

Course Outcome:

- To analyze behaviour of basic circuit elements and to apply concept of mesh and node analysis in Circuit theory.
- Apply various network theorems to determine the circuit response / behaviour.
- To apply transformation of a network to analyze time domain, differential eq.
- To study nEEssary conditions for driving point functions, transfer function for their application to a Given network for analyzing circuit design.
- To analyze the sinusoidal steady state for different electric network and apply concepts of Fourier series for analyzing non sinusoidal periodic waveforms.

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Topics for the laboratory (Expandable):

- To Verify Thevenin Theorem.
- To Verify Superposition Theorem.
- To Verify Reciprocity Theorem.
- To Verify Maximum Power Transfer Theorem.
- To Verify Millman's Theorem.
- To Determine Open Circuit parameters of a Two Port Network and to
- Determine Short Circuit parameters of a Two Port Network.
- To Determine A,B, C, D parameters of a Two Port Network
- To Determine h parameters of a Two Port Network
- To Find Frequency Response of RLC Series Circuit.
- To Find Frequency Response of RLC parallel Circuit.

Text Books:-

1. Network Analysis by M.E. Van Valkenburg
2. Network ANalysis an Synthesis by B.R. Gupta

References Books:

1. M.E. Van Valkenburg, Network Analysis, Pearson
2. William H Hayt. & Jack E. Kemmerly, Steven M Durbin; Engineering Circuit Analysis; McGraw Hill
3. Richard C Dorf, James A Svoboda, Introduction to Electric Circuits, Wiley India, 2015
4. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits; McGraw-Hill
5. J David Irwin, Robert M Nelms, Engineering Circuit Analysis, Wiley India, 2015
6. Robert L Boylestad, introductory circuit analysis, Pearson, 2016
7. M S Sukhija, T K Nagsarkar; Circuits and Networks, Oxford University Press, 2015
8. Samarajit Ghosh, Network Theory Analysis and Synthesis
9. Network Analysis and Synthesis by Pankaj Swarnkar

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Circuit designers should be working on a computer and using software programs, such as Microsoft Office	The ability to simplify and explain technical information to others • Team working and team management experience• Good project management skills • Good organization and problem-solving skills	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Battery Production, Battery store, Electrical Wire Manufacturing, Printed Circuit Board Making

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SEMESTER- 3rd
Course: BE EE
SUBJECT: ANALOG ELECTRONICS

Subject Code: 3TBEX 304
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

- To give the idea about fundamental properties of semiconductors.
- To prepare students to perform the analysis of any Analog electronics circuit.
- To empower students to understand the design and working of BJT / FET amplifiers, oscillators and Operational Amplifier.
- To prepare the students for advanced courses in Communication system Circuit Design.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Semiconductor Diodes: Theory of P-N junction, temperature dependence and break down characteristics, junction capacitances, Zener diode, Varactor diode, Tunnel diode, PIN diode, LED, Photo diode, Schottky diode, Diode applications: series –parallel configurations, full wave and half wave rectification, voltage multiplier circuits, diode testing	Lectures, Audio – visual aids such as – chalk board , flip chart, models
Unit – II	Transistors: BJT, types& configuration, working principal, characteristics, and region of operation, load line, biasing methods, Small signal analysis of transistor (low frequency) using h-parameters, thermal runaway and thermal stability. FET, MOSFET, Transistor as an amplifier, gain,band width, frequency response,	Lectures, Audio – visual aids such as – chalk board , flip chart, models
Unit – III	Feedback amplifier and Oscillators: Feedback amplifier, negative feedback, voltage-series, voltage shunt, current series and current shunt feedback, Sinusoidal oscillators, L-C (Hartley- Colpitts) oscillators, RC phase shift, Wien bridge, and Crystal oscillators. Power amplifiers, class A, class B, class A B, C amplifiers, their efficiency and power Dissipation, Push-pull and complimentary symmetry push- pull amplifier.	Lectures, Audio – visual aids such as – chalk board , flip chart, models
Unit – IV	Wave Shaping circuits: Switching characteristics of diode and transistor, turn ON, OFF time, reverse recovery time, transistor as switch, Multivibrators, Bistable, Monostable, Astable multivibrators. Clipper and clamper circuit, Differential amplifier, calculation of differential, common mode gain and CMRR using h- parameters, Darlington pair, Boot strapping technique. Cascade and cascade amplifier.	Lectures, Audio – visual aids such as – chalk board , flip chart, models
Unit - V	Operational Amplifier: Operational amplifier basics, practical Op-amp circuits & characteristics, slew rate , bandwidth, offset voltage ,basic current, application, inverting, non- inverting amplifier, summer, average, differentiator, integrator, differential amplifier, instrumentation amplifier, log and antilog amplifier, voltage to current and current to voltage converters, comparators Schmitt trigger , active filters, 555 timer and its application.	Lectures, Audio – visual aids such as – chalk board , flip chart, models

Course Outcome:

- Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
- Develop the Ability to understand the design and working of BJT / FET amplifiers.
- Able to design amplifier circuits using BJT s and FET's. And observe the amplitude and Frequency Responses of common amplifier circuits

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- Observe the effect of negative feedback on different parameters of an Amplifier and different types of Negative feedback topologies.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment. Laboratory assessment will be based on external assessment, assignments, presentations, and interview of each candidate

Topics for the laboratory (Expandable):

- Design & measure the frequency response of an RC coupled amplifier using discrete components.
- Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth.
- Study the effect of voltage series, current series, voltage shunt and current shunt feedback on amplifier using discrete components.
- Design & realize inverting, non-inverting and buffer amplifier using 741 op-amps.
- Verify the operation of a differentiator circuit using op amp IC 741 and show that it acts as a high pass filter.
- Verify the operation of a integrator circuit using op amp 741 and show that it acts as a low pass filter.
- Design & Verify the operation of adder and subtractor circuit using op amp 741.

Text Books:-

1. S Salivahanan, N Suresh Kumar; Electronic Devices and Circuits; McGraw-Hill

References Books:

1. Robert L Boylestad, Louis Nashelsky; Electronic Devices and Circuits; Pearson
2. Jacob Millman, Cristos C Halkias, Satyabrata Jit; Electronic Devices and Circuits; McGraw- Hill
3. Anil K Maini, Electronic Devices and Circuits, Wiley
4. Analog and Digital Communicaton Systems by Martin S. Roden
5. Analog Communication by J.S. Katre

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design , manufacture electronics or electrical industries	Able to understand Understand the construction, working principles of electronics instruments	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Start business Unit (retail and Micro).

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SEMESTER- 3rd
Course: BE EE
SUBJECT: POWER SYSTEM-I

Subject Code: 3TBEX 305
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- To introduce the concepts and phenomenon of different sources of Power Generation.
- To give an idea about the fundamental concepts of electrical power distribution, both AC & DC.
- To familiarize the students with the Tariff methods for electrical energy consumption in the prospect of optimum utilization of electrical energy.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Power Generation &Transmission System Steam Power station: Main parts and working of a steam station , Hydro power stations , Nuclear power stations: main parts of nuclear power station Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φ and 3- Φ, Single and double circuit line, Concept of GMR and GMD, Symmetrical &asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground or capacitance, Capacitance calculation for symmetrical and asymmetrical 1-phase and three phase, Single and double circuit line, Charging current, Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – II	Underground Cable Comparison of cables and overhead transmission lines, Classification of cables, requirement of cable construction, capacitance of single and multi-core cable, economic core diameter, dielectric stress in cable, Grading of cables, ionization of Heating of cables, Phenomena of dielectric losses and sheath loss in cables, Thermal resistance of cables.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – III	Transmission systems & performance of transmission lines Various systems of transmission, effect of system voltage, comparison of conductor materials required for various overhead systems. Short, Medium & long transmission line and their representation, Nominal T, Nominal JI, Equivalent T and equivalent JI, network models, ABCD constants for symmetrical & asymmetrical network, Mathematical solution to estimate regulation & efficiency of all types of lines. Surge Impedance, loading, Interpretation of long line equation and its equivalent equation. Tuned power lines. Power flow through transmission line, Circle diagram, Method of voltage control, Static & rotating VAR generator, transformer control. Insulator & Mechanical design.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – IV	Types of conductors used in overhead transmission line, Types of line supports and towers, Distribution of conductors over transmission towers, spacing between conductors, Length of span and sag tension calculation for transmission line, Wind & ice loading, support of line at two different levels, string chart, Sag template, Stringing of conductor, Vibration and Vibration dampers. Insulator Materials used for transmission line insulations, Types of insulator for overhead transmission line failure of insulator, Voltage distribution of suspension insulator, String efficiency, Shielding and grading.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit - V	Voltage control & Distribution system: AC single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most	Lectures Demonstration of equipments.Exercises,Audio

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	economical size of conductor Substation layout showing substation equipment, bus bar single bus bar and sectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system, ring mains.	visual aids such as chalk board.

Course Outcome:

- Students will be able to learn the basics of various fundamentals of electrical power generation, Transmission & distribution.
- Students will be able to learn transmission line parameters, the calculations also the effects on Transmission lines & its effects on the communication system.
- Students will be able to learn electrical characteristics of transmission line such as types of Transmission lines, various effects on transmission & per unit representation of power system.
- Students will be able to learn load flow studies and its equation, Comparison of various methods like GS & NR
- Students will be able to learn Mechanical design along with the types of insulators also the Knowledge of voltage distribution across the string and introduction to HV, LV and EHV.
- Students will be able to learn information regarding conductors and insulation, different types of underground cable parameters.

Text Books:-

1. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
2. Basic Electrical Engineering by R.K. Rajput
3. A Textbook of Power Plant Engineering in S.I. Units by R.K. Rajput

References Books:

1. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
2. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009.
3. Basic Electrical Engineering by J.B. Gupta

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job requirement in the Steam power plant,, power plant ,hydroelectric plants etc	Able to understand the conversion of energy processes Etc. Skilled engineers & Good technical hands	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Power plant establishment we can motivate the entrepreneurship of the businesses

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SEMESTER- 3rd **Subject Code:3TBEX 306**
Course: BE EE **Theory Max. Marks: 25**
SUBJECT: ELECTRICAL MODELING & SIMULATION LAB I **Theory Min. Marks** : 12

Practicals:

- Study of various Electrical Toolbox I.e. Power System, Power Electronics, Control system, Electrical Measurement, Flexible AC Transmission.
- Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter For different load models.
- Developing Simulation Models using FACTs Devices i.e. STATCOM, SVC, TCSC, SSSC, IPFC, UPFC in power system transmission lines.

References Books:

1. Shailendra Jain "Modeling and Simulation using MATLAB Simulink" wileyindia& sons

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunities in many private sectors as well as government sectors . Opportunities to do work as a field engineer. Can get the job in power plants.	Simulation of electrical devices	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Substation , power plant establishment

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SEMESTER- 3rd
Course: BE EE
SUBJECT: LT MAINTENANCE

Subject Code: 3STEX 307A
Theory Max. Marks: 25
Theory Min. Marks 12

COURSE OBJECTIVE:

- The objective of this course is to get an overview of Basic electronics and component Identification,
- The Importance of alignment and balancing, basic programming, Insulating Materials, Transformers and windings Transformers.

Course Outcome:

After successful completion of course, Students are expected to possess an in-depth understanding and Knowledge of the concepts and principles of Basic electronics and component identification, Importance of alignment and balancing, basic programming, Insulating Materials, Transformers and windings Transformers.

List of Experiments:

Transformer Winding

1. Safety precautions
2. Testing the supply using test lamp with different wattage lamps.
3. Take the dimensions of a bobbin and prepare the bobbin from suitable materials.
4. Measure and also determine the size of winding wire for primary and secondary.
5. Dismantle /reassemble the transformer cores.
6. Wind the primary and secondary winding layer by layer.
7. Familiarization and operation with the motorized coil winding machine– General maintenance to be done.
8. Test the transformer for insulation, transformation ratio and performance.

Armature Winding

1. Safety precautions.
2. Study the parts of armature.
3. Check and test the armature. Strip the old winding from the armature.
4. Record the winding data.
5. Prepare the armature for rewinding.
6. Wind the coils by hand insulate them.
7. Connection of armature leads on raiser.
8. Understand end connection, electrical and distinguishing start and finish of each.
9. Varnish the armature winding

Rewinding of AC/DC Motor

1. Safety Precaution.
2. List the conducting and insulating materials used in motor winding.
3. Testing the motor before declaring for rewinding.
4. Prepare the winding former and the coils.
5. Method of stripping the old winding and preparing the winding former and
6. the coils
7. Method of inserting coil in the slots.
8. Making end connections.
9. Testing the motor after rewinding. Impregnation methods of winding

Text Books

1. Transformers; by BHEL (Tata McGraw - Hill Education).
2. Transformer and Inductor Design Handbook;by McLyman,Col. William T. Magnetic Circuitits and Transformers. John Wiley & Sons

References Books:

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1. Armature Winding and Motor Repair; by Daniel H. Braymer
2. Electric Motor Test and Repair; by Jack Beater
3. Electric Motor Repair; by Robert Rosenberg
4. Electric Motors and Drives: Fundamentals, Types and Applications; by Austin Hughes, Bill Drury
5. Unwinding Electric Motors: Strategic Perspectives and Insights for Automotive Power train Applications; by Timothy G. Thoppil
6. Armature winding; a practical manual on the construction, winding and repairing of A. C. and D. C. motors and generators, together with practical connection diagrams, by David P. Moreton, Carl H. Dunlap and L. R. Drinkall.

Job opportunity	**Employability skill developed**	**Local/National/UNDP Goal Achieved**	**Entrepreneurship Opportunity**
Electric appliances business in different sectors / institution .private sector , self – employability.	Maintenance ability of transformer winding, motor winding	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Workshop for maintenance work

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SEMESTER- 3rd
Course: BE EE
SUBJECT: SOLAR TECHNICIAN

Subject Code: 3STEX 307B
Theory Max. Marks: 25
Theory Min. Marks 12

COURSE OBJECTIVE:

The objective of this course is to get an overview of –

- Fundamentals of renewable energy, Basic of electrical energy, Basic components of solar photovoltaic,
- Basic solar power plant designing and power engineering, Operation and maintenance of solar plant.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Fundamentals of renewable energy, overview of energy sources, Basic of Solar Energy, irradiance & solar constant, Radiation, Measurement of solar radiation, Introduction to Solar Power Generation Technique.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – II	Basic of electrical energy, Basic components of solar photovoltaic plants-1 Photovoltaic Modules, photovoltaic effect, solar modules, protection diodes, PV landscape, Comparison of different technologies.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – III	Basic components of solar photovoltaic plants-2, mounting structure & fasteners, cable, fuse, connection & junction box, charge controller, inverter, PCU-batteries, earthling & lightning arrestors.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – IV	Basic solar power plant designing and power engineering, standard labeling, PV system electrical design, single line diagram and plant design conclusion, capacity utilization factor and performance ratio.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit - V	Operation and maintenance of solar plant, preventative maintenance for batteries, important practical tips during site visit & designing, financial aspect of solar plant, overview of solar PV MW level grid interactive, solar tracking system. Other important application to solar power, solar home lightning system, solar fencing, solar street light, solar thermal, hands on experience on simulator, effect of temperature on generation, effect of mismatching of PV panels.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.

Course Outcome:

After successful completion of course,

- Students are expected to possess an in-depth understanding and Knowledge of the concepts and principles of Fundamentals of renewable energy,
- Basic of electrical energy, Basic components of solar photovoltaic, Basic solar power plant designing and power engineering,
- Operation and maintenance of solar plant.

List of Experiments:

- Identifying and measuring the parameters of a solar PV module in the field.
- Series and Parallel Connection of PV modules.

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- Efficiency measurement of Standalone Solar PV System.
- Measurement of current – voltage characteristics of crystalline silicon solar cell in series and b) in parallel
- Measurement by using 4 quadrant power supply and solar cell as load in dark and ii) under illumination.
- Dependence of current- voltage characteristics of crystalline silicon solar cell on a) light intensity and b) temperature of solar cell Carrier lifetime in a solar cell.
- Spectral response measurement and quantum efficiency measurements.

