School of Engineering and Technology

Programme Structure & Syllabus

Electrical Engineering

2022-23

K.K. University

Bihar Sharif, Nalanda - 803115

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Department of Electrical Engineering

B.tech Electrical EngineeringProgramme/Course Structure

FIRST SEMESTER

S. No	CODE	TITLE	CREDIT	L	T	P	HOURS PER WEEK
1	ETSH-101	Fundamental of Basic Science	3	3	0	0	3
2	ETSH-102	Engineering Mathematics-I	3	2	1	0	3
3	ETCS-101	Introduction to Artificial Intelligence	3	3	0	0	3
4	ETSH-103	Soft Skills	3	3	0	0	3
5	ETSH-104	Professional Ethics and Human values	3	3	0	0	3
6	ETME-111	Engineering Workshop Lab	1.5	0	0	3	3
7	ETSH-111	Fundamental of Basic Science Lab	1	0	0	2	2
8	ETCS-111	Python Lab	1	0	0	2	2
9	ETSH-113	Soft Skills Lab	1	0	0	1	1
Total			**19.5**	**14**	**1**	**08**	**23**

SECOND SEMESTER

S. No	CODE	COURSE TITLE	CREDIT	L	T	P	HOURS PER WEEK
1	ETSH-201	Engineering Mathematics -II	3	3	0	0	3
2	ETEE-201	Basic Electrical & Electronics Engineering	3	3	0	0	3
3	ETCS-201	C Programming	3	3	0	0	3
4	ETME-201	Fundamental of Mechanical & Civil Engineering	3	3	0	0	3
5	ETSH-202	Technical Communication & Project Management	3	3	0	0	3
6	ETME-202	Engineering Graphics &Design	3	1	0	3	4
7	ETCS-202	Basics of Internet of Things (IoT)	NC	0	0	0	2
8	ETEE-211	Basic Electrical & Electronics Engineering Lab	1	0	0	2	2
9	ETME-211	Fundamental of Mechanical & Civil Engineering Lab	1	0	0	2	2
10	ETCS-211	C Programming Lab	1	0	0	2	2
TOTAL			**21**	**16**	**2**	**09**	**27**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

THIRD SEMESTER

S.No	CODE	COURSETITLE	CREDIT	L	T	P	Hours PerWeek
1	ETEE301	Electric Circuit Analysis	4	3	1	0	4
2	ETEC306	Analog & Digital Electronics	4	3	1	0	4
3	ETEE302	Electrical Machine - I	4	3	1	0	4
4	ETSH301	Mathematics-III	4	3	1	0	4
5	ETEC301	Electronic Devices and Circuits	4	3	1	0	4
6	ETEE311	Electric Circuit Analysis Laboratory	1	0	0	2	2
7	ETEC316	Analog&Digital Electronics Laboratory	1	0	0	2	2
8	ETEE312	Electrical Machine – I Laboratory	1	0	0	2	2
TOTAL			**23**	**15**	5	**6**	**26**

FOURTH SEMESTER

S.No	CODE	COURSE TITLE	CREDIT	L	T	P	Hours Per Week
1	ETEE401	Electrical Machines-II	4	3	1	0	4
2	ETEC403	Microprocessor &Microcontroller	4	3	1	0	4
3	ETEE402	Electrical Measurement and Measuring Instrument	4	3	1	0	4
4	ETEE403	Signals and System	4	3	1	0	4
5	ETEE404	Electromagnetic Field	4	3	1	0	4
6	ETEC413	Microprocessor &Microcontroller Laboratory	1	0	0	2	2
7	ETEE411	Electrical Machines-II Laboratory	1	0	0	2	2
8	ETEE412	Electrical Measurement and Measuring Instrument Laboratory	1	0	0	2	2
TOTAL			**23**	**15**	**5**	**6**	**26**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

FIFTH SEMESTER

S.No	CODE	COURSE TITLE	CREDIT	L	T	P	Hours PerWeek
1	ETEE501	Power System-I	4	3	1	0	4
2	ETEE502	Control System	4	3	1	0	4
3	ETEE503	Electrical Engineering Material	4	3	1	0	4
4	ETEE504	Numerical Method and computer programming					
4	****	Elective-I	4	3	1	0	4
6	ETEE511	Power System-ILaboratory	1	0	0	2	2
7	ETEE512	Control System Laboratory	1	0	0	2	2
8	ETEE514	Numerical Method and Computer Programming Laboratory	1	0	0	2	2
TOTAL			**23**	**15**	**5**	**6**	26

Elective I:

1. ETEE521 Electrical Machine Design
2. ETEE522 Industrial Electrical System
3. ETEE523 Control System Design

SIXTH SEMESTER

S.No	CODE	COURSE TITLE	CREDIT	L	T	P	Hours Per Week
1	ETEE601	Power Systems-II	4	3	1	0	4
2	ETEE602	Power Electronics	4	3	1	0	4
3	ETEE 603	Switch Gear and Protection	4	3	1	0	4
4	****	Elective-II	4	3	1	0	4
5	****	Open Elective-I	4	3	1	0	4
6	ETEE611	Power Systems-II Laboratory	1	0	0	2	2
7	ETEE612	Power Electronics Laboratory	1	0	0	2	2
8	ETEE613	Switchgear & Protection Laboratory	1	0	0	2	2
TOTAL			**23**	**15**	**5**	**6**	**26**

Elective II: ETEE621B HVDC Transmission Systems

ETEE622B Power System Dynamic and Control

ETEE623B Power System SCADA

Open Elective I: ETCS627B Internet of Things

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

SEVENTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	HoursPer Week
1	ETEE701	Utilization of ElectricalPower	4	3	1	0	4
2	****	Elective III	4	3	1	0	4
3	****	Elective IV	4	3	1	0	4
4	****	Open Elective II	4	3	1	0	4
5	ETEE712	Project Stage-I	6	0	0	12	12
TOTAL			**22**	**12**	**4**	**6**	**28**

EIGHTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hours perweek
1	****	Elective V	3	3	0	0	3
2	****	Open Elective III	3	3	0	0	3
3		Open Elective IV	3	3	0	0	3
4	ETEE811	Project Stage-II	8	0	0	16	16
TOTAL			**17**	**9**	**0**	**16**	**25**

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Elective III:	1.	ETEE721	Electric Drives
	2.	ETEE722	Power Quality &FACTS
	3.	ETEC721	Electronic Design
Elective IV:	1.	ETEE723	Wind and Solar Energy System
	2.	ETEE724	Power System Reliability
	3.	ETEE725	Installation Maintenance and Testing Of Electrical Equipments
Open Elective II:	1.	ETCS721	Big Data Analysis
	2.	ETEC722	Digital Image and Video Processing
	3	ETCS822	Soft Computing
Elective V:	1.	ETEE821	Electrical Energy Conservation and Auditing
	2.	ETEE822	High Voltage Engineering
	3.	ETEE823	Smart Grid Technology
Open ElectiveIII:	1.	ETEE824	Biomedical Instrumentation
	2.	ETEC807	Embedded System Designing
Open ElectiveIV:	3.	ETEE825	Robotics and Automation
	1.	ETEC805	Low Power VLSI Design
	2.	ETCS821	Information Security
	3.	ETEE826	Power System Operation & Control

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

I[st] SEMESTER

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETSH-101
Course Name	Engineering Physics.
Course Credits	3 (T) + 1(P)= 4
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

1. Course Overview:

To impart knowledge in basic concepts of physics relevant to engineering applications.To introduce advances in technology for engineering applications. Apply Biot- Savart Law and Ampere's Law. To impart knowledge on the concepts of electrostatics, electric potential, energy.

2. Prerequisite: Basic Concept of semiconductor, Optics and Laser.

3. Objective of Syllabus:

- To impart knowledge in basic concepts of physics relevant to engineering applications.
- To introduce advances in technology for engineering applications.
- Apply Biot- Savart Law and Ampere's Law to compute magnetic field due to a current distribution.
- Calculate the field of a magnetized object.
- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	To design and conduct simple experiments as well as analyze and interpret data.
CO2	Engineering applications Capability to understand advanced topics in engineering.
CO3	Identify formula and solve engineering problems.
CO4	Apply quantum physics to electrical phenomena.
CO5	Apply engineering and physics concepts to the nano-scale and non-continuum domain.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

5. Syllabus.

UNIT I: ELECTROSTATICS AND ELECTROMAGNETIC

Electrostatics, Electric charge as point charge, charge distribution, Coulomb s law, Electric field, electric field due to point charge & charge distribution, Electrostatic Potential , Potential due to point charge, long charged wire, charged Spherical conductor & Electric dipole ,Ampere's law, application of Ampere's law, Biot- Savart law, Application of biot- savart law.

UNIT II: OPTICS & LASER

Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, Lasers , Characteristics of Laser, Ruby laser, Working Principle of He-Ne Laser. Polarization of light, Brewster's Law, Malu's Law.

UNIT III : QUANTUM PHYSICS

Planck's theory of black body radiation, Compton effect, Photo electric effect, Wave particle duality, De-Broglie waves, De-Broglie wave velocity, Wave and group velocity, Heisenberg's uncertainty principle, Application of uncertainty principle.

UNIT IV: SEMICONDUCTORS

Introduction of semiconductor, intrinsic & Extrinsic semiconductor, P –N junction, P-N junction with forward bias, P-N junction with reverse bias, reverse breakdown, light emitting diode, Zener diode, properties of Zener diode .

UNIT V: NANO-PHYSICS

Introduction and Basic definition of Nano Technology, Properties of Nano particles, Elementary ideas of Synthesis of Nano particles, Application of Nano particles.

REFERENCE BOOKS:

1. Modern Physics by G. Aruldhas & P. Rajagopal; Pub: Prentice Hall of India.
2. Quantum Physics by H.C. Verma Pub.: Surya Publication.
3. Lasers and Non-Linear Optics by B.B. Laud; Pub: New Age International (P) Ltd.
4. Principles of electricity by Leigh Page and Normal llsley Adams, Pub.: Eurasia Publishing House, New Delhi.
5. Engineering physics by Dr. Rakesh Dogra Pub: S.k Kataria & sons.
6. Engineering physics by Dr. Abhijit Nayak Pub: S.k kataria & sons.

ENGINEERING PHYSICS LAB SUB-CODE: ETSH-111 CREDIT: 01

LIST OF EXPERIMENTS:

Week 1: Find the acceleration due to gravity (g) with the help of bar Pendulum.
Week 2: To determine the external diameter of solid Cylinder by the slide calipers.
Week 3: To determine the thickness of glass plate by using Spherometer.
Week 4: To determine the diameter of metal wire by using Micrometer (Screw Gauge).
Week 5: Study the junction diode.
Week 6: To find the refractive index of a material given in the form of a prism by using a Spectrometer.
Week 7: To obtain the particle size by the laser.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETSH-102
Course Name	Engineering Mathematics - I
Course Credits	3 (T)
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

1. Course Overview:

Techniques in matrices, differentiation and Integration, advanced level of Mathematics and applications.

2. Prerequisite:

Basic knowledge of Algebra & Calculas.