Reference Books:

1. Solar Photovoltaic: Fundamentals, Technologies and Applications; by Chetan Solanki Solar Engineering ; by John Duffie The Physics of Solar Cells ; by Jenny Nelson
2. Solar Energy Principles of Thermal Collection and Storage by S.P. Sukhatme & J.K. Nayak

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In govt/private sector , self – employability.	Pv panal maintenance , installation	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Installation of solar plants

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SEMESTER- 4th **Subject Code: 3TBEX 401**
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: ENERGY, ECOLOGY & SOCIETY **Theory Min. Marks** : 17

COURSE OBJECTIVE:

- This course introduces students to environment concerns. Students are expected to learn about environment, factors affecting it, environmental Ethics.
- its protection through lectures, presentations, documentaries and field Visits.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Energy- Sources of Energy: Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydra, nuclear sources.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Ecosystem – Segments of Environment: Atmosphere, hydrosphere, Lit hosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Air Pollution & Sound Pollution - Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain. Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – IV	Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent. Soil Pollution – Soil Profile, Pollutants in so il, their adverse effects, controlling measures.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit - V	Society, Ethics & Human values– Impact of waste on society. Solid waste management Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study. Preliminary studies regarding Environmental Protection Acts, introduction to value education, self exploration, sanyam & swasthya.	Classroom teaching, ICT Based and individual presentation and Google classroom

Text Books

1. Energy, Ecology, Environment and Society by A. Maheshwari Anmol Publications Pvt Ltd (January 15, 2004)

References Books:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics; Cengage Pub.
2. Rana SVS ; "Essent ials of Ecology and Environment"; PHI Pub.
3. Rayno ld, GW "Ethics in informat ion Techno logy"; Cengage.
4. Svakumar;Energ Environment & Ethics in societ y; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. DK Sharma, "Environmental Chemistry", Goel Publ. House

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7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Cunninghan WP and MA; principles of Environment Sc; TMH
10. Pandey, S.N. & Mishra, S.P. Environment & Ecology, 2011, And Books, Pvt. Ltd, New Delhi
11. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In govt/private sector , self – employability.	Green house maintenance	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Green house installation

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SEMESTER- 4th **Subject Code: 3TBEX 402**
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: ELECTRICAL MEASUREMENT AND INSTRUMENTATION **Theory Min. Marks**: 17

COURSE OBJECTIVE:

- To provide students with a fundamental knowledge of low, medium & high resistance and there measuring technique with the help of D.C. bridges
- To provide students with a fundamental knowledge of Inductor and capacitor and there measuring technique with the help of various A.C. bridges.
- To provide students with a fundamental knowledge of galvanometer construction and working.
- To provide students with a fundamental knowledge of wattmeter & Energy meter and there testing.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Galvanometers – Theory, principle of operation and construction of ballistic galvanometer, D'arsonal galvanometer, Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling.	Exercises Lectures Demonstration of equipments
Unit – II	Different types of Ammeter & Voltmeter – PMMC, MI, Electrodynamometer, Induction, Expression for control &deflection torque, their advantages, disadvantages & error, Extension of range of instruments using shunt & multiplier. Digital Voltmeter, Ammeter, Multimeter and meter. Instrument transformers: Potential and current transformers, ratio and phase angle errors, testing of instrument transformers, Difference between CT and PT, errors and reduction of errors.	Exercises Lectures Demonstration of equipments
Unit – III	Measurement of power: Power in AC and DC Circuit, Electrodynamometer type of wattmeter, Construction, theory, operation & error, Low power factor & UPF wattmeter, Double element and three element dynamometer wattmeter, Measurement of power in three phase circuit, one, two & three wattmeter method, Measurement of reactive power by single wattmeter, Measurement of power using CTs & PTs.	Exercises Lectures Demonstration of equipments
Unit – IV	Measurement of Energy: Single phase and three phase digital / Electronic energy meter – construction & operation – Energy flow and power calculations, errors – Testing by phantom loading, Tri-vector meter, Maximum demand meter, Ampere hour meter.	Exercises Lectures Demonstration of equipments
Unit - V	Power factor meter– Single phase and three phase Electro-dynamometer type moving iron type. Frequency meter – Vibrating reed, Resonance type & Weston type, Synchronoscope, Ohmmeter –series & stunt type, Megger & Ratio meter. Resistance Measurement – Classification of low, medium & high resistance – Voltmeter-Ammeter method, Wheatstone Bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Earth resistance measurement. Magnetic Measurement – B-H Curve, Hysteresis Loop determination, Power loss in sheet metal – Lloyd Fischer square for measurement of power loss.	Exercises Lectures Demonstration of equipments

Course Outcome:

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- To use the techniques and skills for electrical projects.
- Design a system, component or process to meet desired needs in electrical engineering.
- Measurement of R, L, C, Voltage, Current, Power factor, Power, Energy
- Ability to balance Bridges to find unknown values.
- Ability to measure frequency, phase with Oscilloscope
- Ability to use Digital voltmeters 7. Ability to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure, Vacuum, and Flow

Topics for the laboratory (Expandable):

- Measurement of low resistance using Kelvin's Double bridge
- Measurement of medium resistance using Wheatstone's bridge
- Measurement of high resistance by loss of charge method
- Measurement of Insulation resistance using Megger
- Measurement of earth resistance by fall of potential method and verification by using earth Tester.
- Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter methods
- Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard Wattmeter.
- Calibration of single phase digital/ Electronic type energy meter.
- Calibration of a dynamometer type of wattmeter by Phantom Loading method.
- Measurements using Instrument Transformers.
- Study of various types of Indicating Instruments.
- Measurement of Power in three phase circuit by one, two & three wattmeter.

Text book:-

1. A.K. Sawhney; 'A course in Electrical & Electronic Measurements & Instrumentation'; Dhanpat Rai & co(p) Ltd ,New Delhi

Reference books:

1. G. K. Banerjee,' Electrical and Electronic Measurements'. PHI Learning Pvt.Ltd.
2. R. B. Northrop,' Introduction to Instrumentation and Measurement'; CRC press Taylor & Francis
3. Vijay Singh;' Fundamentals of Electrical & Electronic Measurements', New Age International Publishers.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design manufacture industrial machinery or power system equipments	Able to understand the electric circuits and different electric connections.	8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE)	Start business Unit, Open shops related to electrical equipments.

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SEMESTER- 4th
Course: BE EE
SUBJECT: ELECTROMAGNETIC FIELDS

Subject Code: 3TBEX 403
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- The objective of this course is to introduce the concepts of electric field and magnetic fields and their applications
- Which will be utilized in the development of the theory for power transmission lines and electrical machines.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem &Stokes's theorem concept of vectors. Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz. line charge, sheet charge, Field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form method of images.	Lectures. Exercises
Unit – II	Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behaviour of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundary value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms' law in point form, equation of continuity.	Lectures. Exercises
Unit – III	Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.	Lectures. Exercises
Unit – IV	Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self-inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy density, Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form.	Lectures. Exercises
Unit - V	Electro Magnetic Waves: Uniform plane wave in time domain in free space, Sinusoid ally time varying uniform plane wave in free space, Wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex pointing vector, power loss in a plane conductor, energy storage, Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.	Lectures. Exercises

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Course Outcome:

- Apply vector calculus to understand the behaviour of static electric fields in standard configurations.
- Apply vector calculus to understand the behaviour of static magnetic fields in standard configurations.
- Describe and analyze electromagnetic wave propagation in free-space.
- Describe and analyze transmission lines.
- Work in a small team using a cooperative learning rules.
- Communicate electromagnetic concepts both orally and in writing.

Text book:-

1. Murthy T.V.S. Arun Electromagnetic Field: Theory and Problems 2011
2. Engineering Electromagnetics by W.H. Hayt & J.A. Bvck

Reference Books:

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. P.V. Gupta; Electromagnetic Fields; DhanpatRai.
3. N.N. Rao; Element of Engineering Electromagnetic; PHI.
4. William H. Hayt; Engineering Electromagnetic; TMH.
5. John D. Kraus; Electromagnetic; TMH.
6. Jordan Balmian; Electromagnetic wave & Radiating System; PHI.
7. David K. Cheng; Fields and Wave Electromagnetic; Addison Wesley.
8. S.P. Seth; Electromagnetic Field; DhanpatRai& Sons.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
	Able to understand Understand RF industry principles	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	

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SEMESTER- 4th
Course: BE EE
SUBJECT: DIGITAL ELECTRONICS

Subject Code: 3TBEX 404
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic Circuits.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Number Systems and Codes: Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes. Alphanumeric codes – ASCII code and BCD codes, concept of parity, complement's& (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes. Basic Theorems & Properties of Boolean algebra: AND, OR, NOT operators, laws of Boolean algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms), sum of minterms & product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, solving digital problems using Maps, Don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator &checkers.	Lectures. Exercises
Unit – II	Combinational Circuits: Design procedure, Adders (half and Full), subtract or (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, DE multiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram.	Lectures. Exercises
Unit – III	Sequential Logic Circuit: Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flip-flop.	Lectures. Exercises
Unit – IV	Registers and Counters: Asynchronous and Synchronous counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre- settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers. Random Access Memory, Timing waveform.	Lectures. Exercises
Unit - V	Memory Decoding.	Lectures

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	Internal Construction, Coincident decoding, Address multiplexing, Read only memory – Combinational circuit implementation, Type of ROMs, combinational PLDs, Programmable Logic Array (PLA), Programmable Array Logic (PAL), sequential programmable device. Analog to digital conversion – Ramp type, dual slope, integration, successive approximation, parallel conversion, parallel/ serial conversion, convertor specifications, Digital to Analog convertors – Binary weighted & R/2R D to A convertor.	Exercises

Course Outcome:

- Have a thorough understanding of the fundamental concepts and techniques used in digital Electronics.
- To understand and examine the structure of various number systems and its application in digital Design.
- The ability to understand, analyze and design various combinational and sequential circuits.
- Ability to identify basic requirements for a design application and propose a cost effective Solution.
- The ability to identify and prevent various hazards and timing problems in a digital design.
- To develop skill to build, and troubleshoot digital circuit

List of Experiments (Expandable):

- Verification of all the logicgates.
- Design of BCD to Excess-3 codeconverter.
- Implementation of NAND & NOR as Universalgate.
- Design of RS, JK, T& D Flipflop.
- Multiplexer /Demultipexer based boolean function
- Design of combinational circuit forthe
  a) Halfadder
  b) Fulladder
  c) Half subtractor
  d) Fullsubtractor
- Design various A-D & D-Aconvertors.
- Verify the truth table of SR flip flop
- Verify BCD to seven segment decoder.

Text Books:-

1. Digital Design by M.M. Mano & M.D. Ciletti.
2. Digital Electronics : an Introduction to Theory and Practice by William H. Gothmann

References Books:

1. A. Anand Kumar, Fundamentals of digital circuits, PHI
2. A K Maini, Digital Electronics, Wiley India
3. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience
4. Jain RP; Modern digital electronics; TMH
5. Tocci ; Digital Systems Principle & applications; Pearson EducationAsia
7. Gothmann; Digital Electronics:PHI
8. Malvino, Leech; Digital Principles and applications–(TMH)
9. Floyad; Digital Fundamentals(UBS)

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Electronics industries	Able to understand Understand electronics industry principles	Goal 4 (Quality education) Goal 10(Reduced inequalities)	To make electronics equipments

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SEMESTER- 4th
Course: BE EE
SUBJECT: POWER ELECTRONICS

Subject Code: 3TBEX 405
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- To provide the students a deep insight in to the working of different switching devices with respect to their characteristics
- To analyze different converters and control with them applications.
- To study advanced converters and switching techniques implemented in resent Technology.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottey diode MCTs. Principle of operation of SCR, two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR. Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A, B, C, D, E, & F Commutation) firing of SCR, Use of pubic transformer and op to isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3-Φ circuit. SCR rating & protection of SCR over voltage, over current, Superior firing, Design of Snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR.	Lectures Demonstration of equipments. Exercises
Unit – II	Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous &non continuous conduction, few small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier circuits active and reactive power input. Effect of freewheeling diode and source inductance on performance of these rectifier circuits. Comparison of mid-point& Bridge rectifier circuits.	Lectures Demonstration of equipments. Exercises
Unit – III	Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self-cumulated inverters, Mc- Murray& MC Murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.	Lectures Demonstration of equipments. Exercises
Unit – IV	Principle of chopper operation, Various control strategies in chopper, step up & step-up/step down choppers, chopper configuration (Type A, B, C, D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper	Lectures Demonstration of equipments. Exercises
Unit - V	Single phase (mid-point& bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs &Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, book & Boost, Ck regulators.	Lectures Demonstration of equipments. Exercises

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Course Outcome:

At the end of the course student will have ability to

- Articulate the basics of power electronic devices
- Express the design and control of rectifiers, inverters.
- Design of power electronic converters in power control applications
- Ability to express characteristics of SCR, BJT, MOSFET and IGBT.
- Ability to express communication methods.
- Ability design AC voltage controller and Cyclo Converter.
- Ability to design Chopper circuit, Inverter circuit.

List of Experiments:

- VI characteristics of SCR
- VI characteristics of DIAC
- VI characteristics of BJT
- Characteristics of TRIAC
- VI characteristics of MOSFET transfer characteristics of MOSFET
- Output characteristics of IGBT
- Transfer characteristics of IGBT
- Single phase SCR half controlled converter with R load
- 1Φ SCR fully controlled converter with R-load
- Study of 3Φ SCR half controlled converter
- Study of 3Φ SCR fully controlled converter
- Study of classes of commutation A, B, C, D, E, F.

Text Books:-

1. Power Electronics by S.N. Singh
2. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub

Reference Books:

1. M.H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education, Singapore, 1993.
2. M Ramsmoorthy, An Introduction to transistor and their application, Affiliated East-West Press.
3. P.C. Sen, Power Electonics, TMH. M.D. Singh, K.B. Khanchandani, Power Electronics, TMH, Delhi, 2001.
4. Chakravarti A., Fundamental of Power Electronics and Drives, Dhanpat Ray & Co.,
5. VedamSubramanyam, Power Electronics New Age International Revised II ed. 2006.
6. Randall Shaffer, Fundaments of Power Electronics with MATLAB Cengage Leaening 2008.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design in large electrical and electronics sector.	Able to understand Understand the construction, working principles of large electrical and electronics sector.	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business Unit (retail and Micro).

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SEMESTER- 4th **Subject Code: 3TBEX 406**
Course: BE EE **Theory Max. Marks: 25**
SUBJECT: ELECTRICAL MODELLING & SIMULATION LAB II **Theory Min. Marks** : 12

Practical's:

- Study of various Electrical Toolbox i.e Power System, Power Electronics, Control system, Electrical Measurement, Flexible AC Transmission.
- Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter For different load models.
- Developing Simulation Models using FACTs Devices i.e STATCOM, SVC, TCSC, SSSC, IPFC, UPFC in power system transmission lines.

References Books:

1. Shailendra Jain "Modeling and Simulation using MATLAB Simulink" wileyindia& sons

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunities in many private sectors as well as government sectors . Opportunities to do work as a field engineer. Can get the job in power plants.	Simulation of electrical devices	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Substation , power plant establishment

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SEMESTER- 4th
Course: BE EE
SUBJECT: HT MAINTENANCE

Subject Code: 3STEX 407A
Theory Max. Marks: 25
Theory Min. Marks 12

Practical's:

- The primary objective of the course is to introduce operation principles of Three – Phase motor winding a 2 pole, 3HP, 5HP, three phase Transformer,
- Tap changing Transformers, Maintenance of Circuit Breaker, Commissioning and Recharging of Transformers.

Course Outcome:

- After successful completion of course, Students are expected to possess an in-depth understandings
- And Knowledge of the concepts and principles of measurement of Three – Phase motor winding a 2 pole, 3HP, 5HP, three phase Transformer, Tap changing Transformers, Maintenance of Circuit Breaker

List of Practical's:

- To understand the various parts and critical elements of Transformer& HT/LT Motor.
- To understand the operation and application of Transformer& HT/LT Motor.
- To understand the maintenance, troubleshooting& Protection of Transformer& HT/LT Motor.
- To understand do's& don'ts of Transformer& HT/LT Motor.
- To understand the various parts and critical elements of Electrical Motor.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In govt/private sector , self – employability.	Motor maintenance , installation	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Installation of machines

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SEMESTER- 4th | **Subject Code: 3STEX 407B**
Course: BE EE | **Theory Max. Marks: 25**
SUBJECT: ELECTRICAL HOUSE WIRING | **Theory Min. Marks 12**

COURSE OBJECTIVE:

- The objective of this course is to get knowledge of Joints and Accessories Terminators and joints,
- Wiring Cleat wiring, testing of domestic wiring Polarity test, and Safety Precautions Earthling electrodes and earth wire to Electrical House wiring.

Course Outcome:

After successful completion of course-

- Students are expected to possess an in-depth understanding and Knowledge of the theory and applications of Joints and Accessories Terminators and joints,
- Wiring Cleat wiring, testing of domestic wiring Polarity test, and Safety Precautions Earthling electrodes and earth wire.

Experiments List:

- Connecting a switch with socket.
- Connection of a switch with bulb.
- Two bulb control by a switch.
- Series connection.
- Parallel connection.
- One bulb and socket control by a switch.
- Two light control by two switches.
- Connection of ceiling rose.
- Fixing of tube light.
- Finding fault in tube light.
- Replacing wiring of tube light.
- Ceiling fan controlled by switch.
- Fan control by regulator through switch.
- Two way switching.
- Corridor lighting.
- Making electric board.
- Finding fault in board.
- Use of multimeter.
- 1BHK wiring.
- 2 BHK wiring.

References Books:

1. Electrical Wiring –Residential; by Ray C. Mullin & Robert L. Smith.
2. Step by Step Guide to Home Wiring; by J. Ray McReynolds
3. The Complete Guide to Home Wiring: A Comprehensive Manual from Basic Repairs to Advanced Projects; by Thomas G. Lamer (Black& Decker Corp.)
4. Wiring a House; by Rex Caudwell .
5. Step by Step Home Wiring Diagrams; by J. Ray McReynolds
6. The Complete Guide to Home Wiring: A Comprehensive Manual, from Basic Repairs to Advanced Projects by Black & Decker

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In govt/private sector , self – employability.	House wiring maintenance , installation	4 (QUALITY EDUCATION) , 9 (INDUSTRY AND INFRASTRUCTURE)	Installation of solar plants

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SEMESTER- 5th
Course: BE EE
SUBJECT: CONTROL SYSTEM

Subject Code: 3TBEX 501
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- Identify the basic elements and structures of feedback control systems.
- Apply final value theorem to determine the steady state response of stable control system.
- Use root locus method for design of feedback control systems.
- Construct Bode, Polar and Nyquist plots for rational transfer function.
- Understand the fundamentals of modern control theory

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Modelling of dynamic systems: Electrical, Mechanical and hydraulic systems, Concept of transfer function, Laplace Transform, State space description of dynamic systems: Open and closed loop systems, Signal flow graph, Mason's formula, Components of control systems: Error detectors (Synchros & Potentiometer), Servomotors (AC & DC), tacho-generators, power amplifier, steeper motors.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Time – domain analysis of closed loop systems: Test signals, time response of first and second order systems, Time domain performance specifications, Steady state error & error constants Feedback control actions: Proportional, derivative and integral control. Solution of state equation: Eigen values & eigenvectors digitalization state transitive matrix, stability Routh-Hurwitz stability analysis.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Characteristics equation of closed loop system root loci, construction of loci, Effect of adding, poles and Zeros on the loci, Stability by root loci.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – IV	Frequency, Domain analysis, bode plots, Effect of adding, poles and Zeros, Polar plot, Nyquist stability analysis, Relative stability: Gain and phase margins.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit - V	Design of control systems with PD/PI/PID Control in time domain and Frequency domain, lead lag, Lag- lead compensation, Design of compensating networks.	Classroom teaching, ICT Based and individual presentation and Google classroom

Course Outcome:

- Ability to acquire and apply fundamental principles of science and technology.
- Analyse continuous systems mathematically through the use of Laplace functions and state equations form.
- Represent any physical system in both transfer functions and state equations form.
- Apply classical design methods to improve the performance of continuous controlled system.

List of experiments (Expandable)

- Time response of second order system

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- Characteristics of Synchros.
- Effect of feedback on servomotors.
- Determination of transfer function of A-C servomotor
- Determination of transfer function of D-C motor.
- Formulation of PI & PD controller and study of closed loop responses of 1st and 2ndorder dynamic systems.
- State space model for classical transfer function using MATLAB.
- Simulation of transfer function using operational amplifier.
- Design problem: Compensating Networks of lead and lag.
- Temperature controller using PID.
- Transfer function of a DC generator.
- Characteristics of AC servomotor.
- Use of MATLAB for root loci and Bode plots of type-1, type-2 systems.
- Study of analog computer and simulation of 1st orderand 2nd order dynamic equations.
- Formulation of proportional control on 1st order and 2nd order dynamic systems.
- Feedback control of 3rd order dynamic Systems
- Study of lead and lag compensating networks.
- Effect of adding poles & zeros on root loci and bode plots of type-1, type-2 systemsthrough MATLAB.

Text books-

1. Control Systems Engineering by I.J. Nagrath and M. Gopal, add- 5th. New Delhi New Age International 2012
2. Linear Control Systems With Matlab Applications by B.S Manke New Delhi :Khanna Pub 1st. 2012
3. Control Systems : Theory and Applications by Smarajit Ghosh 1st. Noida Pearson , 2011.

References Books:

1. B.C. Kuo and Farid Golnaraghi, 'Automatic Control Systems', Wiley India.
2. M. Gopal, 'Control system engineering', McGraw Hill
3. K. Ogata, 'Modern Control Engineering', Pearson
4. D. Roy, Chaudhary,'Modern Control Systems', PHI.
5. S. Salivahanan, R. Rengaraj, G.R. Venkatakrishnan, 'Control System Engineering',Pearson.
6. Stefani ShahianSavant,Hostetter, 'Design of feedback control systems' Oxford
7. B.S.Manke, Control system Engineering, Khanna Publishers

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical production contractor companies	Able to do the mathematical modeling of control system	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business of small production enterprises

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SEMESTER- 5th
Course: BE EE
SUBJECT: ELECTRICAL MACHINE-II

Subject Code: 3TBEX 502
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- The objective of this course is to provide knowledge about the basic principles, construction and working of synchronous, single and three-phase induction machines.
- The aim of this course is to give the knowledge of the equivalent circuits, parameter determination, and operational constraints.
- To give the knowledge of starting mechanisms, conventional speed control methods, various tests and applications of synchronous and induction machines.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	D.C. Machine-I Basic construction of DC machines; types of DC machines and method of excitation; lap and wave windings; Emf equation; armature reaction and methods of limiting armature reaction; Commutation process and methods for improving commutation; Basic performance of DC generators and their performance characteristics; Metaldyne and Amplidyne; permanent magnet DC motors; Brush less dc motors.	Lectures Demonstration of equipment's .Exercises, Audio visual aids such as chalk board.
Unit – II	D.C. Machine-II Basic operation of DC motors; Torque equation; Operating characteristics of DC motors, Starting of DC motors- 2point, 3 point and 4 point starters; speed control of DC motors; losses and efficiency of DC machines; testing of DC machines, direct testing, Swinburne's test and Hopkinson's test. Application of DC machines.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – III	Synchronous Machine-I Construction; types of prime movers; excitation system including brushless excitation; poly phase distributive winding, integral slot and fractional slot windings; emf equation, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and new A.S.A method.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – IV	Synchronous Machine-II Salient pole machines; two reaction theory equivalent circuit model and pharos diagram; determination of Xd and Xq by slip test; SCR and its significance; regulation of salient pole alternator, power angle equation and characteristics; synchronizing of alternator with infinite busbar,; parallel operation and load sharing; synchronizing current, synchronizing power and synchronizing torque coefficient; synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque,.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit - V	Synchronous machine-III Synchronous motor operation, starting and stopping of synchronous motor, pull in torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, synchronous motors as power factor correcting device, super synchronous and sub synchronous motors, hunting and damper winding efficiency and losses. Analysis of short circuit oscillogram, determination of various transient, sub transient and steady reactance's and time constants, expression of transient and sub	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.

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	transient reactance's in terms of self and mutual inductances of various winding, short circuit current, equivalent circuit. Single phase synchronous motors- hysteresis motor, reluctance motor. Repulsion motor, stepper motor, switched reluctance.	

Course Outcome:

- To impart the knowledge on fundamental of AC rotating machine
- To impart the knowledge on constructional details, principle of operation of 3 phase Alternator and synchronous motor
- To impart the knowledge on constructional details, principle of operation, performance, Starter, speed control and braking of 3 phase induction motor.
- To impart the knowledge on constructional details, principle of operation, type of 1 phase Induction motor and special machine.

List of Experiments:

Experiments can cover any of the above topics, following is a suggestive list:

- To plot magnetisation characteristic of a separately excited DC generator
- To perform load test on DC generators.
- To perform load test on DC series and shunt motor
- To perform Swinburn's test on a DC machine and find out its efficiency under full load condition.
- To conduct Hopkinson's test on a pair of DC shunt machine.
- To perform OCC and SCC test on an alternator and determine its regulation.
- To determine regulation of alternator using mmf and zpf methods.
- To synchronise alternator with infinite bus bar.
- To plot V and inverted V curves for a synchronous motor
- To find Xd and Xq of salient pole synchronous machine by slip test.
- To determine negative sequence and zero sequence reactance of an alternator.
- To determine subtransient direct axis and quadrature axis synchronous reactances of salient pole machine.

Text Books-

1. I.J. Nagrath& D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi M.G. Say,Performance& design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. I.J. Nagrath& D.P. Kothari, Electric Machines, Tata McGraw Hill , New Delhi,
3. Electrical Technology in S.I. Units (Basic Electrical Engineering) by B.G. Theraja & A.K. Theraja

Reference Books:

1. M.G. Say,Performance& design of AC machines, CBS publishers & distributors, Delhi, 3rd edition
2. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
3. P.S. Bhimbra, Electrical Machinery, Khanna Pub. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,
4. Ashfaq Husain, Electric Machines, DhanpatRai, New Delhi
5. A.E. Clayton & N.N. Nancock, The Performance & design of DC machines CBS publications & distributors, Delhi, 3rd edition
6. P.S. Bhimbra, Electrical Machinery, Khanna Pub. P.S. Bhimbra, Generalized theory of Electrical Machines, Khanna publishers, Delhi,
7. Ashfaq Husain, Electric Machines, DhanpatRai, New Delhi
8. Generalized Theory of Electrical Machines by P.S. bimbhra.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical production and contractor companies	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 5th | **Subject Code: 3TBEX 503**
Course: BE EE | **Theory Max. Marks: 50**
SUBJECT: MICROPROCESSORS AND MICROCONTROLLERS | **Theory Min. Marks** : 17

COURSE OBJECTIVE:

- The objective of this course is to provide knowledge about the fundamentals of Microprocessors
- To provide their evolution internal architecture and construction.
- This course is also useful to provide the knowledge of various supporting chips provided with the Microprocessor 8085.
- The aim of this course is to give the knowledge of various instructions, basic programming with Microprocessors 8085, data transfer schemes, Instruction format and addressing modes.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Microprocessor 8086Introduction to 16-bit 8086 microprocessors, architecture of 8086, Pin Configuration, interrupts, minimum mode and maximum mode, timing diagram, Memory interfacing, Comparative study of Salient features of 8086, 80286 and 80386.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Microprocessor 8086 programming Instruction set of 8086, Addressing mode, Assembler directives & operations, assembly and machine language programming, subroutine call and returns, Concept of stack, Stack structure of 8086, timings and delays.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Input-Output interfacing: Memory Mapped I/O and Peripherals I/O. PPI 8255 Architecture and modes of operation, interfacing to 16-bit microprocessor and programming, DMA controller (8257) Architecture, Programmable interval timer 8254, USART 8251, 8-bit ADC/DAC interfacing and programming.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – IV	Microcontroller 8051Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, accessing internal& external memories and different mode of operations, Memory organization, addressing mode, instruction set of 8051 and programming.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit - V	8051 Interfacing, Applications and serial communication8051 interfacing to ADC and DAC, Stepper motor interfacing, Timer/ counter functions, 8051 based thyristor firing circuit, 8051 connections o tRS-232, 8051 Serial communication, Serial communication modes, Serial communication programming, Serial port programming in C.	Classroom teaching, ICT Based and individual presentation and Google classroom

Course Outcome:

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

- Understand the basic architecture of Microprocessor 8085.
- Understand various instructions and their application in programming.
- Understand memory organization and mapping

List of Experiments:

- Introduction to 8086 & 8051 kit, hardware features & modes of operation.
- Techniques of programming & basic commands of kit

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- Instruction set of 8086 & 8051.
- B. Assembly language programming of 8086 & 8051.
- Write a program to add two 8-bit numbers.
- Write a program to add two 16-bit numbers.
- Write a program for 8-bit decimal subtraction.
- Write a program to find 1's complement and then 2's complement of a 16-bit numbers.
- 5.Write a program to find larger of two numbers.
- Write a program to shift an 8-bit number left by 2-bits.
- Write a program to multiply two 16-bit numbers .
- Write a program for factorial of given number by recursion.
- Write a program to square of an 8-bit number.
- Write a program to generate a square wave of 2 KHz Frequency on input pin.

Text Books:-

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson education, 2005
2. McKinlay, The 8051 Microcontroller and Embedded Systems – using assembly and C, PHI, 2006 / Pearson, 2006

Reference Books:

1. Hall Douglas V.,Microprocessor and interfacing, Revised second edition 2006, Macmillan, McGraw Hill .
2. A.K. Ray & K.M. Bhurchandi, Advanced Microprocessors and peripherals- Architecture, Programming and Interfacing, Tata McGraw – Hill, 2009 TMH reprint..
3. Kenneth J. Ayala, The 8086 microprocessor: programming and interfacing the PC, Indian - edition , CENGAGE Learning.
4. Kenneth J. Ayala, The 8051 Microcontroller Architecture, III edition, CENGAGE Learning.
5. V. Udayashankara and M.S.Mallikarjunaswamy, 8051 Microcontroller: Hardware, Software & Applications, Tata McGraw – Hill, 2009.
6. Microprocessor and Interfacing, I edition 2012,oxford press setnilkumar, SaravamJeevanathan shah.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In various electronics industries	Gain knowledge about architecture of general purpose microprocessor,interface the 8085 microprocessor to the outside world	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Can start fabrications of electronics circuits

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ANALOG AND DIGITAL COMMUNICATION

SEMESTER- 5th
Course: BE EE
SUBJECT: ANALOG AND DIGITAL COMMUNICATION

Subject Code: 3TBEE 504
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- The course provides an introduction to analog and digital communication systems.
- This course responds to the needs of the engineering and technological paraphenia.