3. Objective of Syllabus:

- Techniques in matrices, differentiation and Integration.
- It aims to equip the student's to deal with advanced level of Mathematics and applications that would be essential for their disciplines.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	Use both the limit definition and rules of differentiation to differentiate functions.
CO2	Apply differentiation to solve maxima and minima problems.
CO3	Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
CO4	Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
CO5	Determine convergence/divergence of improper integrals and evaluate convergent proper integrals.
CO6	Apply various techniques in solving differential equations

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

5. Syllabus.

UNIT I: LINEAR ALGEBRA

Matrix algebra, Determinant, Inverse and rank of a matrix by elementary transformation, solution of system of linear equation, vector, Basis, L.D&L.I, Eigen value and Eigen vector of a real matrix, properties of Eigen values, cay-lay Hamilton theorem. diagonalization of matrices.

UNIT II: DIFFERENTIAL CALCULUS

Limit, continuity and Differentiability, Successive differentiation, Leibnitz theorem, mean value theorem (Rolle's, Lagrange's Cauchy) Maxima & Minima for single variable, Taylor & Maclaurin Series.

UNIT III: FUNCTION OF SEVERAL VARIABLES

Partial derivative, Homogeneous functions and euler's theorem Total derivative, Differentiation of implicit function of two variables, Maxima and Minima of function of variables, Lagrange's method of undetermined co-efficient.

UNIT IV: INTEGRAL CALCULUS

Integration of various functions, Definition of proper and improper integral, Convergence of improper integral, Beta and gamma functions, Differentiation under integral sign.

UNIT V: CURVE TRACING

Curve tracing of Cartesian and Polar form, Surface area and volume of Surface of revolution.

REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher's, 36 th edition, 2010.
2. Erwin Kresyszig, Advance Engineering Mathematics, John Wiley and Sons, 9 th edition, 2006.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETCS-101
Course Name	Introduction to Artificial Intelligence
Course Credits	3 (T) + 1(P)= 4
Total Course Credit	181

Abbreviations: T-Theory, P-Practical

1. Course Overview:

The primary objective of this course is to introduce the basic principles techniques, and applications of. Artificial Intelligence, students will get basic knowledge about Searching techniques like hill climbing,A* Algorithm, AO*.

2. Prerequisite:

To understand the basic knowledge of Reasoning, Mathematics, Psychology and Learning Techniques.

3. Objective of Syllabus:

- The primary objective of this course is to introduce the basic principles
- techniques, and applications of. Artificial Intelligence
- In this course, students will get a basic introduction to the building blocks and components of artificial intelligence
- learning about concepts like algorithms.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	To understand Introduction to AI, Overview of AI, Problems of AI, AI technique, Searching techniques like hill climbing, A* Algorithm, AO*.
CO2	Understand the basic concept of Python, Data types, Variables, Basic input –output operations, Basic Operators, literals, Strings, Number and Conditional Statement, Loop Statements.
CO3	Ability to Define and Accessing List, tuple, Dictionary, Functions, Numpy, Matplotlib.
CO4	To understand Problem in representing knowledge, Knowledge representation using propositional and predicate logic, resolution.
CO5	Ability to understand Probabilistic reasoning, Baye's Theorem, Semantic networks, fuzzy logic, forward and backward reasoning.
CO6	Ability to understands Learning, various techniques in Learning, Introduction to Neural networks, application of Neural network, common sense and reasoning.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

5. Syllabus.

UNIT I:
Introduction to AI : History of AI, Overview of AI, Problems of AI, AI technique, Production Systems, Characteristics of production systems, Tic-Tac-Toe problems, Searching techniques like hill climbing,A* Algorithm, AO* Algorithm etc , and various types of control strategies.

UNIT II:
Introduction to Python: Python basics – Data types, Variables, Basic input –output operations, Basic operators, Python literals, Strings, Number, list, tuple, Dictionary, Functions, Conditional Statement, Loop Statements, Numpy, Matplotlib, Simple programming exercises using Python.

UNIT III:
Knowledge representation, Problem in representing knowledge, Knowledge representation using propositional and predicate logic, resolution, refutation, deducation, Theory proving, monotonic and non-monotonic reasoning.

UNIT IV:
Probabilistic reasoning, Baye's Theorem, Semantic networks, Scripts, Schema, frames, conceptual dependency, fuzzy logic, forward and backward reasoning, introduction to understanding,natural language processing.

UNIT V:
Introduction to learning, various techniques in Learning, Introduction to neural networks, application Neural network, common sense, reasoning, some example of expert systems.

TEXTBOOKS / REFERENCES

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligence by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligence: A Modern Approach, Prentice-Hall

INTRODUCTION TO A.I WITH PYTHON LAB SUB-CODE: ETCS-111 CREDIT: 01

LIST OF EXPERIMENTS:

Week 1: Python program to demonstrate the example for arithmetic operators
Week 2: Python program for simple interest
Week 3: Python program to find power of a number using exponential operator
Week 4: Python program Find largest of three number using nested if else.
Week 5: Python program Calculate discount based on the sale amount.
Week 6: Python program Demonstrate an example of for loop
Week 7: Python program Examples of loops (based on their control)

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Week 8: Python program Find factorial of a given number
Week 9: Python Program to print Odd and Even numbers from the list of integers.
Week 10: Python Program to calculate n-th term of a Fibonacci Series
Week 11: Python Program to check whether a given Number is prime or not prime.
Week 12: Python Program to check whether a given Number is Armstrong or not.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETSH-103**
Course Name	**SOFT SKILLS**
Course Credits	**3 (T) +1(P) = 4**
Total Course Credit	**177**

Abbreviations: T-Theory

1. **Course Overview**:This course will encourage students for self awareness,self Development, and will give good communication skill,Leadership knowledge, and will also have knowledge about Ethics.

2. **Prerequisite:**students should have knowledge about Basic English and communication and also about Basic Leading knowledge **.**

3. **Objective of the Syllabus:** The objective of this course to help the students to develop as team member, leader and all round professional in the long run. This course would focus on over all personality development of the student and to improve his technical writing and documentation.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

4. Course Outcomes:

S.No.	Course Outcomes (Cos)
CO1	Communicate, interact and present his ideas to the other professionals
CO2	Understand and aware of importance, role and contents of soft skills through instructions, knowledge acquisition, demonstration and practice
CO3	Have right attitude in al and behavioral aspects, and build the same through activities.
CO4	Possess right professional and social ethical values.
CO5	Possess knowledge about Time Management.

5.Syllabus:

.

UNIT I: SELF AWARENESS AND SELF-DEVELOPMENT

Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Emotional Intelligence, Lateral thinking, Depression and Habit, relating SWOT analysis &goal setting, prioritization.

UNIT II: COMMUNICATION SKILL

Importance of communication, Aspects of communication, communication through words, communicationthroughbodylanguage,communicationthroughtechnology,Oralcommunication, Listening Skills, Group Discussion and Interview Skills, Presentations kills: preparing the presentation, performing the presentation, Written communication: Reading comprehension, précis writing, Business and technical reports, Styles, Business correspondence, Memorandum writing, Notice, Agenda and Minutes, Research papers and articles, Advertising and job Description, Mechanics of Manuscript preparation.

UNIT III: INTERPERSONAL RELATIONSHIP

Teamwork, Team effectiveness, Group discussion, Decision making- Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics, Multicultural Diversity and Socializing

UNIT IV: LEADERSHIP SKILLS

Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, team building, Organizing and conducting meetings, decision making, giving support, Vision, Mission, Coaching, Mentoring and counseling, Appraisals and feedback, conflict, Power and Politics, Public Speaking.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

UNIT V: OTHER SKILLS

Managing Time, Managing Stress, Meditation. Improving personal memory, Study skills that include Rapid Reading, Note Taking, Self-learning, Complex problem solving and creativity, listening skill and speaking skills, Corporate and Business Etiquettes.

UNIT VI: ETHICS IN ENGINEERING PRACTICE AND RESEARCH Introduction to ethical reasoning and engineer ethics, Right and responsibilities regarding Intellectual property, workplace rights and responsibilities, Central Professional Responsibilities of Engineers, Responsibility for environment.

TEXTBOOKS:

1. Developing Communication Skill: Krishna Mohan, Meera Banerji, Mac-Millan India Ltd.
2. B.N Ghosh," Managing Soft Skills for Personality Development" McGraw-Hill.
3. Ethics in Engineering Practice and Research: Caroline Whitbeck, Cambridge University press.
4. A Course In Communication Skills: Kiranmai Dutt, Cambridge University press.
5. English for Business Communication: Simon Sweeney, Cambridge University Press.
6. Basics Of Communication In English: Francis Sounderaj, MacMillan India Ltd.
7. Group Discussions and Interview Skills: Priyadarshi Patnaik, Cambridge University Press.
8. Professional Presentations: Malcolm Goodale, Cambridge University Press.
9. An IntroductiontoProfessionalEnglishAndSoft Skills: Das, Cambridge University Press.
10 A practical course in Effective English speaking skills, G.K. Gangal, PHI Publication.

SOFT SKILL LAB **SUBJECT CODE ETSH-113** **CREDIT: 01**

LIST OF EXPERIMENTS

Week 1: Work/Assignments
Week 2: SWOT analysis Personal & Career Goal setting – Short term & long term Presentation Skill
Week 3: Dining EtiquettesLetter/Application/Notice/Agenda/MinuteswritingReportwriting
Week 4: Listening skills using Language laboratory
Week 5: Group discussion
Week 6: Resume writing

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETSH-105
Course Name	ENGINEERING CHEMISTRY
Course Credits	3 (T) + 1(P)= 4
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

1. Course Overview:

A number of academic and research options are available to students in various fields such as pharmaceuticals, food products, environmental monitoring and assessments, environmental chemistry, fuel chemistry, cosmetic chemistry, biochemistry, biomaterials, nano-chemistry, materials chemistry, polymer chemistry, industrial chemistry, water chemistry, etc. in addition to physical, organic and inorganic chemistry that a student can explore for choosing a professional career.

2. Prerequisite:

Students must have Chemistry as a one subject at +2 levels.

3. Objective of Syllabus:

i. Broad and balance knowledge in chemistry in addition to understanding of key chemical concepts, principles and theories.

ii. To develop students' ability and skill to acquire expertise over solving both theoretical and applied chemistry problems.

iii. To provide knowledge and skill to the students' thus enabling them to undertake further studies in chemistry in related areas or multidisciplinary areas that can be helpful for self-employment/entrepreneurship.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	Characterize bonding between atoms, molecules, interaction and energetics (ii) hybridization and shapes of atomic, molecular orbitals, bond parameters, bond- distances and energies.
CO2	Importance of hydrogen bonding, metallic bonding
CO3	Understanding chemistry of Water and its properties
CO4	Understanding principle of UV-Vis/FTIR spectroscopy and its applications.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

CO5	Understanding principles of NMR analysis and study of Flame photometry of materials/characterization of materials.
CO6	Understanding chemistry of polymers, their structures and uses.

5. Syllabus.

UNIT- I: CHEMICAL BONDING

Introduction, Molecular Orbital Theory (MOT), Sigma (σ) and pi (π) Molecular Orbitals, Energy level Diagram for Mono and Di atomic Molecules, Linear Combination of Atomic Orbitals (LCAO) Method, Crystal Field Theory, Calculation of CFSE

UNIT- II: WATER AND ITS TREATMENT

Introduction, Soft and Hard Water, Type of Hardness, Techniques for Water Softening- Lime Soda Process, Zeolite Process, Ion Exchange Process.

UNIT- III: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Basic concept of spectroscopy. Principle and Applications of different spectroscopic techniques (UV-Visible and IR spectroscopy). Nuclear magnetic resonance and magnetic resonance imaging. Elementary Discussion of Flame photometry.

UNIT- IV: POLYMER

Introduction, types of polymerizations. Classification, mechanism of polymerization (Free radical and Ionic polymerization). Thermoplastic, and thermosetting polymers Elementary idea of Biodegradable polymers, preparation, properties and uses of the following polymers- PVC, PMMA, Teflon, Nylon-6, Polyester phenol formaldehyde, Urea- Formaldehyde, Buna-s, Vulcanization of Rubber.

UNIT- V: CORROSION AND LUBRICANT

Lubricant- Definition, Classification with examples. Functions of Lubricant, Physical Characteristics of Lubricants Such and Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, and Cloud & Pour Point. Chemical Characteristics of Lubricant such as Acid Value or Neutralization Number, Emulsification, Saponification Value etc.

TEXT BOOKS:

- University Chemistry, by B.H. Mahan.
- Chemistry Principles and Applications, by M.J. Sienko and R.A. Plane.
- Fundamentals of Molecular Spectroscopy, by C.N. Banwell.
- Engineering Chemistry (NPTEL Web-book) by B.L. Tembe, Kamaluddin and M.S. Krishnan
- Physical Chemistry, by P.W. Atkins.

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

ENGINEERING CHEMISTRY LAB **ETSH-115** **CREDIT: 01**

OBJECTIVES OF THE COURSE:

This Engineering Chemistry Laboratory is common to first year branches of UG Engineering. At The end of the course the student is expected to provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems. Practical implementation of fundamental concepts.

LIST OF EXPERIMENT: -

Week 1: Qualitative analysis of given salts having three acidic and basic radicals.
Basic radicals: - Pb2+, Cu2+, Al3+, Fe2+, Fe3+, Cr3+, Zn2+, Ca2+, Ba2+ etc.
Acidic radicals: - Cl,Br-,I-,,SO4,NO3,OH- etc.

Week 2: Determination the total hardness of given water sample.

Week 3: To Determine the Saponification value of given oil sample.

Week 4: To Determine the acid value of given oil sample.

Week 5: Adsorption of acetic acid by charcoal.

Week 6: Synthesis of polymer /drug.

Week 7: To Determine the Ph of given solution by universal indicator or pH meter.

Week 8: To determine dissolved oxygen in water sample.

Week 9: To determine thinner content in oil paint.

Week 10: To determine carbon monoxide, carbon di-oxide, ointment emission from petrol vehicle.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology

Department of Electrical Engineering

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETEA - 111**
Course Name	Inter-disciplinary Experimental Active Learning (IDEA LAB)
Course Credits	**0 (T) + 2 (P) = 2**
Total Course Credit	

Abbreviations: T-Theory, P-Practical

1. Syllabus:

Course Objective:

The objective of an Idea Lab course is to foster creativity, innovation, and problem-solving skills among participants. Through a combination of theoretical learning, practical exercises, and hands-on projects, Idea Lab courses aim to:

Cultivate creative thinking: Encourage participants to think outside the box, explore unconventional solutions, and challenge traditional approaches to problem-solving.

Develop ideation skills: Equip participants with techniques and methods for generating, refining, and evaluating ideas effectively.

Promote collaboration: Foster a collaborative environment where participants can exchange ideas, provide feedback to each other, and collaborate on projects.

Encourage experimentation: Encourage participants to experiment with different ideas, prototypes, and solutions, embracing failure as a natural part of the creative process.

Course Outcomes:

The outcomes of an Idea Lab course go beyond the acquisition of knowledge to encompass the development of a creative and entrepreneurial mindset, equipping participants with the skills and confidence to thrive in a rapidly changing world.

LIST OF EXPERIMENTS: -

Week 1 To study various active & passive devices like R, L & C, battery etc.

Week 1 To study the CRO and function generator for signal analysis.

Week 2 To study the basics of mechatronics and various parts of a robot.

Week 3 To study the refrigeration and Air-conditioning system with future perspectives.

Week 4 Identification of various types fabrics like cotton, woolen, linen, silk etc.

Week 4 Identification of different types of stones and aggregates (visual identification) with study of their properties and applications.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Week 5 Identification of timbers: teak, Sal, chir, shisum, siras, deodar, kail and mango. (Visual identification) and with study of their properties and applications.

Week 6 Identification of hard drive, RAM, mother board and other important parts in a desktop computer

Week 7 To study the types of soil, water and renewable energy with present scenario and future challenges for sustainable development.

Week 8 To learn the parts of fan, LED bulb, induction cook top, electric iron etc.

Week 9 To study the working principle and various parts of a Hybrid Electric Vehicle (HEV)

Week 10 To study the various components of Green Building (also called as Zero Energy Building)

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology

Department of Electrical Engineering

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETME - 111**
Course Name	**Engineering Workshop Lab**
Course Credits	**0 (T) + 1 (P) = 1**
Total Course Credit	

Abbreviations: T-Theory, P-Practical

1. Syllabus:

Course Objective:

Providing basic knowledge of workshop tools, equipment, machineries and various workshop activities related to carpentry, smithy, foundry etc. with hands-on practices.

Course Outcomes:

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

- Use welding equipments to join the structures.
- Carry out the basic machining operations
- Illustrate on operations of smithy, Carpentry, foundry and fittings

LIST OF EXPERIMENTS: -

Week 1 Smithy Shop

(a) To prepare a ring a mild steel rod in black smithy shop.

(b) To prepare an eye-nail of M.S rod of 125 mm long & 8 mm thickness.

Week 2 Foundry Shop

(a) To prepare a V block casting using pit furnace.

Week 3 Carpentry Shop

(a) To prepare a dovetail joint in carpentry shop.

(b) To prepare a cross lap joint in carpentry shop.

Week 4 Fitting Shop

(a) To prepare a matching joint in fitting shop.

(b) To prepare a square by chipping & filling.

Week 5 Machine Shop

(a) To prepare a cylindrical job of dia. 25 mm to 22.5 mm on lathe using turning operation.

(b) Drilling Practice

Week 6 Welding

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

(a) To prepare a T-joint by arc welding.

(b) To prepare an L-shape corner joint by Arc welding.

Week 7 Sheet Metal Shop

(a) To prepare a conical funnel with soldering in sheet metal shop.

TEXT BOOK:

1. Jain, R.K. Production Technology.

2. Rao, P. N. Manufacturing Technology (Vol. I &II)

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

IInd SEMESTER

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETSH-201
Course Name	ENGINEERING MATHEMATICS –II
Course Credits	3 (T)
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

1. Course Overview:

This course will introduce the core concepts of differential equations, Laplace and Fourier transform, Fourier series and advanced level of mathematics and applications.

2. Prerequisite:

Basic knowledge of differential equation.

3. Objective of Syllabus:

- The objective of this course is to familiarize the prospective engineers with techniques in ordinary and partially differential equations, Laplace and Fourier transform, Fourier series, complex variables
- It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their discipline

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	After successfully completing the course, the student will have a good understanding of the following topics and their applications:
CO2	Analytic function, singularity, residues and complex integration
CO3	Laplace and Fourier transform and its properties, application of Laplace and Fourier transform
CO4	Laplace and Fourier transform and its properties, application of Laplace and Fourier transform.
CO5	Finding the solution of ode and pde

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

5. Syllabus.

UNIT 1: ORDINARY DIFFERENTIAL EQUATION

Ordinary differential equation: definitions, order and degree of differential equation, equation, exact differential equations, equations solvable for x, y and p, Clairaut's form, second order linear differential equation with constant coefficient, Cauchy -Euler's equation, Method of variation of parameter.

UNIT 2: PARTIAL DIFFERENTIAL EQUATION

Partial differential equations: Definition and formulation, partial differential equation of the first order, Non-linear Partial differential equations, Legendre's and Charpit's method, Homogeneous linear partial differential equation with constant co-efficient, Methods for finding C.F. and P.I. of Linear Homogeneous Partial Differential Equations.

UNIT 3: LAPLACE TRANSFORM

Laplace Transform: Definition and properties of Laplace transform, shifting theorem, Transform of derivative and integrals, Multiplication by t^n, Division by t. Inverse Laplace transform, convolution theorem (without proof) and its application.

UNIT 4: FOURIER SERIES AND FOURIER TRANSFORM

Fourier series: Periodic Function, Function of arbitrary period, Even and odd functions, half range Series Fourier Transform: definition and properties of Fourier transform, convolution, Parseval's identity for Fourier transforms, Relation between Fourier transform and Laplace transform.

UNIT 5: COMPLEX ANALYSIS

Complex Analysis: definitions, Cauchy- Riemann Equations, Harmonic functions, Elementary Analytic function and their properties, Cauchy Integral formula (without proof), Taylor's Series, Singularities, Residues, Cauchy Residue Theorem (without proof).

REFERENCE BOOK:

B.S. Grewal, Higher Engineering Mathematics, Khanna publisher's,44thedition
Erwin Kresyszig, Advance Engineering mathematics, John Wiley and Sons,9th edition

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Program Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE201**
Course Name	**Basic Electrical & Electronics Engineering**
Course Credits	**3 (T) + 1 (P) = 4**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

1. Course Overview:

The course provides a thorough understanding of fundamental electrical concepts, beginning with potential difference, current, resistance, and Ohm's law, progressing to advanced topics such as electromagnetism, magnetic circuits, and energy stored in magnetic fields. Students learn analysis techniques for DC circuits and AC fundamentals, including Kirchhoff's laws and sinusoidal voltage/current characteristics. Single-phase transformers and electrostatics are explored, covering construction, working principles, and capacitance. Semiconductor theory, diodes, rectifiers, and transistor configurations and applications are also studied. The course concludes with an introduction to Boolean algebra, logic gates, and simplification techniques, equipping students with a comprehensive skill set for electrical engineering and related disciplines.

2. **Prerequisite:** The prerequisite for the course encompasses a solid understanding of fundamental electrical concepts, including potential difference, current, resistance, and Ohm's law. Additionally, familiarity with electromagnetism, magnetic circuits, and basic analysis techniques for DC circuits and AC fundamentals is required. Students should also possess knowledge of single-phase transformers, electrostatics, semiconductor theory, and Boolean algebra.