	Course Content	Methodology Adopted
UNIT - I	**Amplitude Modulation** Need of amplitude modulation, Amplitude modulation, power relation. AM wave, generation of AM, balanced modular signal side band technique, suppression of unwanted sideband, side band transmission, demodulation, envelop detector, synchronous detector, noise in amplitude modulation system.	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - II	**Angle Modulation** Mathematical equation of frequency modulation (FM), frequency spectrum, phase modulation (PM), relationship between PM and FM, pre-emphasis and de-emphasis, adjacent channel interference, comparison of narrow band and wide band FM, noise in angle modulation system, generation of FM, reactance modulator, frequency division multiplexing.	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - III	**Pulse Modulation System** Pulse width modulation, pulse position modulation (PPM), pulse code modulation, sampling, Quantization of signals, time division multiplexing	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - IV	**Digital Modulation Techniques** Introduction, Digital modulation formats, types of digital modulation techniques, Coherent binary modulation techniques, BPSK, Coherent BFSK, Non coherent binary modulation techniques, Non coherent binary ASK, DPSK, QPSK, MSK, comparison of different techniques. Wave form coding Techniques, Discretisation in time and amplitude, Quantization, PCM, PCM generator, Quantizer, Transmission band width in PCM, PCM receiver, quantization noise/error in PCM, companding in PCM, Delta modulation, Adaptive delta modulation, DPCM, comparison of different DPM methods.	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - V	**Information Theory** Introduction, Sources of information, Contents in DMS, Contents of a symbol, Entropy, Information rate, Discrete memory less channel, Conditional joint entropies, mutual information, Channel capacity, Active white Gaussian channel, Source coding, Entropy coding, introduction to error control coding like Parity codes, Linear block codes, Hamming code and convolution codes.	Classroom teaching, ICT Based and individual presentation and Google classroom

COURSE OUTCOME:

Upon successful completion of this course, the students should be able to:

- Acquire the generalize knowledge of communication system in the present scenario.
- Develop problem solving skills in complex communication networking.

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1. "Electrical Communication Systems", Kennedy, TMH
2. "Digital Communications" Sanjay Sharma, S.K. Kataria & Sons, New Delhi
3. "An Introduction To Analog And Digital Communication", Haykins, Wiely Pbs

REFERENCE BOOKS:
1. Analog and digital communication, Roden, PHI pbs.
2. Communication engineering,Singh & Sapre PubTMH Pbs

Job Opportunities	Employability Skill Developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
RF engg. In Telecomm sector etc.	Able to understand Understand the construction, working principles of Telecomm sector.	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for antenna, RF equipments etc.

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SEMESTER- 5th | **Subject Code: 3TBEX 505**
Course: BE EE | **Theory Max. Marks: 50**
SUBJECT: ELECTRICAL & ELECTRONICS MATERIAL | **Theory Min. Marks** : 17

COURSE OBJECTIVE:

- To review physics and chemistry in the context of materials science & engineering.
- To describe the different types of bonding in solids, and the physical ramifications of these differences.
- Give an introduction to metals, ceramics, polymers, and electronic materials in the context of a molecular level understanding of bonding.
- Give an introduction to the relation between processing, structure, and physical properties.
- Give the beginning student an appreciation of rEEnt developments in materials science & engineering within the framework of this class

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to material science and engineering: Atomic structure and bonding in materials. Types of material, REEnt advances and future trends: (Smart & Nano materials) Crystal structure of materials, crystal systems, unit cells and space lattices, crystalline solids and their role in influencing various properties.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Metals & Alloys: Mechanical behavior of metals and alloys, Tensile & compressive stress-strain relations, fracture toughness, fatigue, creep, wear and abrasion. Microstructure, properties and applications of ferrous and non-ferrous alloys, low alloy steels, aluminum alloys, copper alloys, stainless steels, cast irons, super alloys.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Introduction to SF6: Physical properties, Electrical properties, SF6as a dielectric and insulating material, Specification of SF6 gas for GIS application, Handling of SF6 gas before use, Equipment for handling the SF6 Gas, Advantages and Applications of SF6. Magnetic and optical properties: Origin of magnetism in metallic and ceramic materials, Par magnetism, diamagnetism, anti-Ferro magnetism, ferromagnetism. ferrimagnetism, magnetic hysteresis, effect of temperature, soft and hard magnetic materials and their properties. Reflection, refraction, absorption and transmission of electromagnetic radiation in solids.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – IV	Ceramics, Polymers, Composites: Structure, defects and properties of Ceramics materials, processing and applications of traditional and advanced ceramics. Thermal, electrical, magnetic, optical and mechanical behavior of ceramics. Classification of Polymers, Polymerization, Structure and Properties, additives for polymer products, Homo polymers and co-polymers, Elastomers and Thermoplastic elastomers, Polymer Blends and Alloys, Liquid crystal polymers, Polymer foams, Properties and applications of polymers. Properties and applications of various composites, metal matrix and ceramic matrix composite, Bone-a natural composite materials. Classification of composite materials, Laws of mixtures, Factors affecting composite properties, Interfacial bonding, Mechanical Behavior of Composites: Young's Modulus and strength considerations for continuous FRCs and short FRCs.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit - V	Electrical Properties: Electrical conduction in metals, Concept of energy band diagram for materials - conductors, semiconductors and insulators, electrical conductivity, effect of temperature on conductivity, intrinsic and extrinsic	Classroom teaching, ICT Based and individual presentation and Google

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	semiconductors, dielectric properties. Compound semiconductors, Electrical properties of ceramics, Nano-electronics. Advanced Materials and Tools: Smart materials, exhibiting ferroelectric, piezoelectric, opt electric, semiconducting behaviour, lasers and optical fibbers, photoconductivity and superconductivity, nonmaterial's, synthesis, properties and applications, biomaterials, photoconductivity and superconductivity, nonmaterial's, Ultra-light Materials and Metallic Foams: Definition and processing, characterization of cellular metals, properties.	classroom

Course Outcome:

After successful completion of course, Students are expected to Possess an in-depth understanding and Knowledge

- Given a type of material, be able to qualitatively describe the bonding scheme and its general physical properties, as well as possible applications.
- Given a type of bond, be able to describe its physical origin, as well as strength. Be able to qualitatively derive a material's Young's modulus from a potential energy curve.
- Given the structure of a metal, be able to describe resultant elastic properties in terms of its 1D and 2D defects. 4.Given a simple set of diffraction data, be able to index the peaks and infer the structure.
- Be able to describe a polymer's elastic behaviour above and below the glass transition. Be able to do simple diffusion problems.

Text Book:

1. William D. Callister, David G. Rethwisch 'Callister's Material Science and Engineering' Willey.
2. William F Smith, Javad Hashemi, Ravi Prakash 'Material science and engineering',McGraw Hill.
3. Text Book of Electrical Engineering Materials by P.L. Kapoor

References Books:

1. L. Solymar, D. Walsh & R. R.A. Syms 'Electrical Properties of Materials', Oxford university press.
2. James F. Shackelford, Madanapalli K. Muralidhara 'Introduction to Materials Science for Engineers', Pearson
3. V. Rajendran 'Materials Science' McGraw Hill education Pvt. Limited.
4. Ian P. Jones 'Materials Science for Electrical and Electronics Engineers' Oxford university press.
5. Asleland, Fulay, Wright, Balani 'The Science and Engineering of Materials', Cengage learning.
6. K. M. Gupta and Nishu Gupta 'Advanced Electrical and Electronics Materials' illey.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design manufacture industrial machinery or power system equipments	Able to understand the electrical and electronics metarials	8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE)	Start business Unit, Open shops related to electrical equipments.

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SEMESTER- 5th
Course: BE EE
SUBJECT: ELECTRICAL MODELLING & SIMULATION LAB III

Subject Code: 3TBEX 506
Theory Max. Marks: 25
Theory Min. Marks : 12

Practical

- Study of various Electrical Toolbox i.e Power System, Power Electronics, Control system, Electrical Measurement, Flexible AC Transmission.
- Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter for different load models.
- Developing Simulation Models using FACTs Devices i.e STATCOM, SVC, TCSC, SSSC, IPFC, UPFC in power system transmission lines.

References Books:

1. Shailendra Jain "Modeling and Simulation using MATLAB Simulink" wileyindia & sons

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunities in many private sectors as well as government sectors . Opportunities to do work as a field engineer. Can get the job in power plants.	Simulation of electrical devices	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Substation , power plant establishment

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SEMESTER- 5th
Course: BE EE
SUBJECT: SKILL ELECTIVE-III ELECTRICAL LOAD MANAGEMENT

Subject Code: 3STEX 507A
Theory Max. Marks:25
Theory Min. Marks 17

COURSE OBJECTIVE:

The objective of the course is to make the student familiar with the production of electrical Load management, Different electricity tariffs-flat rate, , monitoring and controlling y in regard to the needs of specific consumer areas in order to be able to appreciate the relative procedures from the technical, economic and social point of view.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	OVERVIEW OF LOAD MANAGEMENT: Electricity, the Special Product, Electric Load Management, And Presentation of this Brochure.	Lectures Demonstration of equipment's. Exercises, Audio visual aids such as chalk board.
Unit – II	COST AND PRICE OF ELECTRICITY, The Cost of Electricity Supply, Electricity Rates Tariff Parameters Overview of Electricity Rates across Countries.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – III	IMPORTANCE OF LOAD MANAGEMENT: Impact of Load Management on the Total Electricity System, The Total System Demand Compared with the Customer Load Profile, Co-ordinating Load Management for Maximum Benefit, Advantages of Practising Load Management, Example of Industrial Load Management.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – IV	MARKET ASPECTS OF LOAD MANAGEMENT: Market Activities, The Different Load Management Contracts, Treatment of Risk Technical Risks Financial Risks, General Remarks on the Interaction Between Utilities and Customers	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit - V	INDUSTRIAL LOADS AND THEIR CONTROL: Load Curve Analysis Load Curve Classification, Controllable Electric Loads Thermal and Refrigeration Loads Fixed-cycle Loads Other Loads, Control Methods, Storage Systems, Stand-by Electricity Generation, Change in Technology, Demand Controllers, Load Management in Selected Industries Metal Works Industries Electrolysis Industries Technology Gas Industries Cement Industries Concrete Mixing Equipment, Processing of Marbles, Stones Gravel and other Building and Public Works Materials Refrigeration Plants Plastics Fabrication Industries.	Lectures Demonstration of equipments .Exercises, Audio visual aids such as chalk board.

Course Outcome:

To understand the relationship between the electrical loads and the respective power production installations on the base of economic and technological criteria, to use the methods and criteria of forming the selling price list of electrical energy.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In power plants and substation	Tariff calculation , l,oad management	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Substation , power plant establishment

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SEMESTER- 5th
Course: BE EE
SUBJECT: SKILL ELECTIVE-III
PLC & SCADA SYSTEMS AND APPLICATIONS

Subject Code: 3STEX 507B
Theory Max. Marks: 25
Theory Min. Marks 12

COURSE OBJECTIVE:

- The objective of this course is to get knowledge of Introduction to SCADA and PLC, SCADA system components, SCADA Architecture,
- SCADA Communication in SCADA Systems and Applications.

Syllabus:

Introduction about industrial automation, Control system in Industry, Need of automations in industries, Logical functions done by relays and field devices, Automation using relays and field devices., Input and Output Devices, Need of PLC for Industrial Automation, Introduction about PLC Programming, Types of Programming Languages, Timers, Types of timers, Example Problem for automation using timers, Need for counters, Types of counters, Run Time Security, Alarm Setup, Introduction about SCADA, Fundamental Principles of Modern SCADA Systems, Advantages and Disadvantages, SCADA Hardware and Software, Remote Terminal Unit (RTU), RTU Configuration, Emerging New Technologies in SCADA System, Rockwell Automation Allen Bradley SCADA, Interfacing PLC to SCADA, Example Exercises 1 – Automatic Bottle Filling System, Example Exercises 2 - Traffic Light Control, Example Exercise 3 -Program to Control Level of Parallel Tanks, Example Exercise 4- Program to Operate Drilling of Parts,

Course Outcome:

- Student after successful completion of course must possess an understanding of Introduction to SCADA and PLC, SCADA system components, SCADA Architecture,
- SCADA Communication in SCADA Systems and Applications.

List of Experiments:

1. Develop/Execute a ladder program to Verify functions of Logic
2. Develop/Execute a ladder program to Verify De Morgans Theorems
3. Develop/Execute a ladder program to verify 4:1 MUX and 1:4 DEMUX
4. Develop/Execute a ladder program to test the START STOP logic using two inputs and one output.
5. Develop/Execute a ladder program for sequential ON-OFF control of lamps
6. Develop/ Execute ladder program for sequential control of DC motor.(Condition1)
7. Develop/ Execute ladder program for 24 hour clock using timer and counter instruction
8. Develop a SCADA mimic diagram and tag database for Traffic light control system
9. Develop/ Execute ladder program for temperature control using PID control. 10.Develop/ Execute ladder program for Automated car parking system

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Automation system engineer	Automation system design	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Start business Unit, Open shops related to electrical equipments.

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SEMESTER- 6th
Course: BE EE
SUBJECT: POWER SYSTEMS-II

Subject Code: 3TBEX 601
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The primary objective of the course is to introduce

- The fault conditions and protective system of power system and how to protect our system to teach students the theory, construction,
- Applications of main types Circuit breakers, Relays for protection of generators, transformers and protection of feeders from over- voltages and other hazards. It emphasis on neutral grounding for overall protection.
- To understand the need of protection of electric equipment and their protection schemes.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – II	Power flow studies - Formulation of static power flow equations and solutions using Gauss-Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system - Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – III	MW Frequency control- Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, optimum parameter adjustment.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – IV	MVAR Voltage Control Problem- Difference in control strategy over MW - f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit - V	Power System Stability - Steady state, dynamic and transient's stability, Swing equation, equal area criterion, solution of swing equation using step by step method modified Eulers method and Rnge-Kutta method, methods of improving transient stability.	Lectures Demonstration of equipments .Exercises, Audio visual aids such as chalk board.

Course Outcome:

After learning the course, the students should be able to:

- Analyze the performance of Short and Medium transmission line.
- Describe the symmetrical components and its applications.
- Analyze Symmetrical and Unsymmetrical faults in power systems.
- Describe transients in power systems.
- Describe corona effect.

List of Experiments:

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- To develop a program in Matlab for information of Y-bus Matrix for N bus system.
- Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iterations.
- Load flow solution for IEE 6-bus and 30-bus system in Matlab Using Newton Raphson method.
- Assessment of transient stability of a single machine system.
- Effect of compensation on voltage profile of IEE 6-bus system.
- Study of any software tools (PSCAD, EDSA, Mi. POWER, ETAP etc.)

Text Books:-

1. Text book of Electrical Technology in S.I. Units (Basic Electrical Engineering) by B.G. Theraja & A.K. Theraja.
2. Modern Power System Analysis-by I.J. Nagrath& D.P. Kothari Tata McGraw – Hill Publication Company Ltd 2nd edition

Reference Books:

1. A Chakrawarti Power System Analysis:Operation and Control PHI Learning 3rd edition
2. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
3. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.
4. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
5. Prabha Kundur, "Power system stability and control", Mc- Graw Hill Inc, New York, 1993.
6. Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.
7. Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994.
8. Weedy B.M. "Electric Power System" John Wiley and Sons, 3rd edition.
9. P.S.R. Murthy, "Power System Operation and Control", B S Publ-ication

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical production and contractor companies	Able to understand the Protection design and its rquirement	4,QUALITY EDUCATION, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 6th
Course: BE EE
SUBJECT: DIGITAL SIGNAL PROCESSING

Subject Code: 3TBEX 602
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

To determine the zero-input and zero-state responses of system described by constant-coefficient difference equations, and determining the complete response of such systems.

- To determine the linear and circular convolutions of discrete-time systems.
- To evaluate the Discrete-Time Fourier Transform.
- To evaluate and plot the frequency (magnitude and phase) of linear-time invariant systems.
- To determine the Discrete-Fourier transform of a sequence.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Classification of signals and systems: ~ Introduction, Classification of signals singularity Functions, Amplitude and Phase Classification of systems simple Manipulation of discrete- time signals, Representation of Systems, Analog- to-Digital Conversion of signals.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	linear Time Invariant systems: Introduction, Properties of DPS systems, Difference equation and its Relationship with system function, Response and Frequency Response, Frequency 'Response.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Discrete and Fast Fourier Transforms: Introduction, Discrete Convolution, Discrete- Time Fourier Transform (DTFT), Fast Fourier Transform {FFl Computing of inverse DFT by Direct DFT, Composite- radix FFT, Fast (Sectioned), Convolution, and correlation.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – IV	Infinite Impulse Response (IlR) Filters: Introduction, IIR Filters Design by Approximation of derivatives, IlR Fitter Design by Impulse invariant Metrod, II Filter Design by the Bilinear Transformation, Suter worth Filters Chebyshev Filters, inverse Chebyshev Filters, =Ellip Filters, Frequency Transformation.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit - V	Realization of Digital Linear System: Introduction, Basic Realization Block Diagram, Signal-flow Graph, Basic structure for IIR systems, Basic Structure for FIR Systems. Application of Digital Signal Processing, Introduction, Voice Processing, Application to Radar, Application to Image processing, Introduction to Wavelets.	Classroom teaching, ICT Based and individual presentation and Google classroom

Course Outcome:

Design digital IIR filters by designing prototypical analog

- filters and then applying analog to digital conversion techniques such as the bilinear transformation.
- Design digital FIR filters using the window method.
- Use a computer to design digital filters via the frequency sampling approach and the Remez exchange Algorithm.
- Implement digital filters in a variety of forms: direct form I and II, parallel, and cascade, and then analyze their sensitivity to finite precision effects such as input quantization, coefficient quantization, and multiplication round-off.
- Analyze signals using the discrete Fourier transform (DFT).
- Understand circular convolution, its relationship to linear convolution.