3. Objective of the Syllabus:

- To explain the laws used in the analysis of DC and AC circuits.
- To understand and analyze AC & DC circuits.
- To provide students with a fundamental knowledge of Single-phase transformer construction and working.
- To provide students with a fundamental knowledge of AC Fundamentals.
- To provide students with a fundamental knowledge of Electrostatics.
- Familiarize with semiconductor devices, rectifier circuits, and their applications.
- Describe the basic applications of transistors.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

- Define logic gates & understand the working principles of logical circuits.
- Describe the significance of Boolean algebra in digital circuits.

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Students will comprehend fundamental electrical principles and electromagnetism, enabling them to analyze circuits and understand magnetic effects.
CO2	Learners will master DC and AC circuit analysis techniques, including Kirchhoff's laws and sinusoidal characteristics, enhancing their ability to analyze and design electrical circuits.
CO3	By the end of this module, students will be proficient in understanding the operation of single-phase transformers and electrostatic phenomena, enabling them to evaluate transformer efficiency and capacitor behavior.
CO4	Participants will gain expertise in semiconductor theory, diode, and transistor operation, facilitating their capability to design and analyze electronic circuits.
CO5	Students will develop skills in Boolean algebra and logic gates, allowing them to simplify logical expressions and design digital systems effectively.

5. Syllabus:

Unit I ELEMENTARY CONCEPTS

(A) Prerequisite: Concept of Potential difference. Current and resistance. Ohm's law, resistance Temperature coefficient, insulation resistance, SI units of work Power and Energy (B) Electromagnetism: Magnetic effect of an electric current, cross and dot conventions, right-hand thumb rule and corkscrew rule, Concept of M.M.F., flux, flux density, reluctance, permeability and Field strength, their units and relationships, the analogy of electrical and magnetic circuit, Energy stored In a magnetic field.

Unit II D. C. CIRCUITS AND AC FUNDAMENTALS

(A) Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Supernode And super mesh excluded). Source transformation. Star delta transformation. Superposition Theorem, Thevevnins's theorem Norton's theorem, maximum power transfer theorem (Source Transformation not allowed for superposition theorem, Mesh and Nodal analysis. (B) Sinusoidal voltage and currents, their mathematical and graphical representation, the concept of Cycle period, frequency, instantaneous, peak, average, R.M.S. values, peak factor, and form factor, Phase difference.

Unit III SINGLE PHASE TRANSFORMER AND ELECTROSTATICS

A) Single phase transformers: Construction, principle of working, e.m.f. equations, voltage, and current ratios, losses, the definition of regulation and efficiency, determination of these by direct

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

loading method. B) Electrostatics: electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity, and capacitance, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors.

Unit IV ANALOG DEVICES

A) Semiconductor theory:- Intrinsic and Extrinsic Semiconductors - N type and P type materials – mechanism of the hole and free electrons- majority and minority carriers, drift and diffusion current - Semi conductor diode - V -I characteristics of PN Junction diode, B) Rectifiers: Working and Waveforms of Half wave - Full wave - Bridge rectifiers (without filters) – Differences. C) Transistor: Working Principle of NPN and PNP transistor - Transistor as a switch - Transistor working as an amplifier- common base - common collector- common emitter configuration - input and output characteristics.

Unit V BOOLEAN ALGEBRA AND LOGIC GATES

A) Number representation: Decimal, Binary, Octal, and Hexa- decimal number systems - Conversion of numbers from one number system to another without decimal points - BCD Codes and limitations – Conversion of BCD to decimal and vice versa. B) Logic gates: Definition, truth table, symbol, and logical equations of logic gates: AND – OR - NOT- NAND – NOR-EXOR - EXNOR (Only 2-inputs) – Universal gates. C) Logic Simplification: Rules and laws of Boolean algebra – Demorgan's Theorem and proof - Simplification of logic functions using Boolean.

TEXT / REFERENCES BOOKS:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. E. Hughes, "Electrical and Electronics Technology, Pearson, 2010
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

Basic Electrical & Electronics Engineering Lab **SUB-CODE: ETEE-211** **CREDIT: 02**

A. BASIC ELECTRICAL ENGINEERING-

WEEK 1-5

1. Verification of Ohm's Law.
2. Verification of KVL (Kirchhoff's Voltage Law) and KCL (Kirchhoff's Current Law).
3. Verification of Superposition theorem.
4. To Verify the Maximum Power Transfer theorem.
5. Measurement of power and power factor of single phase AC circuit using three voltmeter methods.
6. Verification of The venin's theorem.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

7. To verify Norton's theorem.
8. To measure power and power factor in a single-phase A.C. circuit using a wattmeter.

B. BASIC ELECTRONICS ENGINEERING-

WEEK 6-11

1. CRO – Applications.
2. V- I characteristics of Silicon & Germanium PN junction diodes.
3. V-I characteristics of Zener diode.
4. Characteristics of BJT in Common Emitter Configuration.
5. Characteristics of JFET in common source configuration.
6. Half and Full wave rectifier without a filter.
7. Half wave and Full wave rectifier with Filter.
8. Characteristics of Common Emitter BJT amplifier.

REFERENCE BOOKS:

- E. Hughes, "Electrical and Electronics Technology, Pearson, 2010
- V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETCS201
Course Name	C Programming
Course Credits	3 (T) + 1(P)= 4
Total Course Credit	181

Abbreviations: T-Theory, P-Practical

1. Course Overview:

Understand the basic concept of C Programming, and its different modules that include Conditional and looping expressions, Arrays, Functions, Pointers, Structures and files.

2. Prerequisite:

To understand the basic knowledge of computer, Keyboard and operating system.

3. Objective of Syllabus:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, and Structures.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

4. Course Outcome:

S. No.	Course Outcomes (Cos)
CO1	Understand the basic concept of C Programming, Constants, variables & data types Operators and expressions managing input and output operators, and Branching Decision Making and Looping.
CO2	Understanding One–dimensionalArrays and their declaration and Initialisations, Two-dimensional Arrays and their initialisations, Multidimensional Arrays, Dynamic Arrays, String Variables, Reading and Writing Strings, Arithmetic Operations on characters, Putting Strings together, Comparison of Two Strings.
CO3	Understand the concept of Functions, Declaration, Definition and Calling of functions, Nesting function and Recursion, Passing array and string to functions, Storage classes: automatic, external and static variables.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

CO4	Ability to Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialisation of Structure, Comparing Structure Variables, Operation on Individual Members, Arrays of Structures, Structures within structures, Structures and Functions, Unions, Size of Structures
CO5	Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, Chain of Pointers, Pointer Expressions, Pointer Increments and Scale Factor
CO6	Understanding Pointers and Arrays, Pointers and Character Strings, Arrays of Pointers, Pointers and Function Arguments, Functions Returning Pointers, Pointers to Functions, Pointers and Structures, Union, File Management in C.

5. Syllabus.

UNIT I: INTRODUCTION TO PROGRAMMING

Introduction to components of a computer system (disks, memory, processor, where a Program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo Code with examples. From algorithms to programs; source code, variables (with data types) Variables and memory locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence.

UNIT II: CONDITIONAL BRANCHING AND LOOPS & ARRAYS

Writing and evaluation of conditionals and consequent branching, Iteration and loops Arrays (1-D, 2- D), Character arrays and Strings

UNIT III: **BASIC ALGORITHMS & FUNCTIONS**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

UNIT IV: RECURSION

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort**.**

UNIT V: STRUCTURE & POINTERS

Structures, Defining structures and Array of Structures Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

TEXTBOOKS / REFERENCES

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguru swamy, Programming ANSIC, Tata McGraw-Hill
3. C in Depth by S.K. Srivastava/ Deepali Srivastava

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

4. C Programming Language (Prentice Hall)
5. https://www.tutorialspoint.com/cprogramming/index.htm
6. https://www.geeksforgeeks.org/c-programming-language/
7. https://www.javatpoint.com/c-programming-language-tutorial

C PROGRAMMING LAB SUB-CODE: ETCS-211 CREDIT: 01

A Theory: Variable, Data type, Keyword ,Operator, Hello world Program, Control Structure, Array, Pointer

Week 1: Write a C program to find the sum of individual digits of a positive integer.

Week 2: Write a C program to generate Fibonacci series.

Week 3: Write a C program to generate all the prime numbers between 1 and n is a Value supplied by the user.

Week 4: Write a C program to find the roots of a quadratic equation.

Week 5: Two integer operands and one operator form user, performs the operation and then prints the result.

Week 6: Write a C program to find the factorial of a given integer by using recursive and non-recursive functions.

Week 7: A C program to find both the largest and smallest number in list of integers

Week 8: Write A C- Program to Determine If The Given String Is A Palindrome Or Not

Week 9: Example of Array In C programming to find out the average of 4 integers

Week 10: Write a program in c to Addition of two matrix in C

Week 11: Write a C program to implement the following searching method.

i) Linear search ii) Binary search

Week 12: Write C programs that implement the following sorting methods to sort a given list of integers in ascending order by using Bubble sort.

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology

Department of Electrical Engineering

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETME - 201**
Course Name	**Fundamental of Mechanical and Civil Engineering**
Course Credits	**3 (T) + 1 (P) = 4**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

1. Course Overview:

A course on "Fundamental of Mechanical and Civil Engineering" is foundational for understanding the physical principles that govern the behavior of solids and fluids. This part of the course covers topics such as force systems, moments, equilibrium conditions, free-body diagrams, and analysis of trusses, frames, and beams. Students learn how to calculate reactions, internal forces, and stresses in static systems. Fluid mechanics deals with the behavior of fluids (liquids and gases) at rest and in motion. Topics include fluid properties, fluid statics, fluid dynamics, continuity equation, Bernoulli's equation, momentum equation, flow in pipes, and boundary layer theory. Students learn about the principles governing fluid flow and their applications in engineering systems. Overall, a course on Fundamental of Mechanical & Civil Engineering provides students with a strong foundation in the principles of mechanics, enabling them to analyze and design mechanical and structural systems with confidence and precision.

2. Prerequisite:

Throughout the course, students are exposed to a variety of engineering problems and applications that require the application of mechanics principles. This could include analyzing structures, designing mechanical components, and solving real-world engineering challenges.

3. Objective of the Syllabus:

The main learning objective of this course is to prepare the students for:

- Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
- Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
- To understand the concepts of Centroid and centre of gravity.
- To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
- To study the concepts of properties of fluids.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

- To study the civil engineering materials and building components.

4. Course Outcomes:

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

S.No.	Course Outcomes (Cos)
CO1	Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
CO2	Apply the concepts of locating Centroid / center of gravity of various sections
CO3	To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
CO4	To study the concepts of properties of fluids.
CO5	To study the Civil Engineering Material, Survey and Building Components.

5. Syllabus:

UNIT 1 FORCE SYSTEMS AND FRICTION

Introduction –Laws of Mechanics – Lami's theorem,Triangle, Parallelogram and polygon law of forces –Force system and its classifications –Equivalent systems of forces, free body diagram.

Beam and types of beam – Support and types of support, Shear force and bending moment diagram– for cantilever and simply supported beam with concentrated, distributed load and couple.

Friction-its types, Laws of friction, Co-efficient of friction, Angle of friction, Angle of repose and its relation.