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Experiments to be performed:

- To generate Analog Signals.
- To generate discrete sequences
- To sample a sinusoidal signal at Nyquist rate
- To convolve two given signals
- To correlate two given signals.
- To design LPF using recursive structures
- To design HPF using recursive structure
- To design BPF using recursive structure
- To design BSF using recursive structure
- To design LPF using non-recursive structures
- To design HPF using non-recursive structure
- To design BPF using non-recursive structure
- To design BSF using non-recursive structure

Text Books:

1. Digital Signal Processing by S Salivahanan, AVallavaraj, Tata McGraw-Hill Education
2. Digital Signal Processing by S. Palani and K. Kalaiyarasi, Anc books, Pvt. Ltd.

References Books:

1. Digital Signal Processing: C. Ramesh BabuDurail, Laxmi Publications
2. Digital Signal Processing: Sanjit. K. Mitra, Mc Graw Hill
3. Digital Signal Processing Principles, Algorithms and Applications: John G Proakisand Manolakis, Pearson
4. Digital Circuits and Design by S. Arivanzahan Salivahannan

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design in large electrical and electronics sector.	Able to synthesize discrete time signals from analog signals, design IIR and FIR filters	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business Unit of electronics equipments

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SEMESTER- 6th
Course: BE EE
SUBJECT: ELECTRONICS DEVICES & CIRCUITS

Subject Code: 3TBEX 603
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The objective of this course is to get an overview of –

- To understand the operation of the various bias circuits of MOSFET and Analyze and de MOSFET bias circuits.
- To understand the operation and design of multistage amplifier for a given specification.
- To understand the operation and design of transformer coupled Various types of power amplifier circuits.
- To understand the effects of negative feedback on amplifier Circuits.
- To analyze the different RC and LC oscillator circuits to determine the frequency of oscillation

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Operational Amplifiers: Design aspects of Monolithic OpAmps, ideal characteristics, specifications, offset voltages and currents, frequency compensation techniques, measurement of opamp parameters, applications of op-amp inverting, non-inverting amplifiers, integrators, function generator, logarithmic amplifier, instrumentation amplifiers, signal conditioning circuits, multivibrators, square wave generator, rectifiers, peak detectors & voltage regulator.	ICT Based & green board based class room teaching
Unit – II	Filters: Active filters, LPF, HPF, BPF, BEF, All pass filter, higher order filters & their design, switched capacitor filters, 555 timer and its applications, 556 function generator IC and its applications, phase locked ICs (PLL) 565 and their applications. IC 1496 (Balanced modulator applications).	ICT Based & green board based class room teaching
Unit – III	Acoustics: Microphones – Carbon, moving coil, ribbon, crystals condenser, their working principle and characteristic, Noise Figure and sensitivity and shielding. Loud Speakers – Moving Coil, electrodynamics horn type, multi-way speaker system, cross over network and their frequency characteristic. Various types of sound recording, magnetic recording, disk and crystal recording, Reverberations, building and studio acoustics, high fidelity.	ICT Based & green board based class room teaching
Unit – IV	Microwave: Generation of microwave by tubes, limitation of conventional tubes, Klystron amplifiers, reflex Klystron oscillator, magnetrons, travelling wave tube (TWT), backward wave oscillator (BWO), high frequency limitation of transistor, microwave transistor, Manley Rowe relations, parametric amplifiers and frequency multipliers, Gun effect, Gun diode oscillator, Avalanche effect, IMPATT & TRAPATT, BARRITT, TUNNETT, MITATT, microwave field effect transistors, MASER, LASER, Microwave Integrated Circuits (MICs) diode, Schottky barrier and backward diodes, PIN diode and their applications.	ICT Based & green board based class room teaching
Unit - V	Logic Families: DTL, ITL, ECL, TTL, MOS Logic Families, parameters and their comparison, transistor logic, interfacing of logic families, Integrated transistor, FET and MOS as switches, switching speed of integrated diode, transistor, FET devices, comparison between TTL and DTL, multi emitter transistor, Characteristics of TTL with Shottkey devices, transfer characteristics of ECL, Fan in and Fan out speed of operation, logic versatility of ECL gates, temperature compensated bias MOS, CMOS and their transfer characteristics, MOS invertors, CMOS inverter, rise and fall time in CMOS gates, interfacing BIT and CMOS gates.	ICT Based & green board based class room teaching

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Course Outcome:

After successful completion of the course student will be able to

- Design and analyze the basic operations of MOSFET.
- Know about the multistage amplifier using BJT and FET in various configuration to determine frequency response and concept of voltage gain.
- Know about different power amplifier circuits, their design and use in electronics and
- communication circuits.
- Know the concept of feedback amplifier and their characteristics.
- Design the different oscillator circuits for various frequencies.

List of Experiments (Expandable):

- Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current)

- Linear application of OP-Amp (voltage follower, inviting and non-inverting amplifier and them frequency response adder subtractor differential amplifier, integrator and differential frequency response)
- Study of Op-Amp as a comparator.
- Design of Schmitt trigger.
- Design of monoastable & a stable multivibrator
- To construct and plot frequency response of low & high pass filter.

Text Books:-

1. Linear Integrated Circuits:D. Raychowdhary and Shail Jain.
2. Applications of linear Integrated circuits: Clayton

References Books:

1. Tobbey; OP- Amps their design and Application
2. Gaikward RA; OP- Amp and linear Integreted circuits; PHI
3. Salivahanan; Linear Integrated Circuits; TMH
4. Kennedy J; Principles of communications; TMH
5. R.G.Gupta; Audio and Video System; TMH
6. Introduction to System Design using Integrated ckt: B.S. Sonde (New Age Pub.).
7. Micro Electronics: Jacob Millman (ISE)
8. Integrated Circuits: Botkar (Khanna)

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design in large electrical and electronics sector.	Able to understand the construction, working principles of large electrical and electronics sector.	8 DECENT WORK AND ECONOMIC GROWTH, 13 CLIMATE ACTION	Start business Unit (retail and Micro).

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SEMESTER- 6th | **Subject Code: 3TBEE 604**
Course: BE EE | **Theory Max. Marks: 50**
SUBJECT: NON CONVENCTIONAL ENERGY SOURCES | **Theory Min. Marks** : 17

COURSE OBJECTIVE:

- This course is an extension of Electrical Power systems-I course. It deals with basic theory of transmission line modelling and their performance analysis.
- To understand one line diagram of a power system.
- To provide knowledge of faults occurs in a power system and their calculations.
- A detailed study of Power System stability, Load flow studies and economic power dispatch is part of the curriculum for students.

	Course Content	Methodology Adopted
UNIT - I	**Introduction** : Various non-conventional energy sources, Need, availability, classification, Relative merits & demerits. Energy storage, distribution and conservation.	Lectures Exercises
UNIT - II	**Solar Energy**: Solar Cells; Theory of Solar Cells, Materials, Solar Cell Power Plants, merits / demerits. Solar Thermal Energy : Solar energy collectors, Applications, storage, Solar Thermal Power Plants, merits / demerits.	Lectures Exercises
UNIT - III	**Wind Energy**: Basic Principles of Wind Energy conversion Site Selection criterion ,wind Data & Energy Estimation, Types of Rotors, Characteristics, performance & limitations of energy conversion systems	Lectures Exercises
UNIT - IV	**Tidal Energy:** Basic Principles, Components of Tidal Plants, Operation methods & utilization **Bio-Mass Energy –** Conversion Technology, Classification of Plants, Advantages & Disadvantages **Geo-Thermal Energy –** Sources of Geo- Thermal energy, Thermal energy conversion- electrical / Non electrical conversion. Advantage & Disadvantages	Lectures Exercises
UNIT - V	**MHD Power Generation –** Principle of working open cycle / close cycle system. Advantages & Disadvantages Thermo Electric Power – Basic Principles, Thermo Electric Materials, Performance & Limitations. Thermionic Conversion – Principles of working. Hydrogen Energy – Principles of conversion ,production of H_2.	Lectures Exercises

COURSE OUTCOME:

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

- Address smart energy and green infrastructure
- Build models that simulate sustainable and renewable green technology systems
- Understand the history, global, environmental and economical impacts of green technology
- Address non renewable energy challenges

TEXT BOOKS:

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1. G.D. Rai – Non Conventional Energy Sources –(4th ed Khanna Pub.)
2. S.P. Sukhatme – Solar Energy – TMH.

REFERENCE:

1. Bansal, Kleemann & Meliss – Renewable Energy Sources & Conversion Technology – TMH.

Job Opportunities	Employability Skill Developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In large energy sectors like battery , hydro energy etc.	Able to understand Understand the construction, working principles of energy industry.	7 ADDORABLE AND CLEAN ENERGY , 8 DECENT WORK AND ECONOMIC GROWTH, 13 CLIMATE ACTION	Start business Unit (retail and Micro).

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SEMESTER- 6th
Course: BE EE
SUBJECT: FACTS DEVICES

Subject Code: 3TBEX 605
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The objective of this course is to get knowledge of-

- Basic Issues Involved in Bulk Power Transmission, Static Var Compensator (Svc) And Purpose,
- Thyristor and Gto Thyristor Controlled Series Capacitors (Tcsc and Gcsc),
- Voltage Source Converter Based Facts Controllers and Controllers and Their Co-Ordination in Facts. Transforms,

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Basic Issues Involved in Bulk Power Transmission, Review of basics of power transmission networks-control of power flow in AC transmission line-Analysis of uncompensated AC Transmission line- Passive reactive power compensation, Principle of Transmission system compensation, Need for FACTS controllers- types of FACTS controllers and Benefits	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – II	Static Var Compensator (SVC) and Purpose Voltage control by SVC – Advantages of slope in dynamic characteristics-Influence of SVC on system voltage, Design of SVC voltage regulator, Modeling of SVC for power flow and stability studies, Applications-Enhancement of transient stability, Steady state power transfer, Enhancement of Power system damping, Prevention of voltage instability.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – III	Thyristor and Gto Thyristor Controlled Seriescapacitors (Tcsc and Gcsc) Concepts of Controlled Series Compensation –Analysis of TCSC-GCSC, Different modes of operation, Modeling of TCSC and GCSC for load flow studies- modeling TCSC and GCSC for stability studies- Applications of TCSC and GCSC, SSR mitigation.	Lectures Demonstration of equipments .Exercises, Audio visual aids such as chalk board.
Unit – IV	Voltage Source Convert. er Based Facts Controllers Static synchronous compensator(STATCOM)- Static synchronous series compensator(SSSC)-Operation of STATCOM and SSSC- Power flow control with STATCOM and SSSC- Modeling of STATCOM and SSSC for power flow studies –operation of Unified and Interline power flow controllers(UPFC and IPFC).	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit - V	Controllers and Their Co-Ordination FACTS Controller interactions – SVC–SVC interaction - co-ordination of multiple controllers using linear control techniques – Quantitative treatment of control coordination.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.

Course Outcome:

- Express different types of FACTS controllers and their role in improving power system performance.
- Understand the operating principles of various FACTS devices.
- Relate the performance and applications of VSI & CSI.
- Know the importance of compensation methods in power system network.
- Extend the knowledge of active & reactive power and voltage control with FACTS devices.
- Analyze role of SVC&STATCOM in improving the power system dynamics.

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- Analyze the use of control schemes of TCSC,TSSC, GSC in improving the power qualit

Text Books:-

1. V. K.Sood, HVDC and FACTS controllers- Applications of Static Converters in Power System, Kluwer Academic Publishers, 2004.

References Books:

1. Mohan Mathur, R., Rajiv. K. Varma, Thyristor – Based FACTS Controllers for Electrical Transmission Systems, IEE press and John Wiley & Sons, Inc, 2002.
2. K.R.Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International (P) Ltd., Publishers, New Delhi, Reprint, 2008.
3. A.T.John, Flexible AC Transmission System, Institution of Electrical and Electronic Engineers (IEE), 1999.
4. Narain G. Hingorani, Laszio. Gyugyl, Understanding FACTS Concepts and Technology of Flexible AC Transmission System, Standard Publishers, Delhi, 2001.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various elecronics companies.	Able to understand the design of electronics equipments.	Goal 1(No Poverty),Goal 2 (Zero hunger), Goal 4 (Quality Education)	Start business.

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SEMESTER- 6th
Course: BE EE
SUBJECT: ELECTRICAL MODELLING & SIMULATION-IV

Subject Code: 3TBEX 606
Theory Max. Marks: 25
Theory Min. Marks : 12

Practicals:

- Study of various Electrical Toolbox i.e Power System, Power Electronics, Control system, Electrical Measurement, Flexible AC Transmission.
- Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter for different load models.
- Developing Simulation Models using FACTs Devices i.e STATCOM, SVC, TCSC, SSSC, IPFC, UPFC in power system transmission lines.

Reference Books:

1. Shailendra Jain "Modeling and Simulation using MATLAB Simulink" wileyindia& sons

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunities in many private sectors as well as government sectors . Opportunities to do work as a field engineer. Can get the job in power plants.	Simulation of electrical devices	7 AFFORDABEL AND CLEAN ENERGY, 9 (INDUSTRY AND INFRASTRUCTURE)	Substation , power plant establishment

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SEMESTER- 6th | **Subject Code: 3STEX 607A**
Course: BE EE | **Theory Max. Marks: 25**
SUBJECT: ELECTRICAL MACHINE MAINTENANCE | **Theory Min. Marks** 12

COURSE OBJECTIVE:

The primary objective of the course is to introduce operation principles of –

- Three – Phase motor winding a 2 pole, 3HP, 5HP, three phase Transformer, Tap changing Transformers,
- Maintenance of Circuit Breaker, Commissioning and Recharging of Transformers.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Three – Phase motor winding a 2 pole, 3HP, 5HP, 3-phase submersible pump motor (identifying starting and ending terminals of a 3-phase induction motor). Winding a 4 pole, 3HP, 5HP, 3-phase squirrel cage motor, testing of motor after varnishing, baking and assembling- insulation resistance, no load, full-load current and efficiency test. To measure the hold and release voltage of an under voltage coil.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – II	Three phase Transformer: Construction, various types of connection and their comparative features, 3- phase transformer connections - Δ-Δ, Y-Y, Δ-Y, Y-Δ, V-V – vector groupings Yy0, Dd0, Yd1, Yd11, Dy1, Dy11, Scott connection – three winding transformer – tertiary winding – per unit impedance, Parallel operation of single phase and three phase transformers. Excitation phenomenon in transformers, Harmonics in single phase and three phase transformers.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – III	Tap changing Transformers - No load and on load tap changing of transformers, Cooling methods of transformers. Special Transformers: Potential transformer, Current transformer, Pulse transformer, Audio frequency transformer, Grounding transformer	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit – IV	Commissioning and Recharging of Transformers: Concept of commissioning and recharging of transformer, General checks, Insulation resistance test, Measurement of oil characteristics, off circuit tap switch, Continuity test, Measurement of winding resistance, Voltage ratio tests, Magnetizing current, charging of the transformer, Do's and Don'ts for transformer, Various commissioning tests on a power transformer, Procedure of loading the transformers. Transformer grounding.	Lectures Demonstration of equipments. Exercises, Audio visual aids such as chalk board.
Unit - V	Maintenance of Circuit Breaker: Steps in maintenance of CB, Maintenance of molded case circuit breakers -Frequency and routine maintenance tests, Maintenance of low-voltage circuit breakers - Frequency and maintenance procedures, Maintenance of medium voltage circuit breakers – Air, Oil and Vacuum circuit breakers - Frequency of maintenance, safety practices and maintenance procedures for each of the above, Maintenance of high-voltage circuit breakers - frequency of inspections, External and internal inspection guidelines, typical internal breaker problems, Influence of duty imposed, Types of tests performed.OIL CB, Post fault maintenance, Steps in maintenance of MOCB, Maintenance for AIR CB,	Lectures Demonstration of equipments .Exercises, Audio visual aids such as chalk board.

Course Outcome:

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- After successful completion of course, Comprehend the basics of Electrical
- Engineering and practical implementation of Electrical fundamentals.
- Develop numerical solutions to fundamental electrical engineering
- Make use of basic principles involved in electrical engineering concepts.
- Examine the methods to solve AC circuits.
- Analyze various circuits using network theorems.
- Know the basics of electric machines used in industries.
- Summarize the different applications of commonly used electric machinery.

List of Practical's:

- To understand the various parts and critical elements of Transformer& HT/LT Motor.
- To understand the operation and application of Transformer & HT/LT Motor.
- To understand the maintenance, troubleshooting& Protection of Transformer& HT/LT Motor.
- To understand do's& don'ts of Transformer& HT/LT Motor.
- To understand the various parts and critical elements of Electrical Motor.
- To understand the operation and application of Electrical Motor.
- To understand the maintenance, troubleshooting& Protection of Motor
- To understand do's& don'ts of Drive; Rating & Failure Analysis.

Job opportunity	**Employability skill developed**	**Local/National/UNDP Goal Achieved**	**Entrepreneurship Opportunity**
Job opportunity in public / private sector and abroad also.	Student will be able to understand Network Infrastructure and machine maintenance	Goal04(quality education)	Start business Unit (retail and Micro).

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SEMESTER- 6th
Course: BE EE
SUBJECT: MOBILE REPAIRING

Subject Code: 3STEX 607B
Theory Max. Marks: 25
Theory Min. Marks 12

COURSE OBJECTIVE:
The Course has been designed to provide knowledge on Mobile Repair & Maintenance.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to mobile phones, Generations of mobile phones, FHSS networks, GSM, Spread spectrum, CDMA, TDMA & Basic electronics components.	Lectures Demonstration of equipments. Exercises
Unit – II	Handset Specific operating systems, Handset features & applications, working principle of mobile handset & Components used in mobile handsets. Reading & writing skills, Communication skills, Time management skills, Team skills, Safety & Security	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Tools & equipment used for repairing & maintenance of mobile handsets, types of power supply & batteries, boosting a battery, troubleshooting basics.	Lectures Demonstration of equipments. Exercises
Unit – IV	Network problems, Power failure (dead), Mobile phone hardware troubleshooting (water damage, hanging, charging & keypad problems), Handsets assembly& disassembly, Soldering & disordering &SMD rework station.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	BGA IC's, Basics of Computer, Installation of software, Flashing, PC based diagnostic tools, mobile sets formatting, used of secret codes. Mobile softwares, Data cable, Card reader, Mobile display, Remove/replace Component & Mobile phone hardware troubleshooting (Troubleshooting through circuit diagram, transmission, transmitter filter, microphone, rEEption, Antenna, RF power amplifier, local oscillator, Audio IC, speaker, charger etc.)..	Lectures Demonstration of equipments. Exercises

Course Outcome:
At the end of the training, the trainee will be able to

- Appreciate the importance of embarking on self-employment and has developed the confidence Identify business opportunities in chosen sector / sub-sector and plan and market and sell
- Start a small business enterprise by liaising with different stake holders
- Effectively manage small business enterprise
- Establish and run a Mobile Handset Repairing unit

.

References Books:

1. Mobile Phone Total Hardware Solution – Institute Edition, Publishers: GT Publications
2. Mobile Phone Total Software Solution – Publishers: Merut Publications

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Job opportunity in public / private sector and abroad also.	Mobile repair	Goal04(quality education)	Start business Unit (retail and Micro).

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SEMESTER- 7th
Course: BE EE
SUBJECT: POWER QUALITY

Subject Code: 3TBEX 701
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

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

- Understand the various power quality phenomenon, their Origin and monitoring and mitigation methods.
- Understand the effects of various power quality phenomenons in various equipment's.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: general classes of power quality problem, causes & effect of power quality disturbances	Lectures Demonstration of equipments. Exercises
Unit – II	Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of protection, monitoring sags.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.	Lectures Demonstration of equipments. Exercises
Unit – IV	Applied harmonics: harmonics distortion evolutions, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, filters, passive input filter standards of harmonics.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance and control, discontinuous current control.	Lectures Demonstration of equipments. Exercises

Course Outcome:

- Graduates will demonstrate knowledge of mathematics, science and engineering.
- A knowledge contemporary issues
- Graduates will show the ability to participate and try to succeed in competitive examinations.
- Identify the harmonic sources and the effects of harmonic distortion
- Analyze voltage sag problems and suggest preventive techniques

Reference Books:

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice

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Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer , manufacturing engineer in industrial machinery or power supply, power control and management system .	Able to understand the working principles of power system Control panels.	Goal7(Affordable& clean energy),Goal 8(Decent work & economic growth),Goal12 (Responsible consumption& production).	Start business Unit (retail and Micro).

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SEMESTER- 7th
Course: BE EE
SUBJECT: POWER SYSTEM PROTECTION

Subject Code: 3TBEX 702
Theory Max. Marks: 50
Theory Min. Marks: 17

COURSE OBJECTIVE:

- To understand the principle of protective schemes and various faults in the Power System Scenario.
- To study the various types of the circuit breakers, the arc quenching phenomena and the protection against over voltages.
- Teach students the protection systems used for electric machines, transformers, bus bars, overhead and underground feeders.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Protectiverelays:tripcircuit&circuitBreaker,Currenttransformer&protection,instantaneous over current relay, I.D.M.T. Relay, Differential relay, Directional relay, Generalized torque expression, impedance relay, reactance relay, mho relay.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – II	a) Generator protection–Differential protection of stator, interterm fault protection, protection against unbalance loading, protection of rotor against ground fault, protection against field failure, protection against failure of prime mover, field suppression in alternators. b) Transformer protection–difficulties in differential protection, mode of C.T. connection for differential protection of three phase transformer, protection against magnetizing in rush current, core balance e a r t h leakage protection. c) Bus bar protection-Differential protection, frame leakage Protection.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – III	a) Feeder protection-protection of zringmain feeder, protection of parallel feeders. b) Transmission line protection-Over current protection of lines, three step distance protection, effect of power swing son distance relay, Directional comparison carrier current protection, phase comparison carrier current Protection, carrier aided distance protection.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit – IV	Static relays-amplitude & phase comparators, duality between amplitude & phase comparators, circulating current amplitude comparators, coincidence type phase comparator, block spike phase comparator, integrating phase comparator, Hall effects in ephase comparator, Design of directional relay, reactance relay, mho relay, impedance relay, quadrilateral characteristics relay using cosine phase comparator and amplitude comparator.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.
Unit - V	Circuit Breakers- Initiation of Arc, Higher esistance arcinter ruption,current zero arcinter ruption, Recovery voltage, Factor affecting recovery voltage, Rest riking voltage, rate of rise of rest riking voltage, Breaking of capacitive current, current chopping, Resistances witching, Circuit Breaker rating, Circuit Breaker testing, Minimum oil circuit breaker, Air Blast circuit Breaker, SF-6 Circuit Breaker.	Lectures Demonstration of equipments.Exercises,Audio visual aids such as chalk board.

Course Outcomes:

At the end of the course, students:

- Design the relevant protection systems for the main elements of a power system
- Analyze with over current, differential, and ratio protection devices and their application in a coordinated protection scheme.
- Do the stability problems and clearing of faults to mitigate these problems

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Text Books:-

1. M.L. Soni, P.V. Gupta, B.S. Bhatnagar, A Chakrabarti, A Text Book on power system Engineering, Dhanpat Rai & Co. 1998

Reference books:

1. Wadhwa, C.L., "Electrical Power Systems", New Age International Publishers Limited, 2006, New Delhi,6th Edition, 2010
2. Sunil, S.Rao, "Switchgear Protection and Power Systems (Theory, Practice & Solved Problems", Khanna Publishers Limited, New Delhi, 12th Edition, 2008.
3. Soni, M.L., Gupta, P.V., Bhatnagar, U.S. and Chakrabarti, A., "A Text Book on Power Systems Engineering", hanpat Rai & Sons Company Limited, New Delhi, 2008

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical production and contractor companies	Able to understand the Protection design and its requirement	Goal 1(No Poverty),Goal 2 (Zero hunger), Goal 4 (Quality Education)	Start business for consultancy.

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SEMESTER- 7th
Course: BE EE
SUBJECT: ELECTRICAL DRIVES

Subject Code: 3TBEX 703
Theory Max. Marks: 50
Theory Min. Marks 17

COURSE OBJECTIVE:

The objective of this course is to get knowledge of –

- To provide students with a strong back ground in different types of electrical drives.
- To train the students to have the solid foundation in mathematical and technical concepts required to engineering problems.
- To prepare the students to excel in post graduate programs or to succeed in industry.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Control of D.C. motors by converters:- Introduction to Thyristor Controlled Drives, single phase semi and fully controlled converters and three semi and fully controlled converters connected to d.c. separately excited and d.c. series motors-continuous current operation, Output voltage and current waveforms, Speed and Torque expression, Speed-Torque Characteristics, Problems on converter fed d.c. motors.	Lectures Demonstration of equipments. Exercises
Unit – II	Four quadrant operation of D.C. Drives: Introduction to Four quadrant operation, Motoring operations, Electric braking, Plugging, dynamic and regenerative braking operations. Four quadrant operation of D.C. motor by Dual converters-Closed loop operation of DC motor (Block diagram only) Control of D.C. Motors by Choppers:-Single quadrant, Two-quadrant and four quadrant chopper fed d.c. separately excited and series excited motors, Continuous current operation, Output voltage and current waveforms- Speed torques expressions-Speed torque characteristics, Problems on Chopper fed d.c. motors, Closed loop operation (Block diagram only)	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Control of Induction Motors on stator side:-Control of Induction Motor by AC Voltage controllers- Waveforms, Speed torque characteristics, Variable frequency control of induction motor by Voltage Source, Current Source inverters and cyclo converters, PWM control Comparison of VSI & CSI operations, Speed- torque Characteristics, Numerical problems on induction motor drives, Closed loop operation of induction motor drives. (Block diagram only)	Lectures Demonstration of equipments. Exercises
Unit – IV	Control of Induction Motors from rotor side:-Static rotor resistance control, Slip power recovery static Scherbius Drive, Static Kramer Drive, Their performance and speed torque characteristics advantages- application-problems.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Control of Synchronous Motors: -Separate control &Self-control of synchronous motors, Operation of self-controlled synchronous motors by VSI, CSI and Cycloconverters. Load commutated CSI fed Synchronous motor, Operation, Waveform, Speed torque Characteristics, Application, Advantage, Numerical problems, closed loop operation so synchronous motors drives. (Block diagram only)	Lectures Demonstration of equipments. Exercises

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Course Outcomes:

- Student after successful completion of course -To apply solid foundation in controlling method of different electrical appliances.
- Interpret power electronics applications in control of speed, torque and other components.
- Develop control Dc motor by Single phase converters.
- Construct control DC Motor by Three Phase Converters
- Able to solve four quadrant operation of DC drives.
- Able to build control DC motors by Choppers
- Able to model the control of Induction motor through system voltage.

List of Experiments:

- Study of DC machine parts and their identification.
- Perform Load test on DC shunt generator and obtain Internal & External characteristics.
- To obtain External & Internal Characteristics of DC series generator.
- To perform speed controls of DC shunt motor by (A) Field control method, (B) Armature Control Method.
- Load Test on DC shunt motor with mechanical load.
- Load test on DC series motor with mechanical load.
- Speed control of 3 Phase Slip Ring Induction motor by Rotor resistance control method.
- To study about different types of DC motor Starter.
- To Study about different types of AC motor Starter.
- To derive the transfer function of an armature controlled separately exited dc motor and to verify how the change in-applied voltage affects the motor speed by simulator.
- To derive the transfer function of a field controlled separately excited dc motor and to verify how change in field current affects the motor speed by simulator.
- To study the different types of dc motor binding.

Text Books:-

1. B.K. Bose "Power Electronic control of AC Drives". PHI Learning
2. G.K. Dubey "Fundamentals of Electrical Drives"-. Narosa Publications

References Books:

1. Gopal K. Dubey "Power semiconductor Controlled Drives"- PHI
2. S.B. Dewan, G.R. Slemon, A. Straughen "Power semiconductor Controlled Drives
3. Ned Mohan Electrical Drive Wiley India
4. V. Subramanyam "Thyristor control of Electric Drive" Tata
5. N.K. De , P.K. Sen "Electric Drives" PHI
6. S.K. Pillai, "A first course of Electrical Drive" New age International.
7. S.K. Pillai. "Analysis of Thyristor Power Conditioned Motors" University Press (India)Ltd.
8. Longman P.V. Rao, "Power semiconductor Drives", BS Publications.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Public / private sector	Able to understand the utilization of electrical energy	Goal 1(No Poverty),Goal 2 (Zero hunger)	Start business

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SEMESTER- 7th
Course: BE EE
SUBJECT: ELECTRICAL MACHINE III

Subject Code: 3TBEE 704
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- To study the importance of transformation of variables in three phase AC machines.
- To study the construction and operation of single phase induction motor.
- To study the construction and operation of ac commutator motors.

Course Content		Methodology Adopted
UNIT - I	**Theory of Ideal Synchronous Machines** The ideal synchronous machine, synchronous machine inductances, transformation to direct and quadrature axis variables, basic machine relation id dq0 variables, steady state analysis using dq0, transient analysis, three-phase short circuit, transient power angle characteristics, effect of additional rotor circuits.	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - II	**Theory of Ideal Poly-Phase Induction Machines** The ideal induction machine, transformation to *dq* variables, basic machine relation in *dq* variables, steady state analysis using *dq0*, electrical transients in induction machine, single phasing of three-phase induction motor, power invariance.	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - III	**Fractional Horse Power Motor** Qualitative examination, starting and running performance of single phase induction motor, revolving field theory of single-phase induction motor, AC tachometer, unbalanced operation of symmetrical two-phase machine, the symmetrical component concept, two-phase control motors.	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - IV	**AC Commutator Motors** Rotational EMFs in commutator windings, action of commutator as frequency converter, effect of EMF injection in secondary circuit of three-phase slip-ring induction motor, secondary (slip) power, constant HP and constant torque drives, Kramer and Scherbius system of speed control, single-phase series motors, universal motors, phasor diagrams, methods of improving commutation	Classroom teaching, ICT Based and individual presentation and Google classroom
UNIT - V	**Special Motors** Hysteresis motor, reluctance motor, stepper motor, Synchronous and linear induction motor, Permanent magnet brushless BC motor.	Classroom teaching, ICT Based and individual presentation and Google classroom

COURSE OUTCOME:

At the end of the course the students should be to :

- Transform three phase variables to two axis variables.
- Analyze the performance of single phase induction motor with the help of its equivalent circuit.
- Understand the construction and principles of operation of different types of special motors..

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- Determination of negative sequence reactance of alternator by static test.
- Determination of negative sequence reactance of alternator by line-to-line short circuit test.
- Determination of zero sequence reactance by synchronous machine.
- Determination of the Xd & Xq of syn. Machine.
- Measurement of circuit Constant of 1-phase induction motor.
- Speed reversal of 1-phase induction motor.
- Single phasing characteristics of 3-phase induction motor.
- To study effect of capacitor on starting, running, and performance of induction motor.
- Output characteristics of Synchro Transmitter.
- To use Synchro transmitter pair as remote control device.
- Characteristics of stepper motor.
- Measurement of torque angle of synchronous machine.
- Study of Linear Induction Motor.
- Characteristics of 1-Phase AC commutator motor.
- To control the speed of Induction Motor by ejecting EMF from rotor.