UNIT 2 CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA

Center of gravity and Moment of inertia; Centroid and center of gravity, Moment Inertia of area and mass, Radius of Gyration

UNIT 3 THERMAL ENGINEERING

Introduction, Classification of power plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear power plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles - Principle of vapour compression system – Layout of typical domestic refrigerator – Window and split type room Air conditioner

UNIT 4 BASIC CONCEPTS OF FLUID MECHANICS

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Fluid – definition, - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension,Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.Bernoulli's equation and its applications.

UNIT 5 CIVIL ENGINEERING MATERIAL, SURVEY AND BUILDING COMPONENTS

Civil Engineering Material:Brick, Stone, Cement, Concrete and its properties.

Surveying:Principles, Measurements of distances, Determination of angles, area, and leveling

Building components: Foundation and its types, bearing capacity,Requirement of goodfoundation

Superstructure: Brick masonry, Stone Masonry, beams, columns, Lintels, roofing, flooring, plastering.

BOOKS AND REFERENCES

Text Books

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education. 11thEdition, 2017

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

3. Nag. P.K. "Power Plant Engineering" Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008

4. B. C. Punamia- Surveying part-1

5. N.S. Basak – Surveying

6. Building Material – S. K. Duggal

7. R. K. Bansal Fluid Mechanics and Machinery

Reference Books

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.

2. Hibbeller, R.C., and Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

Fundamental of Mechanical and Civil Engineering **SUB-CODE:** ETME-211 **CREDIT: 01**

Course Objective:

The main learning objective of this course is to prepare the students for:

- Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
- Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
- To understand the concepts of Centroid and centre of gravity.
- To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
- To study the concepts of properties of fluids.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

- To study the civil engineering materials and building components.

Course Outcomes:

At the end of the course the students are able to:

- Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To study the concepts of IC engine components.

Syllabus:

Week 1 To verify the parallelogram law of forces.

Week 2 To verify the lami's theorem.

Week 3 To determine the coefficient of Friction of an inclined Plane.

Week 4 To study about the model of two stroke petrol engine.

Week 5 To study about the four stroke petrol engine and diesel engine.

Week 6 To Verify the Bernoulli's Theorem.

Week 7 To determine the compressive strength of Brick

Week 8 To determine the horizontal angle with prismatic and surveyor compass.

Week 9 To determine the area by chain survey.

Week 10 To measure horizontal and vertical angles in the field by using Theodolite.

BOOKS AND REFERENCES

Text Books

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education. 11thEdition, 2017

2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

3. Nag. P.K. "Power Plant Engineering" Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008

4. B. C. Punamia- Surveying part-1

5. N.S. Basak – Surveying

6. Building Material – S. K. Duggal

7. R. K. Bansal Fluid Mechanics and Machinery

Reference Books

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.

2. Hibbeller, R.C., and Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETSH-202**
Course Name	**TECHNICAL COMMUNICATION & PROJECT MANAGEMENT**
Course Credits	**3 (T)**
Total Course Credit	**177**

Abbreviations: T-Theory

1. **Course Overview**:

In this course student will learn about letter writing and technical presentation skills.

2. **Prerequisite:**

Basic knowledge of grammar, letter & application.

3. **Objective of the Syllabus**

- To introduce the students to the fundamentals of mechanics of writing.
- To facilitate them with the style of documentation and specific formal written communication.
- To initiate in them the art of critical thinking and analysis.
- To help them develop techniques of scanning for specific information, comprehension and organization of ideas.
- To enhance their technical presentation skills.

4. ourse Outcomes:

S.No.	Course Outcomes (Cos)
CO1	Students will heighten their awareness of correct usage of English grammar in writing and speaking
CO2	Acquisition of technical communication's generic aspects like Reading Technical Material, Technical Writing, Listening
CO3	Learning the skill of proofreading and copy editing, paraphrasing and spinning using technical tools
CO4	Learning the technical phrases and writing styles like descriptive, argumentative etc for developing good technical documents for presentations or disseminating technical documents

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

CO5	Accessing the reading material and developing the writing technical material with the use of technical concepts and tools

5.Syllabus:

UNIT I:

Mechanics of Writing: Grammar rules -Articles, Tenses, Part of Speech. General Reading and Listening comprehension – rearrangement & organization of sentences.

UNIT II:

Different kinds of written documents: Definitions- descriptions- instructions-recommendations-user manuals – reports – proposals. Formal Correspondence: Writing formal Letters. Reading & Listening Comprehension.

UNIT III:

Technical paper writing: documentation style – document editing – proof reading – Organizing and formatting Reading and listening comprehension of technical documents Technical presentations

UNIT IV:

Reading and listening comprehension of technical documents Technical presentations

UNIT V:

Project Writing

TEXT BOOKS:

- Essential Communication Strategies for Scientists, Engineers and Technology Professionals. II Edition. New York: IEEE press, 2002
- Technical Communication: A Reader-Centred Approach. V Edition. Harcourt Brace College Publication, 2003
- Technical Report Writing Today. VIII Edition (Indian Adaptation). New Delhi: Biztantra, 2004.
- Practical English Usage, Oxford University Press, 2000

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical LENGINEERING

.

Programme Structure	B. Tech (Electrical ENGINEERING)
Semester	2nd
Subject Code	ETME202
Course Name	Engineering Graphics & Design
Course Credits	0(T)+3(P)
Total Course Credit	169

Abbreviations: L-Lecture, T- Tutorial, P-Practical

1) **Course Overview:** This course of Graphics explains the concepts of engineering drawing of objects in order to develop the skill of designing the new and existing engineering products.

2) **Prerequisite:** There are no specific prerequisites for this course, although a basic understanding of Geometry and Menstruation is recommended.

3) **Objectives of the Syllabus:** To develop graphic skills for communication of concepts, ideas and design of engineering products among the students. To expose them to existing national standards related to technical drawings.

4) Course Outcomes: On successful completion of this course, the student will be able to

5)

SL No.	Course Outcomes (Cos)
CO1	Familiarize with the fundamentals and standards of Engineering graphics
CO2	Perform freehand sketching of basic geometrical constructions and multiple views of objects.
CO3	Project orthographic projections of lines and plane surfaces.
CO4	Draw projections and solids and development of surfaces.
CO5	Visualize and to project isometric and perspective sections of simple solids.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

6) Syllabus:

CONCEPTS AND CONVENTIONS

Importance of graphics in engineering applications–Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning, Scales

MODULE I: PLANE CURVES

Plane Curves: - Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of in volutes of square and circle – Drawing of tangents and normal to the above curves.

MODULE II: PROJECTION

Projection: - Types of projection, Orthographic projection, First and Third angle projection, Projection of points and lines, Line inclined to one plane, Inclined with both the plane.

MODULE III: PROJECTION OF PLANES AND SOLIDS

Projection of Planes and Solids: - Projection of Planes likes circle and polygons in different positions; Projection of polyhedrons like prisms, pyramids and solids of revolutions like cylinder, cones in different positions.

MODULE IV: SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Section of Solids: - Section of right solids by normal and inclined planes; Intersection of cylinders.

Development of Surfaces: - Parallel line and radial - line method for right solids, Introduction of surfaces-cylinder.

MODULE V: ISOMETRIC PROJECTIONS & COMPUTER AIDED DRAFTING

Isometric Projections: -Isometric scale, Isometric axes, Isometric Projection from orthographic drawing.

Computer Aided Drafting (CAD): Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.

ENGINEERING GRAPHICS & DESIGN LAB

Sub code: ETME111

LIST OF EXPERIMENTS: -

Week-1: Introduction to the sheet layout
Week-2: Dimensioning & Lettering
Week-3: Conic sections

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

Week-4: projection of points
Week-5: projection of lines
Week-6: projection of planes
Week-7: Section o Week-2: f solids and development of surfaces

BOOKS AND REFERENCES:

1) Bhatt, N.D.,Panchal V M and Pramod R. Ingle, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
2) Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press, 2015
3) Agrawal, B. and Agrawal C.M., “Engineering Drawing”, Tata McGraw, N. Delhi, 2008.
4) Gopalakrishna, K. R., “Engineering Drawing”,Subhas Stores, Bangalore, 2007.
5) Natarajan, K. V., “A text book of Engineering Graphics”, 28thEd.,Dhanalakshmi Publishers, Chennai, 2015
6) Shah, M. B., and Rana, B. C., “Engineering Drawing”, Pearson, 2nd Ed., 2009.
7) Venugopal, K. and Prabhu Raja, V., “Engineering Graphics”, New Age, 2008.

K.K. UNIVERSITY 803115 NALANDA

Pro Vice Chancellor
KK University
Berauti, Nepura, Bihar Sharif
Nalanda - 803115 (Bihar)

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical ENGINEERING

.

Programme Structure	**B. Tech (**Electrical ENGINEERING**)**
Subject Code	**ETCS202**
Course Name	**Basics of Internet of Things (IoT)**
Course Credits	**0(L) + 0(P)= 0**
Total Course Credit	**181**

Abbreviations: L-Lecture, P-Practical

ETCS-202 BASICS OF INTERNET OF THINGS (IOT)

OBJECTIVES OF THE COURSE:

- The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time.
- It's becoming the Internet of Things (IoT).
- The course enables students to understand the basics of Internet of things and protocols.
- It introduces some of the application areas where Internet of Things can be applied.
- Students will learn about the middleware for Internet of Things.

1. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural Models
CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
CO3	Appraise the role of IoT protocols for efficient network communication.
CO4	Elaborate the need for data analytics and security in IoT.
CO5	Illustrate different sensor technologies for sensing real world entities.

MODULE - 1 INTRODUCTION

Introduction, Definition and Characteristics of IoT, Some basic terminologies related to IoT, The technology
behind IoT, Design principles of IoT: Physical design of IoT, Logical design of IoT, Functional blocks of IoT,
, Advantage & Disadvantage of IoT. Applications of IoT.

MODULE-2 IOT& M2M

IoT& M2M ,M2M Communication, Key features of M2M, M2M Applications, Difference between IoT
and M2M, Sensing, Actuation, Basic of Networking. M2M ecosystem.

MODULE-3 IOT ARCHITECTURE

IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles-
IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoT acivity stack architecture- Resource model and Abstraction.

MODULE-4 IOT AND ITS COMPONENT

IoT and its component –Introduction, RFID, Applications of RFID, Wireless Sensor network
(WSN & VSN),Participatory Sensing Technology, Embedded platform for IoT. Interfacing a gas sensor to
Arduino.

MODULE- 5 IOT APPLICATION DEVELOPMENT AND DESIGN CHALLENGES

IoT Design methodology, Requirement and process model of IoT, Process specification, Information model for IoT application. IoT applications- smart city street lights-control and monitoring, Home automation,
E-health, Smart farming.

TEXT BOOKS /REFERENCES:

• Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press,2012.
• Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
• David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010.
• Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012. References:
• Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”,1st Edition, VPT, 2014
• Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”,
1st Edition, Apress Publications, 2013
• CunoP fister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Program Structure	B. Tech (Electrical Engineering))
Subject Code	ETEE301
Semester	3rd
Course Name	Electric Circuit Analysis
Course Credits	3 (T) + 2 (P)= 5
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

1. Course Overview:

This course covers advanced electrical circuit analysis topics, network theorems, solution techniques for first and second-order networks, sinusoidal steady-state analysis, Laplace transform methods, and two-port networks. It provides a comprehensive understanding of linear electrical networks and their behavior under different conditions.

2. Prerequisite:

- Basic understanding of electrical circuits and circuit analysis techniques.
- Proficiency in algebra and calculus.
- Familiarity with basic circuit elements such as resistors, capacitors, and inductors.
- Knowledge of basic electrical laws such as Ohm's law and Kirchhoff's laws.

3. Objective of the Syllabus:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits
- To educate on obtaining the transient response of circuits
- To introduce phasor diagrams and analysis of three-phase circuits
-

4. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	• Ability to apply superposition, Thevenin, Norton, and other network theorems. • Proficiency in node and mesh analysis.

	• Understanding of duality and dual networks concepts.
CO2	• Skill in solving first and second-order differential equations for circuits. • Capability to analyze transient and steady-state responses of circuits. • Competence in determining initial and final conditions in network elements.
CO3	• Proficiency in representing sine functions as phasors. • Understanding of AC circuit analysis and phasor diagrams. • Competence in analyzing three-phase circuits and coupled circuits.
CO4	• Ability to apply Laplace transforms for circuit analysis. • Skill in determining transfer functions, poles, and zeros. • Competence in frequency response analysis and resonance studies.
CO5	• Understanding of two-port network parameters and relationships. • Proficiency in interconnecting two-port networks. • Capability to analyze circuits using impedance and admittance parameters.

5. Syllabus:

Unit I Network Theorems

Superposition theorem, the Thevenin theorem, the Norton theorem, the Maximum power transfer theorem, Reciprocity theorem, Compensation theorem, Analysis with dependent current and voltage sources, Node and Mesh Analysis, Concept of duality and dual networks.

Unit II Solution of First and Second order networks

Solution of first and second-order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

Unit III Sinusoidal steady state analysis

Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power, and complex power. Three-phase circuits, Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

Unit IV Electrical Circuit Analysis Using Laplace Transforms

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions, Transfer function representation, Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances.

UnitV Two Port Network and Network Functions

Two Port Networks, terminal pairs, the relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two-port networks.

BOOKS AND REFERENCES

Text Books

- M.E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
- D. Roy Choudhury, "Networks and Systems", New AgeInternationalPublications,1998.
- W.H.HaytandJ.E.Kemmerly,"EngineeringCircuitAnalysis", McGrawHillEducation,2013.

Reference Books

- C.K.AlexanderandM.N.O.Sadiku,"ElectricCircuits",McGrawHillEducation,2004.
- K.V.V.MurthyandM.S.Kamath,"BasicCircuitAnalysis",JaicoPublishers,1999.

Electric Circuit Analysis LAB SUB-CODE: ETEE311 CREDIT: 02

Course Objective:

- To gain practical experience in electric circuits and verification of theorems.

Course Outcomes:

At the end of the course, the students can:

- Understand and apply circuit theorems and concepts in engineering applications.

Syllabus:

Week 1:
Verification of the Z-parameter of a T network and its cascade connection.

Week 2:
Verification of the Y-parameter of a T network and its cascade connection.

Week 3:
Verification of the h-parameter of a T network and its cascade connection.

Week 4:
Verification of ABCD parameter of a T network and their cascaded connection.

Week 5:
Transient response of RLC circuit.

Week 6:
To observe and plot the transient waveform for a series RC circuit and compute the time constant.

Week 7:
Measurement of three-phase power using two-watt meter methods.

Week 8:
Verification of Thevenin's Theorem.

Week 9:
Verification of Norton's Theorem.

Week 10:
Verification of Maximum Power Transfer Theorem.

REFERENCE BOOKS:

- C.K.AlexanderandM.N.O.Sadiku,"ElectricCircuits", McGrawHillEducation,2004.
- K.V.V.MurthyandM.S.Kamath,"BasicCircuitAnalysis", JaicoPublishers,1999.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Program Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEC301**
Semester	**3rd**
Course Name	**Analog &Digital Electronics**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

6. Course Overview:

This course provides a comprehensive understanding of both analog and digital circuits, covering fundamental concepts, design methodologies, and practical applications in the field of electronics.

Analog Circuits: Students will delve into the world of analog circuits, where continuous signals play a crucial role. They will learn about operational amplifier applications, including various configurations such as instrumentation amplifiers and waveform generators. Active filters and their configurations will be explored, alongside analysis techniques for filters like low-pass and high-pass filters. Additionally, the course covers other essential analog components and circuits such as diode rectifiers, IC 555 timers, and voltage regulators.

Digital Circuits: The digital circuits segment of the course introduces students to the realm of discrete signals and binary logic. They will gain a deep understanding of combinational circuits, including Boolean algebra, Karnaugh maps, and the design of basic logic gates. Sequential circuits, such as counters and shift registers, will be explored in detail, along with an introduction to digital memories like SRAM, DRAM, and ROM. Moreover, students will learn about various digital logic families and programmable logic devices (PLDs), including PALs, CPLDs, and FPGAs.

Course Objectives:

- Provide a strong foundation in analog and digital circuit theory and analysis.
- Equip students with the skills to design and analyze analog circuits, including operational amplifier applications, active filters, and waveform generators.
- Enable students to design and implement digital circuits, covering combinational and sequential logic circuits, digital memories, and logic families.

- Foster practical skills through hands-on exercises, circuit simulations, and laboratory experiments.
- Prepare students for real-world applications in electronics engineering, spanning industries such as telecommunications, consumer electronics, and embedded systems.

7. **Prerequisite:**

- Basic understanding of circuit theory and electronic components.
- Familiarity with algebra and Boolean logic.
- Proficiency in circuit analysis techniques, including Kirchhoff's laws and Ohm's law.

8. Objective of the Syllabus:

The syllabus aims to provide students with a comprehensive understanding of analog and digital circuits, enabling them to:

- Grasp fundamental concepts in both domains.
- Develop proficiency in designing, analyzing, and optimizing circuits.
- Cultivate problem-solving skills for real-world engineering challenges.
- Gain hands-on experience through laboratory work and projects.
- Prepare for further study or careers in electronics engineering.

9. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	• Understand Boolean algebra and its applications in circuit design. • Learn to simplify Boolean expressions using Karnaugh maps. • Design combinational circuits like encoders, decoders, and adders using Boolean expressions and K-maps.
CO2	• Gain insight into sequential circuit design principles. • Design synchronous and asynchronous counters. • Implement shift registers and various types of counters.
CO3	• Understand different types of digital memories like SRAM, DRAM, and ROM. • Learn about various digital logic families such as PAL, PLA, CPLD, and FPGA.
CO4	• Understand the working principles of operational amplifiers. • Gain proficiency in designing and analyzing various operational amplifier circuits such as comparators, filters, and waveform generators.
	Other Analog Circuits(CO5A) • Learn about active filters and their configurations. • Understand the working principles and applications of the IC 555 timer.

CO5	• Design voltage regulators using ICs like 78xx, 79xx, and LM 317. Diode Rectifiers(CO5B) • Understand the operation of single-phase half-wave and full-wave rectifiers. • Design rectifier circuits supplying resistive and RL loads. • Gain insight into three-phase full-wave bridge rectifiers and their performance parameters.

10. Syllabus:

Unit I Design of combinational circuit

Booleans algebra, De-Morgan theory, etc, Karnaugh map: structure for two, three, and four Variables, SOP and POS form reduction of Boolean expressions by K-map. Design of combinational circuits using Boolean expression and K-map, encoder, decoder, half and full adder.

Unit II Design of Sequential Circuit

Introduction to the sequential circuit. Design of synchronous (K-map) and asynchronous counters. Up-down counters, N modulo counters, Shift registers, ring and twisted ring counters.

Unit III Digital memories and logic families

Digital memories: SRAM, DRAM,ROM, EPROM Digital logic families: PAL, PLA, CPLD, FPGA.

Unit IV Operational Amplifier Applications

Open loop and close loop configuration of Op-Amp. Applications of Op- Amp- zero crossing detectors, Comparator, Schmitt trigger, V-I and I-V converters, Instrumentation amplifier, peak detector, Waveform generation using Op-amp - sine, square, saw tooth and triangular generator.

UnitV (A) Other Analog circuits

Active filters-Its configuration with frequency response, Analysis of first order low pass and high pass filters using OPAMP, IC 555 –construction, working and modes of operation- as table and mono stable multi vibrators, Sequence generator, voltage regulators using IC78xx, 79xx, LM 317.

(B) Diode rectifier

Single phase half wave rectifier with R, RL loads. Single phase full wave rectifier-Center taps and bridge rectifier supplying R and RL load and performance parameters. Three phase full wave bridge rectifier with R load.

BOOKS AND REFERENCES (Text Books& Reference Books)

· **Microelectronic Circuits"**Author: Adel S. Sedra, Kenneth C. Smith , Edition: 7th Edition (2015), Publisher: Oxford University Press

· **"Digital Design: Principles and Practices"** Author: John F. Wakerly Edition: 4th Edition (2005)**,**Publisher: Pearson Education

· **"Fundamentals of Electric Circuits"** Author: Charles K. Alexander, Matthew N. O. Sadiku **,** Edition: 6th Edition (2020), Publisher: McGraw-Hill Education

·**"Analog Integrated Circuit Design"** Author: David A. Johns, Ken Martin**,** Edition: 2nd Edition (1997)**,** Publisher: Wiley

· **"CMOS VLSI Design: A Circuits and Systems Perspective"** Author: Neil H. E. Weste, David Money Harris**,** Edition: 4th Edition (2010)**,** Publisher: Pearson Education

OPERATING SYSTEMS LAB SUB-CODE: ETEC 316 CREDIT: 02

Course Objective:

- This course aims to provide students with a comprehensive understanding of analog and digital circuits, covering fundamental principles, design methodologies, and practical applications. The course will equip students with the knowledge and skills necessary to analyze, design, and optimize electronic circuits for various engineering applications..

Course Outcomes: At the end of the course, the students can:

- Understand fundamental concepts of analog and digital circuits.
- Design and analyze circuits effectively.
- Develop problem-solving skills.
- Apply knowledge to real-world applications.
- Prepare for further study or careers in electronics engineering.

Syllabus:

List of Experiments:

Perform any eight (three experiment should be on bread board/trainer kit) experiment from following list:

Week 1:

Design of logical circuit for display of decimal number on seven segment display.