TEXT BOOKS:

1. Electrical machines by Fitzerald and Kingseley, 2nd edition, McGrawHill.
2. Performance and design of AC commutator machines by Taylor.

REFERENCE BOOKS:

1. Generalized theory of electrical machines by Bimbhra, Khanna Pbs.
2. Power system stability, vol-3 by Kimbark, Wiely
3. General theory of electrical machines by Adkins

Job Opportunities	Employability Skill Developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the design of machines	Goal 1(No Poverty),Goal 2 (Zero hunger)	Start business for consultancy.

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SEMESTER- 7th
Course: BE EE
SUBJECT: ELECTIVE-I COMPUTER NETWORKS

Subject Code: 3TBEE 7101A
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

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

- Describe the general principles of data communication.
- Describe how computer networks are organized with the concept of layered approach.
- Describe how signals are used to transfer data between nodes.
- Implement a simple LAN with hubs, bridges and switches.
- Describe how packets in the Internet are delivered.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to computer network, classification of networks (WAN, MAN, LAN), distributed systems, digital signals and data rates, bit stream, symbols and band rate, transmission media, modems, structure of computer network, circuit, packet, message switching topological design, back bone design OSI, reference model.	Lectures Demonstration of equipments. Exercises
Unit – II	Physical and data link layer, bit communication between DTE and DCE, RS232C, novel modem Terminal handling, multiplexing and concentration data link layer service and design issues, errors detection and correction, retransmission strategies, sliding window protocols, satellite and packet radio networks, pure aloha protocols, slotted aloha protocol, satellite networks, reservation aloha protocol, DES, PCEM, packet radio networks.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Network layer, basic design issues, network layer services, connection oriented and connection less services, routing, static multipath, centralized isolated distributed hierarchical broadcast, flow based routing, congestion deadlocks radio concept of Ethernet LAN topology and architecture CSMA/CD protocol, token ring LAN token bus LAN, Fiber optic LAN principle of LAN bridges, transparent bridge source routing bridges, gateway, gateway design issues x25 internet working.	Lectures Demonstration of equipments. Exercises
Unit – IV	ISDN, B-ISDN and ATM, evolution of ISDN, goal of ISDN services, ISDN system architecture and network terminating devices ISDN interface ISDN signaling, broad band ISDN, Asynchronous transfer mode ATM adaptation layer, transport layer, OSI transport protocol, session layer designing issues, data exchange OSI session layer primitives, transport protocol TCP	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Presentation layer, abstract syntax notation data compressed on oxyptography, application layer OST service elements ACSE and CCR, the transfer access and management, concurrence control nistual terminals, electronic mail directory services distributed systems, formal protocol modules, network management, mobile networking.	Lectures Demonstration of equipments. Exercises
Unit - VI	Networking Equipment's and Monitoring Tools Routers, Modems, Switches, Gateways, online networking monitoring tools, Network security, Proxy Server design.	Lectures Demonstration of equipments. Exercises

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Course Outcome:

- To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
- To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks,
- To be familiar with wireless networking concepts,
- To be familiar with contemporary issues in networking technologies,
- To be familiar with network tools and network programming

References Books:

1. Tanenbum, Computer Networks, PHI.Keizer, LANs.
2. Stalling W., Computer Networks, PHI .ISDN & Broadband. ISDN: Stalling W., PHI.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
In management field in IT and Electronics sector	Able to understand the IT requirements.	Goal 1(No Poverty),Goal 2 (Zero hunger)	Start business

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SEMESTER- 7th **Subject Code: 3TBEX 7102B**
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: ELECTIVE-I ADVANCED COMMUNICATION SYSTEMS **Theory Min. Marks : 17**

COURSE OBJECTIVE:

- To introduce students to various modulation and demodulation techniques of analogy communication.
- To analyze different parameters of analogy communication techniques.
- It also focuses on pulse modulation and demodulation.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to spread spectrum modulation, Direct sequence (DS) spread spectrum, Spread spectrum with code division multiple access (CDMA), Ranging, Frequency hopping (FH) spread spectrum, PN sequence generation, Acquisition and tracking of FH signal and DS signals.	Lectures Demonstration of equipments. Exercises
Unit – II	Satellite communication: Introduction to satellite communication, Frequency allocation active/passive synchronous ,Non synchronous systems, Orbits satellite attitude, Transmission path, Path loss, noise consideration link analysis, Satellite systems effective isotropic radiated power, Multiple access methods, Earth stations, Tracking and servo system, Up-down converters, Example of satellite systems.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Digital switching systems: Introduction to electronics and digital exchanges, Hierarchy of switching offices, Common control push button dialing systems, Switching matrix multiple stage switching time division multiplexing time slot interchanging (TSI), Comparison of TSI with space switching, Space array for digital signals, Combined space and time switching. Principles of FAX.	Lectures Demonstration of equipments. Exercises
Unit – IV	Mobile communication: Introduction to cellular mobile communication element of the cellular systems, Cell design, hand off techniques, Frequency Management.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Local access networks: Improvement in convention cables: XDSL, ADSL, Wireless local loop, Fiber in local loop, radio Trunking. ISDN: Architecture, Services and Protocols, ATM networks	Lectures Demonstration of equipments. Exercises

Course Outcome:

Student after successful completion of course-

- Use of different modulation and demodulation techniques used in analog communication
- Identify and solve basic communication problems
- Analyze transmitter and rEEiver circuits
- Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems

Text Books:-

1. Fundamentals of Satellite Communication by K.N. Raja Rao

References Books:

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1. Radio Callins, Microwave communication.
2. Gagldardi, Satellite communication.
3. ThyggajanVishwanathan, Tele Communication switching systems – PHI Learning
4. Lee, Cellular and mobile communication
5. KarmiloFehar, Wireless digital communication. - PHI Learning

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
RF engg. In Telecomm sector etc.	Able to understand Understand the construction, working principles of Telecomm sector.	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for antenna, RF equipments etc.

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SEMESTER- 7th
Course: BE EE
SUBJECT: POWER APPARATUS SYSTEM

Subject Code: 3TBEX 7103C
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

- Impart theoretical knowledge of design of electrical transmission line, different types of substation, bus-bar arrangement.
- Introduce the concept of Different types of earthling system.
- To provide the theoretical insights overvoltage production and protection from these.
- Deliberate & discuss the concept of reliability of transmission line.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Transmission Line Design& Overhead Line Design Types of Insulator, String Efficiency, Improvement of voltage distribution, Improvement of String Efficiency, Line Supports, Types of Steel Towers, Cross Arms, Equivalent span, Conduct or configurations, Spacing & Clearance, Sag & Tension calculations, Erection conditions, Factors affecting Sag, Sag Template, Cautionary, Vibration of conductors & prevention, Selection of conductor size, Crossarm, No. Of circuits, Selection of round wire	Lectures Demonstration of equipments. Exercises ,Audio visual aids such as chalk board.
Unit – II	Electrical Substation& Earthling: Types of Substation, Layout and Bus Bars chimes, Voltage level, Substation equipment's Protection & Control, Substation Earthling, Tolerance limits of body currents, Soil resistivity, Earth resistance, Toler able & Actual Step & Touch Voltages, Design of Earthling Grid, Tower Footing Resistance, Measurement of soil & earth resistivity	Lectures Demonstration of equipments. Exercises ,Audio visual aids such as chalk board.
Unit – III	Power System Earthling: Ground versus isolated neutral, Solidly and effectively grounded system Resistance and Impedance Grounding, Resonant Grounding, Reactance Grounding, Voltage Transformer Grounding, Zigzag Transformer Grounding, Grounding practice, Effect of grounding on system over voltages & protection over voltage and over voltage phenol menonin isolated and grounded neutral system.	Lectures Demonstration of equipments. Exercises ,Audio visual aids such as chalk board.
Unit – IV	Surge Protection & Insulation Co-ordination: External and Internal lover voltages mechanism of lighting discharge, wave shapes of stroke current line design based on direct stroke, over voltage protection, earth wire Rod gap T.F.R., Expulsion tube, surge diverter. General idea, Selection of B.I.L., International recommendation, Selection of arrester rating, Co-ordination of protector devices with apparatus insulation	Lectures Demonstration of equipments. Exercises ,Audio visual aids such as chalk board.
Unit - V	Reliability of Transmission & Distribution Systems: Definition,Outage,BathTubCurve,TwoStateModel,Failure&RepairRate,ProbabilityDensityFunction, Probabilities of Survival & Failure, Mean Time to Failure, Mean Down Time, Reliability of Series & Parallel Systems, Two-State Fluctuating Environment, Approximate Method, reliability Planning, Preparation of Reliability Models.	Lectures Demonstration of equipments. Exercises ,Audio visual aids such as chalk board.

Course Outcome:

- To facilitate students understand the practical application of different types of apparatus used in power stations.

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- Graduates opting for C.S.E.B., NHPC, NTPC, and other industry as a career are likely to come across substations and shall be able to deliver more efficiently with their prior knowledge & by co-relating the concepts of substation, bus-bar scheme, earthling, protection introduced to them during engineering.
- Students will gain the knowledge of different substation , mechanism of lightning, reliability of transmission line. This shall also impart them the understanding & importance of conducting these tests in real-life situations.
- Apart from gaining the knowledge of above topics, students would develop analytical ability to understand the system dynamics and become capable of applying analytical approach to engineering challenges ahead.

References Books:

1. Transmission & Distribution–Westinghouse
2. A Course in Electrical Power–J.B. Gupta, Kataria

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 7th
Course: BE EE
SUBJECT: MINOR PROJECT

Subject Code: 3TBEE 706
Theory Max. Marks: 50
Theory Min. Marks : 25

Objective of GD and seminar

Minimum 2 seminars of 15 minutes each by every student during the semester to be evaluated by a Panel of Examiners.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 7th | **Subject Code: 3TBEE 707**
Course: BE EE | **Theory Max. Marks: 25**
SUBJECT: INDUSTRIAL TRAINING/INTERNSHIP/IPR | **Theory Min. Marks** 12

COURSE OBJECTIVE:

Entrepreneurship education is a kind of education that aims at cultivating the comprehensive qualities of entrepreneurship, the value of innovatory spirit and entrepreneurship abilities. The objectives of entrepreneurship education in university are in the following four aspects.

- Cultivating the spirit of entrepreneurship
- Leadership
- Teamwork
- Bearing a part of quality-oriented education Managing relationships

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction to Entrepreneurship; Definition of Entrepreneur/ Entrepreneur, Difference between, Entrepreneurship/Entrepreneurship, Need for Entrepreneurship, Qualities of successful entrepreneur Myths about Entrepreneurship, Classification of entrepreneurs on the basis of different criteria, Reasons for the failure of entrepreneurs.	Lectures Demonstration of equipments. Exercises
Unit – II	Industries and Business Organization; Concept of Industry or Enterprise, Classification of Industries : (a) On the basis of capital investment; Tiny(Micro)Industry, Small Scale, Medium Scale, Large Scale, (b) Others; Rural Industry, Cottage Industry, (c) Forms of Business Organization; Proprietorship, Board & Co-operative, Partnership, Public Ltd., Private Ltd., Jt. Sector, Government Co-operative/Undertakings , (d) Tiny small scale Industry; Definition, Its significance in National Development, Govt. policies for SSI promotions Sector /Product for SSI.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Institutional Assistance; (a) Types of Institutional assistance: Infra-structural assistance, Technical Assistance, Financial assistance, Marketing Assistance, (b) Information/guidance & Training : SISI,- ASK, MPCON, CSIR, CED-MAP, NRDC, (c) Infrastructure: D/C, AVN/AKVN, (d) Finance: SIDBI-KVIB, MPFC, NABARD, MPWDC, NSICM.P.A.V.V.N.,(e) Marketing: MP-AGRO, NSIC, PM.LUN, EXPORTCOPPORATION, KVIP, MPHSVN, MPLDC, (f)Quality Control : BIS, FPO, MPLUN, F.D.A., AG.MKT. Board. Incentives/Concession/ Facilities Available: Seed money, Incentive/subsidies others (Phones, Land set c)	Lectures Demonstration of equipments. Exercises
Unit – IV	Planning of Industrial Unit: Pre-Planning Stage; Scanning the environment, Market survey, Seeking information, product/project selection, Implementation Stage; PPR Preparation, DIC registration, Arrangement of Land, Arrangement of Power, Obtaining NOC/ Licenses from various Deptt., DPR Preparation, Seeking financial assistance, Commercial Production, Post Implementation stage; Permanent registration from D.I.C., Availing Subsidies, Diversification/Modification, Setting up of marketing channel/Distribution.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Achievement Motivation; Historical perspective, Concept of achievement motivation, Significance of achievement motivation, Development of achievement motivation, Financial Management of an Industrial Unit(SSI); Tools of financial analysis, Ratio analysis, Fund Flow/Cash flow analysis, Working capital and Concepts Financial accounting	Lectures Demonstration of equipments. Exercises

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Course Outcome:

- Entrepreneurial behaviour, attitudes and skill development
- Creating empathy with the entrepreneurial life world
- Key entrepreneurial values
- Motivation and entrepreneurship career
- Understanding of process of business entry and tasks
- Generic entrepreneurship competences
- Key minimum business how-to

References Books:

1. EntrepreneurialDevelopmentVol.I,II,IIIbyVasantDesaiHimalayaPublication
2. CEDMAP(Center of Entrepreneurial development Madhya Pradesh)
3. Udyamita Vikas by Anand Prakashan

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 8th | **Subject Code: 3TBEX 801**
Course: BE EE | **Theory Max. Marks: 50**
SUBJECT: COMPUTER APPLICATION TO POWER SYSTEM | **Theory Min. Marks** : 17

COURSE OBJECTIVE:

The objective of this course is to get knowledge of Models of power system components,

- Control of load bus voltage using reactive power control variable, Sensitivity analysis,
- Power system security, and Voltage stability in Computer Applications to Power Systems.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Models of power system components, network model using graph theory, formation of Z bus, transmission line models, regulating transformer, line load ability, capability curves of alternator.	Lectures Demonstration of equipments. Exercises
Unit – II	Control of load bus voltage using reactive power control variable, SVC & SVS, Regulated shunt compensation, series and shunt compensation, Uniform series and shunt compensation and effect on load ability of transmission lines.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Sensitivity analysis- General sensitivity relations, generation shift distribution factors, line outage distribution factors, compensated shift factors, sensitivity associated with voltage-VAR, sensitivities relating load bus voltage changes in terms of PV bus voltage changes, sensitivity relating changes in reactive power generation for changes in PV Bus Voltage.	Lectures Demonstration of equipments. Exercises
Unit – IV	Power system security - Security functions, Security level, contingency analysis, security control, economic dispatch using LP formulation, pre-contingency and post- contingency, corrective rescheduling.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Voltage stability - Difference between voltage and angle stability, PV Curve for voltage stability assessment, proximity and mechanism, modal analysis using reduced Jacobian, participation factor, effect of series and shunt compensation on voltage stability , effect of load models.	Lectures Demonstration of equipments. Exercises

Course Outcome:

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

- Analyze a control problem and suggest appropriate system architecture.
- Analyze the need for information exchange and suggest appropriate information models and protocols.
- Develop simple software for a controller.
- Analyze the information needed for a given automation and control function for power systems.

Text Books:-

1. Computer Modeling of Electrical Power Systems, Arrillaga J. watson N R Wiley India
2. Advance Power Systems Analysis and Dynamics Singh L.P. John Wiley

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1. A Chakrawarti Power System Analysis: Operation and Control PHI Learning 3rd edition
2. Power Generation, Operation and Control by A.J. wood and B.F. Wollenberg John Wiley & Sons Inc. 1984.
3. Computer Techniques in Power Systems Analysis- Pai M.A. Tata McGraw Hill.
4. Computer Aided Power Systems Analysis Kusic G.L. 2nd Edition, CRC Press
5. Modern Power Systems Analysis Nagrath I.J. and Kothari D.P. Tata McGraw Hill.
6. Power System Analysis Grainger J.J. & Stevnson W.D. McGraw Hill.
7. Power System Stability and control -P Kundur , IEE Press 1994.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the computer application in industry	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 8th
Course: BE EE
SUBJECT:- EHV AC & DC

Subject Code: 3TBEE-802
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The objective of this course is to get knowledge of the extra high voltages, AC & DC transmission line. Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and transmission, Power handling capacity ,different types of FACTs ,EHV AC DC controls, Harmonics, Travelling waves on transmission systems.etc.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.	Lectures Demonstration of equipments. Exercises
Unit – II	FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series series controller, combined series-shunt controller, unified power flow controller (UPFC), thyristor controlled phase shifting transformer(TCPST).	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics disoperation, Multi terminal D.C. lines.	Lectures Demonstration of equipments. Exercises
Unit – IV	Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of travelling waves.	Lectures Demonstration of equipments. Exercises

Course Outcome:

- Student after successful completion of course - Understand the importance of estimating the line parameters of EHV AC transmission lines.
- Does the calculation of electrostatic field of AC lines and able to understand their effect on voltage gradients?
- Identify the impact of over voltages on transmission lines.
- Get the knowledge of energized & un-energized lines and able to understand the requirement of VAR compensation.
- Emphasize on the effect of corona with respect to its characteristics, properties and losses.
- Understand the information of radio noise generation in transmission lines.
- Get the awareness of the design of EHV lines with respect to steady & transient limits

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1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. P. Kundur- "H.V.D.C. Transmission" McGraw Hill.

Reference Books:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission"2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", john willy & sons pub.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Electrical Engg. sector.	Able to understand Understand the construction, working principles of Electrical Engg. sector.	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for Electrical Engg. sector.

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SEMESTER- 8th **Subject Code: 3TBEC 803A**
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: PRINCIPLE OF MANAGEMENT & MANAGERIAL ECONOMICS **Theory Min. Marks** 17

COURSE OBJECTIVE:

To integrate the basic concepts of economics with the tools of mathematics and statistics in order to analyze and make optimal business decisions.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.	Lectures Demonstration of equipments. Exercises
Unit – II	Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.	Lectures Demonstration of equipments. Exercises
Unit – IV	Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.	Lectures Demonstration of equipments. Exercises

Course Outcome:

After learning the course the students should be able to:

- Understand the roles of managers in firms
- Understand the internal and external decisions to be made by Managers.
- Analyze the demand and supply conditions and assess the position of a company
- Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures Of Products and the structures of the markets.
- Analyze real-world business problems with a systematic Theoretical Framework.
- Make optimal business decisions by integrating the concepts of Economics, Mathematics and statistics.

Text Books:-

1. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.
2. Staner: Management, PHI Learning.

References Books:

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2. Koontz: Essentials of Management, PHI Learning.
3. Daft: Principles of Management, Cengage Learning.
4. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
5. Hirschey: Managerial Economics, Cengage Learning.
6. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
7. Joel Dean: Managerial Economics, PHI learning.
8. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
9. V. L. Mote: Managerial Economics, TMH, New Delhi

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 8th **Subject Code: 3TBEX 803B**
Course: BE EE **Theory Max. Marks: 50**
SUBJECT: ELECTRICAL INSTALLATION MAINTENANCE & TESTING **Theory Min. Marks** 17

COURSE OBJECTIVE:

- To learn the industrial standards in testing and commissioning of electrical equipments.
- To understand the common problems in installing and commissioning of electrical equipments.
- To learn about safety measures and maintenance procedures for various electrical equipments.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Overview of Site Management, Electrical Safety Introduction to Site activities; civil works, Erection, Testing & Commissioning, Operation and Maintenance, Type and Scope of Maintenance, Advantages of programmed preventive maintenance, Safety management, Electrical Shocks, Recommended safety precautions against electrical shocks in LV and HV installations, Safety procedure During commissioning phase and Operation & maintenance phase.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – II	Transformer I.M.T. Important steps in maintenance of power transformer, maintenance schedule for attended and unattended transformer, causes of troubles and failure of power transformer, Dispatch and shipping, inspection, storage, procedure of filling oil in transformer tank, drying out, various commissioning tests on a power transformer, typical maintenance schedule for transformer up to 1000 KVA and above 1000KVA, transformer oil filtration.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – III	Switchgear, Circuit Breaker I.M.T. Introduction to switchgears and equipment's in substation and their functions, Type tests, routine test and commissioning tests, high/low voltage ac circuit breakers (Air, Oil, Vacuum, SF6) possible troubles, causes and remedial actions for outdoor circuit breakers, maintenance of CB (Air, Oil, Vacuum, SF6), Trouble shooting of substation equipment's.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit – IV	Rotating Machines I.M.T. Standard designation for cooling and degree of protection, Installation and commissioning of introduction motor and rotating machines, drying out of electrical rotating machines, installation resistance measurements, Mechanical maintenance of rotating machines, Care, servicing and maintenance of motor, Troubles, causes, remedies and protective devices during respective abnormal condition in low voltage induction motor, Testing of induction motors.	Classroom teaching, ICT Based and individual presentation and Google classroom
Unit - V	Hotline Maintenance Meaning and advantages of hot-line maintenance. Special type non conducting materials used for preparing tools for Hot line maintenance, Tools, Various types of Hot- line operations, safety during Hot line maintenance.	Classroom teaching, ICT Based and individual presentation and Google classroom

Course Outcomes:

- After studying the subject students will be able to understand the common problems arising while commissioning of electric Equipment's.
- They will also be able to learn about the routine tests to be performed and maintenance measures for various equipment's

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Reference Book:

1. B. Ravindranath M Chander New Age International Publishers
2. C.L. Wadhwa, Electrical Power System: New abc International Publishers Limited 2006, New Delhi, 6th Edition 2010

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Designing and maintenance engineer of Electrical Equipments in various companies	Able to understand the equipments design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business of electrical equipments

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SEMESTER- 8th
Course: BE EE
SUBJECT: HIGH VOLTAGE ENGINEERING

Subject Code: 3TBEX 8201A
Theory Max. Marks: 50
Theory Min. Marks : 17

COURSE OBJECTIVE:

The objective of this course is to get knowledge of Introduction to HV technology,

- Breakdown phenomena, Generation of HV AC DC and Impulse Voltage and current,
- Measurement of high voltages and High voltage tests on electrical apparatus in High Voltage Engineering.

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction:-Introduction to HV technology, advantages of transmitting electrical power at high voltages, need for generating high voltages in laboratory. Important applications of high voltage.	Chalk board posters& different symbols etc.
Unit – II	Breakdown phenomena:- Classification of HV insulating media, Properties of important HV insulating media. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend's theory, Limitations of Townsend's theory. Streamer's theory breakdown in non-uniform fields. Corona discharges. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown.	Chalk board posters& different symbols etc.
Unit – III	Generation of HV AC DC and Impulse Voltage and current:- HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade, Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage double circuit, cock croft- Walton type high voltage DC set, Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage, Multistage impulse generator Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Triggering gap and oscillography time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current.	Chalk board posters& different symbols etc.
Unit – IV	Measurement of high voltages: - Electrostatic voltmeter-principle, construction and limitation. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Surge current measurement.	Chalk board posters& different symbols etc.
Unit - V	High voltage tests on electrical apparatus:-Definitions of technologies, tests on isolators, circuit breakers, cables insulators and transformers.	Chalk board posters& different symbols etc.

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Course Outcome:

Student after successful completion of course:

- Understand the importance of Transmission power through HVDC.
- Analyse the HVDC Converter operation.
- Discuss firing angle control of 6 pulse,12 pulse circuits.
- Discuss harmonics in
- Identify the importance of filters for HVDC system.
- Analyse the impact of AC system faults on DC system operation.
- Identify the need for proper grounding for HVDC operation.

List of Experiments:

- To calibrate the voltmeter of high voltage control panel with The help of standard sphere gap.
- To determine the corona starting voltage for a) rod-plane gap b) rod-sphere gap
- To study & determine breakdown strength of cable (11KV).
- Study & determination of breakdown voltage of rod& rod gap.
- To test "One minute with stand voltage " or transformer oil.
- To test power frequency break down strength of solid insulating materials. a) Paper b) Presspan c) Bakelite
- To determine flash over voltage of 11 KV Disc insulation.
- To find the string efficiency of a string of 11KV insulator disc.
- To study impulse generator & obtained standard impulse Voltage wave.

Text Books:-

1. E. Kuffel and W.S. Zaengl, "High voltage engineering Fundamentals", 2nd edition, Elsevier, press, 2005
2. C.L. Wadhwa, High voltage engineering, New Age International Private limited, 1995

Reference books:

1. M.S.Naidu and Kamaraju, "High Voltage Engineering", 3rd Edition, THM, 2007.
2. L. L. Alston, "High Voltage technology", BSB Publication, 2007..
3. Rakosh Das Begamudre, Extra High voltage AC transmission Engineering, Wiley Eastern limited, 1987.
4. Transmission and distribution reference book-Westing House.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Electrical Engg. sector.	Able to understand Understand the construction, working principles of Electrical Engg. sector.	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for Electrical Engg. sector.

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SEMESTER- 8th | **Subject Code: 3TBEX 8202B**
Course: BE EE | **Theory Max. Marks: 50**
SUBJECT: COMPUTER-AIDED DESIGN OF ELECTRICAL MACHINES | **Theory Min. Marks : 17**

COURSE OBJECTIVE:

The objective of this course is to get knowledge of

- All electrical machines design for computer based analysis.
- Including Design problem, Design problem,
- Optimal design of power transformer, optimal design of 3-phase induction motor

Syllabus:

Unit	Unit wise course contents	Methodology Adopted
Unit – I	Introduction: Design Problem-Mathematical programming methods, computer aided design- Mathematical formulation of the problem. Programming techniques (LP & NLP only), Methods of solution, Unconstrained optimization problems, constrained optimization problems.	Lectures Demonstration of equipments. Exercises
Unit – II	Optimal design of DC machine:-Design of armature Windings and field systems, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit – III	Optimal design of power transformer:-Design of magnetic circuit, Design of windings, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.	Lectures Demonstration of equipments. Exercises
Unit – IV	Optimal design for 3-phase alternator:-Design of stator, windings, Design of Field systems for salient pole and non-salient pole machines, Selection of variables for optimal design, Formulation of design equations, Objective function, Constraint functions, Algorithms for optimal design.	Audio – visual aids such as – chalk board , flip chart, models , posters, slides and videos.
Unit - V	Optimal design of 3-phase induction motor:-Design of stator, Windings Design of squirrel cage rotor, Design of slip ring rotor, Selection of variables for optimal design, Formulation of design equations, Objective functions Constraint functions, Algorithms for optimal design.	Lectures Demonstration of equipments. Exercises

Course Outcome:

- Students will be able to understand complete structure of Power System and working of steam power plant.
- Students will learn the total working principle and various procedures involved in Gas Turbine and Nuclear Power plants.
- Students will get proficient knowledge about Hydroelectric stations. Students will also be able to learn coordination of different power plants to increase the efficiency of plants.
- Students will get acquainted with all technical knowledge of Electrical Substations
- Student will be able to design economical feeders for electrical distribution systems.
- Students will get acquainted with the installation of Electrical wiring in domestic, commercial and industrial areas.

Text Books:-

1. Electrical Machine Design- by A.K. Sawhney, Dhanpa Rai & Sons
2. Computer Aided Design of Electrical Equipment by Dr. M. Ramamoorthy Affiliated East West Press Pvt. Ltd. New Delhi

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Reference books:

1. Design and Testing of Electrical Machines, MV Deshpandey PHI Learning
2. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
3. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 8th
Course: BE EE
SUBJECT: MAJOR PROJECT

Subject Code: 3TBEE 805
Theory Max. Marks: 100
Theory Min. Marks : 50

The objectives of the course 'Major Project' are To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems. To give students an opportunity to do something creative and to assimilate real life work situation in institution. To adapt students for latest developments and to handle independently new situations. To develop good expressions power and presentation abilities in students. The focus of the Major Project is on preparing a working system or some design or understanding of a complex system using system analysis tools and submit it the same in the form of a write-up i.e. detail project report. The student should select some real life problems for their project and maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan. Each student is required to prepare a project report and present the same at the final examination with a demonstration of the working system (if any).

The faculty and student should work according to following schedule:

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.
ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
iii) At all the steps of the project, students must submit a written report of the same.

Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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SEMESTER- 8th
Course: BE EE
SUBJECT: TOUR/TRAINING/SEMINAR

Subject Code: 3TBEE 806
Theory Max. Marks: 50
Theory Min. Marks 25

SCHEME OF STUDIES

Duration: 2 weeks after the VII semester in the summer break, Assessment in VIII semester.

For the assessment of industrial training undertaken by the students, following components are considered with their weight age.

(a) Term work

In Industry Marks allotted

1. Attendance and General Discipline 05
2. Daily diary Maintenance 05
3. Initiative and participative attitude during training 05
4. Assessment of training by Industrial Supervisor/s 05

TOTAL 20

(b) Practical/Oral Examination (Viva-Voce) In Institution Marks allotted

1. Training Report 20
2. Seminar and cross questioning (defense) 20

---------- TOTAL 40

Marks of various components in industry should be awarded to the students, in consultations with the Training and Placement Officer/Faculty of Institute, who must establish contact with the supervisor/Authorities of the organization where, students have taking training to award,. The marks for term work and I/c of training from Industry. During training students will prepare a first draft of training report in consultation with section in-charge. After training they will prepare final draft with the help of T.P.O./Faculty of the institute. Then they will present a seminar on their training and they will face viva-voce on training in the institute.

OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly

an industry guide for their Major Project in final semester.

Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment. This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.

LEARNING THROUGH INDUSTRIAL TRAINING

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Layout of Computer/ EDP/MIS centers.

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- Customer services.
- Problems related to various areas of Work etc.

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work). Students are supposed to acquire the knowledge on above by –

1. Observation,
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.

GUIDANCE TO THE FACULTY/TPO FOR PLANNING AND IMPLEMENTING THE INDUSTRIAL TRAINING

The industrial training programme, which is spread to 2 weeks' duration, has to be designed in consultation with the authorities of the work place, keeping in view the need of the contents.

Following are some of the salient points:

I. Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.

II. Discussing and preparing students for the training for which meetings with the students has to be planned.

III. Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the programme.

IV. Correspondence with the authorities of the work place.

V. Orientation classes for students on how to make the training most beneficial - monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information from the workplace, ethics etc.

VI. Guiding students to make individual plans (week wise/ day wise) to undertake industrial training

VII. Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.

VIII. Inviting industrial personnel to deliver lectures on some aspects of training.

ACTION PLAN FOR PLANNING STAGES AT THE INSTITUTION LEVEL

1. Meeting with Principal
2. Meeting with Colleagues
3. Correspondence with work place (Industries concerned)
4. Meeting with authorities of work place
5. Orientation of students for industrial training
6. Scrutinizing individual training plan of students
7. Commencement of industrial training
8. First monitoring of industrial training
9. Second monitoring of industrial training
10. Finalization of Training report
11. Evaluation of performance at Industry level
12. Evaluation of industrial programme in the institution.

INDUSTRIAL TRAINING DAILY DIARY

Name of the Trainee:……..College:……
Industry/Work place Week
No.:……Department/Section:……..
Date:……

Dates Brief of observations made, work done, problem/project undertaken, discussion held, literature-consulted etc..

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Job opportunity	Employability skill developed	Local/National/UNDP Goal Achieved	Entrepreneurship Opportunity
Design engineer in various electrical companies.	Able to understand the Protection design and its requirement	4,QUALITY EDUCATION , 8 DECENT WORK AND ECONOMIC GROWTH, 9 (INDUSTRY AND INFRASTRUCTURE	Start business for consultancy.

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