Week 2:

Deign 3:8 decoder for binary to octal decoding.(Hardware)

Week 3:

Design three bit full adder using any open source software. (Software)

Week 4:

Design logical circuit to convert binary to EXCESS 3/Gray number system. (Hardware)

Week 5:

Design digital clock or stop watch using decade counter.(IC74192) (Hardware)

Week 6:

Find phase angle difference between same frequency signal using ZCD and AND gate. (Hardware)

Week 7:

Design of comparator and schmitt trigger. (Hardware)

Week 8:

Study of Instrumentation amplifier using three Op-amp, CMRR measurement (Hardware)

Week 9:

Design sine, and triangular wave generator. (Hardware)

Week 10:

Design first order high pass and low pass filter using OPAMP in any open source software. (For this provide one statement to each of four students to perform with desired cut-off frequency. Each group will demonstrate their result and prepare documentation) (Software)

Week 11:

Design of monostable mutivibrator using IC555 and digital circuit to count number of pulses. (Hardware)

Week 12:

Design as table multivibrator using IC-555. (Hardware)

Week 13:

Design of single phase bridge rectifier with output voltage and specified ripple.(this practical should be design by each students, perform in simulation and demonstrate with hardware in laboratory with design documents) (Software and Hardware)

REFERENCE BOOKS:

·**"Analog Integrated Circuit Design"** Author: David A. Johns, Ken Martin**,** Edition: 2nd Edition (1997)**,** Publisher: Wiley

· **"CMOS VLSI Design: A Circuits and Systems Perspective"** Author: Neil H. E. Weste, David Money Harris**,** Edition: 4th Edition (2010)**,** Publisher: Pearson E

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE302**
Course Name	**ELECTRICAL MACHINE-I**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**174**

Abbreviations: T-Theory, P-Practical

11. Course Overview:

This course will introduce the core concepts of magnetic circuit applied for Electromechanical energy conversion in DC machines and Transformer. It will help students to understand the construction, working principle and operation of different types of DC machines and transformers along with performance index such as efficiency, regulation and power generated in any electrical machines. It also helps students to analyze the losses to improve the efficiency by conducting various tests.

12. **Prerequisite:** To understand the basic network circuit theory and concepts of Electromagnetic fields.

13. Objective of the Syllabus:

This course Electrical machine-1 is a core subject of Electrical Engineering that deals with various electrical machines. As a civilization we need to harness power in order to satisfy both personal and commercial needs which can be carry out by the application of Electrical machines as they are more efficient and economic as compared to the conventional method. That's why it become very crucial to understand the construction, operation and working phenomenon of any electrical machine. In this course students will able to gain knowledge of different types of DC machines and Transformers. This course also enlightens the various performance parameter of machines like efficiency, regulation and output power generation. It also helps to analyze the different losses encounter during operation of a machine especially DC machines and Transformers to improve efficiency by carrying out several tests.

14. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Analyze the theory of electro-mechanical energy conversion to develop the concept of magnetic flux produced in different machines.

CO2	Discuss the construction, working and performance of DC generator to estimate emf, number of turns, voltage regulation, efficiency, losses etc.
CO3	Discuss the construction, working and performance of DC motor to estimate back emf, speed, various currents, torque, losses and interpret characteristics of various types of DC motor.
CO4	Outline the principle of operation, construction and testing of single- phase transformers and apply the knowledge of transformer fundamental to estimate emf, number of turns, voltage regulation, efficiency, losses etc.
CO5	Interpret the procedure and implementation to perform with understanding of various connections of three phase transformer.

15. Syllabus:

Unit I: ELECTROMECHANICAL ENERGY CONVERSION

Electro mechanical energy conversion: Forces and torque in magnetic systems, energy balance, energy and force in a singly excited and multi excite d magnetic field systems, determination of magnetic force, co energy.

Unit II: DC GENERATORS

Principle of operation, construction, armature windings, lap and wave windings, simplex and multiplex windings, use of laminated armature, commutator, emf equation, types of DC generators, voltage build up, critical field resistance and critical speed, causes for failure to self-excite and remedial measures; Armature reaction: Cross magnetization and demagnetization, ampere turns per pole, compensating winding, commutation, reactance voltage, methods of improving commutation; Characteristics: Principle of parallel operation load sharing, use of equalizer bars and cross connection of field windings problems.

Unit III: DC MOTORS AND TESTING

Principle of operation, back EMF, torque equation, condition for maximum power developed, types of DC motors, armature reaction and commutation, characteristics, methods of speed control, types of starters, numerical problems; Losses and efficiency: Types of losses, calculation of efficiency, condition for maximum efficiency. Testing of DC machines: Swinburne's test, brake test, regenerative testing, Hopkinson's test, field's test, retardation test and separation of stray losses, problems.

Unit IV: SINGLE PHASE TRANSFORMERS

Single phase transformers: Principle of operation, construction, types of transformers, EMF equation, concept of leakage flux and leakage reactance, operation of transformer under no load and on load, pharos diagrams, equivalent circuit, efficiency, regulation and all-day efficiency; Testing of transformer: objective of testing, polarity test, measurement of resistance, OC and SC tests, back to back test, heat run test, parallel operation, problems.

Unit V: THREE PHASES TRANSFORMERS

Three phase transformers: Principle of operation, star to star, delta to delta, star to delta, delta to star, three phase to six phase, open delta connection, Scott connection; Auto transformers: Principles of operation, equivalent circuit, merits and demerits, no load and on load tap changers, harmonic reduction in phase voltages, problems.

BOOKS AND REFERENCES

Text Books

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. J B Gupta, "Theory and Performance of Electrical Machines", S K Kataria & Sons publications, 14thedition, 2010.3. IJNa 2010.
3. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

Reference Books

1. P S Bimbra, "Electrical Machines", Khanna publications, 2nd edition, 2008.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

ELECTRICAL MACHINE-I LAB

SUB-CODE: ETEE312 **CREDIT: 02**

Course Objective:

- Illustrate the theory of electro mechanical energy conversion and the concept of co energy.
- Demonstrate the working principle of different types of dc machines and transformers.
- Analyze the losses in dc machines to improve the efficiency by conducting various tests.
- Outline the principle of operation, construction and testing of single-phase transformers.

Course Outcomes:

At the end of the course the students are able to:

- Define the basic terms related to term magnetic circuits, electromagnetic force production, DC machines and Transformers.
- calculate the performance parameters of various kinds of D.C machines and 1-phase and 3-phase transformers.
- Analyze the performance characteristics of various types of D.C machines and Transformers.
- Identify the various types of starters.

Syllabus:

Week 1: To study the construction of a D C Machine.
Week 2: To study the construction of 3- point starter of a DC Machine.
Week 3: To Measure power in a 3 phases circuit by 3 wattmeter method.
Week 4: To Measure power in a 3 phases circuit by two watt meter method.

Week 5: To study the construction of single phase transformer.
Week 6: To study the construction of three phase transformer.
Week 7: To find the efficiency of a single phase Transformer by Direct loading.
Week 8: To Start DC shunt motor by using three point starters.
Week 9: To observer set he direction of DC motor.
Week 10: To obtain the Speed control of DC shunt motor (Armature and Field control).

REFERENCE BOOKS:

1. P S Bimbra, "Electrical Machines", Khanna publications, 2nd edition, 2008. 2. J B Gupta, "Theory and Performance of Electrical Machines", S K Kataria & Sons publications, 14thedition, 2010.3. IJNa 2010.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Programme Structure	B. Tech (Electrical Engineering)
Subject Code	ETEE302
Course Name	Energy storage Technology
Course Credits	3 (T) + 2 (P)= 5
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

16. Course Overview:

This comprehensive course provides a thorough understanding of various energy storage technologies, from traditional batteries to advanced fuel cells and alternate storage methods. It covers the principles, types, applications, and environmental aspects, offering students a holistic view of the evolving landscape of energy storage in the modern world.

17. **Prerequisite:**

Understanding of fundamental principles of physics, including energy, electricity, and electrochemistry, to ensure a solid foundation and successful learning experience in Energy Storage Technologies.

18. Objective of the Syllabus:

a. Identify the various energy storage devices and their utilization.
b. Understand the fundamental concepts of batteries and their operation.
c. Understand the battery technology used in Electric and Hybrid Vehicles.

19. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand and compare different energy storage technologies and their applications in real-world scenarios.
CO2	Understand and assess the storage density and safety considerations of various battery types.
CO3	Understand the power electronic interfaces for wind and solar generation.
CO4	Understand the analysis of each fuel cell type, their advantages, and drawbacks.
CO5	Understand the concept of Hybrid Storage and its applications.

20. Syllabus:

Unit 1: INTRODUCTION TO ENERGY STORAGE

Energy storage - Utilization of Energy storage devices - Need for Energy Storage-Types of energy Storage Comparison of Energy Storage technologies - Applications.

Unit II: ELECTRICAL ENERGY STORAGE

Concept of batteries - Measurement of Battery performance Charging and Discharging- Storage Density Safety issues. Types of Batteries - Lead Acid, Nickel-Cadmium, Zinc manganese dioxide and Modern batteries -Zinc Air, Nickel Hydride, lithium battery.

Unit III: FUEL CELL

Fuel Cell-History of fuel cell - Principle of electrochemical Storage-Types-Hydrogen oxygen cells, Hydrogen air cell-Hydrocarbon air cell-alkaline fuel cell-detailed analysis - advantage and drawback of each cell.

UNIT IV ALTERNATE ENERGY STORAGE TECHNOLOGIES

Solar Photovoltaics Compressed, Wind Power, Flywheel, Super Capacitors Principles & applications, Air Energy Storage- Concept of Hybrid Storage – Applications.

UNIT V ELECTRIC VEHICLE

Electric Vehicle-Types-Hybrid, Vehicle- Battering Charging - Usage of batteries in Hybrid vehicle - Fundamentals of Electric vehicle modeling - EV and the Environment - Pollution effect.

BOOKS AND REFERENCES

Text Books

1. 'Energy Storage: Fundamentals, Materials and Applications'.by Robert Huggins,***2011***
2. Energy Storage for Power Systems by A. A. Hussein, ***2019***
3. Electric Energy Storage Systems: Flexibility Options for Smart Grids by Andreas Sumper,***2018.***

Reference Books

1. 'Energy Storage: Fundamentals, Materials and Applications'.by Robert Huggins,***2011***
2. Wind Energy Storage Systems by Panos M. Pardalos ***2014.***
3. Electric and Hybrid Vehicles: Design Fundamentals by Iqbal Husain ***2019***

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Program Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE401**
Course Name	**Electrical Machine- II**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

21. Course Overview:

This course imparts knowledge of Rotating Magnetic Fields and, the construction & performance of salient, non-salient, and induction motors. Computing induction and synchronous machines' losses, efficiency, and starting-running speed control.

22. **Prerequisite:** To basic understand the Faraday law of electromagnetic induction, mutual induction, and principles of Lenz's law.

23. Objective of the Syllabus:

The objective of this foundational course is to develop fundamentals, physical concepts, and systematic development of circuit models analysis of synchronous, induction motors and special machines. Construction and performance of salient and non-salient type synchronous generators.

- Principle of operation and performance of the synchronous motor.
- Construction, principle of operation, and performance of induction machines.
- Starting and speed control of three-phase induction motors.

- Construction, principle of operation, and performance of single-phase induction motors and special machines.

24. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Fundamental of A.C machine, revolving magnetic fields, 3-D visualization of windings. Air gap MMF, concentrated winding and distributed winding.
CO2	Basic understanding of 90-degree and 120-degree winding, pulsating, revolving magnetic fields, and constant magnetic fields.
CO3	Induction machine types, squirrel cage, slip ring rotor, slip-speed characteristics, losses, efficiency, cogging, and crawling.
CO4	Single-phase induction motor, induction generator, split type motor, special motors
CO4	Synchronous machine constructional features, pole pitch, cylindrical and salient type rotor, types of starting methods, operating characteristics of synchronous machine(V-curve, inverted V-curve).

25. Syllabus:

Unit I Fundamental of AC Machines

Fundamentals of AC machine windings Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding-concentrated and distributed, Sinusoidally distributed winding, winding distribution factor

Unit II Concept of Magnetic Fields

Pulsating and revolving magnetic fields Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field .

Unit III 3-Phase Induction Machine

Induction machine construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque, Equivalent circuit, Phasor Diagram, Losses and Efficiency, Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency), Methods of starting, braking and speed control for induction motors. Generator operation, Self-excitation,Doubly-Fed Induction Machines

Unit IV Single-Phase Induction Motor

Single-phase induction motors Constructional features double-revolving field theory, equivalent circuit, and determination of parameters, Split-phase starting methods, and applications

Unit V Synchronous Machine

Synchronous machines Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves, Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division

BOOKS AND REFERENCES

Text Books

1. Electrical Machines by Nagrath and Kothari, McGraw-Hill Edition 2010 *Year.*
2. P.S.Bimbhra, Electrical Machines, Khanna Publishers Edition 2011 *Year.*

Reference Books

1. V.Del Toro, "Electrical Machines & Power Systems", 1985, Prentice-Hall, Inc., Englewood cliffs 1985 *Year*
2. Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co 2016 *Year*.
3. Samarajit Ghosh, Electrical Machines, Pearson Edition 2012*Year*

ELECTRICAL MACHINE LAB SUB-CODE: ETEE401 CREDIT: 02

Course Objective:

To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

Course Outcomes:

After the completion of course, students must learn the foundation to the theory of electromechanical
devices with specific emphasis on transformers and induction motor.

Syllabus:

Week 1: Load test on 3-phase Induction Motor..

Week 2: Parallel operation of 3-phase alternator with infinite bus bar.

Week 3: To perform no load and blocked rotor test on a 3-phase Induction motor and to determine the parameters of its equivalent circuits. Draw the circuit diagram and compute the following i) Maximum torque ii) Current iii) slips iv) Power factor v) efficiency

Week 4: To plot the V – curve & inverted V - curve for a Synchronous motor for different values of loads.

Week 5: To plot the OCC and SCC of an alternator and to determine its Zs, Xd, and regulation by synchronous impedance method**.**

Week 6: To determine the voltage regulation of 3 phase alternator by Direct Loading

Week 7: To Study the DOL starter and provide a connection to the 3-phase Induction motor.

Week 8: Visit the substation of the Institute and observe the sequence of operation to make DG set ON and OFF.

Week 9: synchronization of two three phase alternator by

(A) synchroscope method

(B) Three dark lamp method

(C) Two bright one dark lamp method

.

Week 10: To determine the equivalent circuit parameters of 3-phase induction motor by No-Load & Block Rotor test.

Week 11: Study of universal motor. Study of different types of stepper motors. Outcomes Ability to model and analyze electrical apparatus and their application to power systems.

REFERENCE BOOKS:

1.) Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co 2016 *Year*.

2.) Samarajit Ghosh, Electrical Machines, Pearson Edition 2012*Year*

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering

Program Structure	B. Tech (Electrical Engineering)
Subject Code	ETEE-302
Course Name	Engineering Mathematics - III
Course Credits	3 (T)
Total Course Credit	177

Abbreviations: T-Theory, P-Practical

Course Objective:

The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

MODULE I: BASIC PROBABILITY

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

MODULE II: CONTINUOUS PROBABILITY DISTRIBUTIONS AND BIVARIATE DISTRIBUTIONS

Continuous random variables and their properties, distribution functions and densities, normal, bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule

MODULE III: BASIC STATISTICS MEASURES OF CENTRAL TENDENCY

Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

MODULE IV: APPLIED STATISTICS

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

MODULE V: SMALL SAMPLES

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Course Outcomes:

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Basic Probability,
- Applied Statistics
- Continuous Probability Distributions and Bivariate Distribution
-

REFERENCE BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher's, 36th edition, 2010.
2. Erwin Kresyszig, Advance Engineering Mathematics, John Wiley and Sons, 9th edition, 2006.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEC413**
Course Name	**Microprocessors &Microcontroller**
Course Credits	**3 (L) + 2 (P)= 5**
Total Course Credit	**174**

Abbreviations: L-**lectures per week,** P-Practical

26. Course Overview:

This course offers an integrated treatment of both hardware and software aspects of 8085 ad 8086 microprocessor along with 8051 microcontroller and also focuses on the basic concepts underlying programmable devices. Providing a sound pedagogy from basic concepts to applications. It prepares users to apply concepts learned to a variety of situations they may encounter in their future jobs. This course covers the hardware aspects of the microcomputer as a system using a spiral approach in exploring and re-exploring topics from various perspectives; introduces programming step by step, beginning with 8085 and 8051 instructions; examines programming techniques, program development, and software development systems; and integrates hardware and software concepts in interfacing and designing microprocessor and microcontroller-based products.

27. **Prerequisite:**

- Computer Organization basics
- Computer Networks basics
- Number systems & digital logic design concepts
- Basic compilation process

28. Objective of the Syllabus:

This course MICROPROCESSOR & MICROCONTROLLER is an essential part of any Computer architecture. The purpose of this course is to gain knowledge on the architecture of 8085 micro-processor and 8086 micro-processor along with 8051 micro-controllers, their programming and associated peripheral interface devices like, I/O, A/D, D/A, timer etc. students will demonstrate the ability to understand RSIC processors and to design ARM microcontroller-based system.

29. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the internal architecture, organization and instruction set of 8085.
CO2	Understand the internal architecture, organization and instruction set of 8086.
CO3	Discuss the input /output, memory interface, Serial Communication and Bus Interface devices
CO4	Understand the Peripherals and interfacing - Serial and parallel I/O (8251 and 8255) Programmable DMA controller Programmable interrupt controller
CO5	Analyze the internal architecture of ARM Processors and Intel 8051 architecture, memory organization

30. Syllabus:

Module1: Introduction to 8085 Block diagram; description of data registers, address registers, pointer and index registers, PSW, Queue, BIU and EU, 8085 Pin diagram descriptions, Microprocessor BUS types and buffering techniques, 8085 minimum mode and maximum mode CPU module. Instruction formats, addressing modes.

Module2: Introduction to 8086, 8086 Interrupt types and interrupt vector table. DOS interrupt INT 21 h functions. INT 10h and INT 16h functions, Intel 8086 bus cycles, instruction queue,8086 CPU Read/Write timing diagrams in minimum mode and maximum mode, reset operation, wait state, halt state, hold state, lock operation, interrupt processing. Address decoding techniques.

Module3: Interrupts of 8086 Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086)

Module4: DMA & Microcomputer Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters; Arithmetic Coprocessors; System level interfacing design

Module5: Introduction to computer architecture Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium; Microcontrollers:8051systems, Introduction to RISC processors; ARM microcontrollers interface designs.

BOOKS AND REFERENCES

Text Books

1. Ramesh S. Gaonkar, 'Microprocessor Architecture Programming and Applications with 8085', Penram Intl. Publishing, 6th Edition, 2013.

2. Kenneth Ayala, 'The 8051 Microcontroller', Cengage Learning Publications, 3rd Edition, 2007.

3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay 'The 8051 Microcontroller and Embedded Systems using Assembly and C', Prentice Hall Publications, 2nd Edition, 2008.

Reference Books

1. R.S.Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing,1996.

2. D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.
3. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing,1996.

MICROPROCESSOR & MICROCONTROLLER LAB

SUB-CODE: ETEC 413 **CREDIT: 02**

Course Objective:

- To expose students to the operation of typical microprocessor (8085) & (8086) trainer kit. To understand the architecture of 8085 & 8086 microprocessor
- To prepare the students to be able to solve different problems by developing different programs.
- To develop the quality of assessing and analyzing the obtained data.

Course Outcomes:

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

- Identify relevant information to supplement to the Microprocessor and Microcontroller course. Ability to design and solve synchronization problems.
- Set up programming strategies and select proper mnemonics and run their program on the training boards.
- Practice different types of programming keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.
- Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases.

Syllabus:

Week 1: Study the hardware, functions, memory and structure and operation of 8085 microprocessor kit.

Week 2: (a)Addition of two 8-bit numbers.
(b) Addition of two 16-bit numbers.

Week 3: (a) Addition of two 8–bit numbers is and 16-bit number.
(b) Addition of two 8-bit decimal numbers.

Week 4: Write a program to perform integer division.

Week 5: Write a program to transfer a block of data placed in one memory location to another memory location in forward order.

Week 6: Write a program to searching a no. in array and find the occurrence of that data.

Week 7: Write a program to sort an array in ascending order.

Week 8: An assembly language program to arrange an array of data in descending order using 8085.

Week 9: Write a program to perform BCD to HEXADECIMAL conversion.

Week 10: Program to multiply 8bit-numbers.

Week 11: Write a program to generate the Fibonaccino.

REFERENCE BOOKS:

1. Ray A.K., Bhurchandi K.M., 'Advanced Microprocessor and Peripherals', Tata McGraw-Hill Publications, 3rd Edition, 2013.
2. Sencer Yeralan, Helen Emery, 'Programming and Interfacing the 8051 Microcontroller', Addison Wesley Publications, 1st Edition, 2000.
3. Krishna Kant, 'Microprocessors and Microcontrollers, Architecture, Programming and System Design 8085, 8086, 8051, 8096', Prentice Hall India Ltd Publications, 1 st Edition, 2010.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETEE402**
Course Name	**Electrical Measurement and Measuring Instruments**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

31. Course Overview:

This course provides a comprehensive exploration of fundamental concepts of measurement systems, including their classification and methods. It explores transducers and sensors this module focuses on the measurement of various electrical parameters and operating principles of corresponding instruments. Understanding of measurement principles and instrumentation in electrical engineering.

32. **Prerequisite:** An understanding of electronic components, circuits, and their behaviors is essential. This includes knowledge of diodes, transistors, operational amplifiers, and their applications. basic instrumentation concepts, such as sensors, and signal conditioning.

33. Objective of the Syllabus:

The course aims to provide a comprehensive understanding of the fundamentals of measurement systems and the classification of instrument systems. Learn various methods of measurement and the static characteristics associated with measurements, such as accuracy, precision, sensitivity, and linearity. Understand the general and dynamic characteristics of transducers. Gain knowledge of the construction and operating principles of instruments used for these measurements.

34. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the fundamentals of measurement systems and the classification of instrument systems, and learn various methods of measurement.
CO2	Understand the general and dynamic characteristics of transducers. Explore specific transducers used for measuring temperature, pressure, strain, displacement, speed, torque, and Hall Effect.

CO3	Understand the measurement principles and applications of voltage, current, power, energy, power factor, and frequency.
CO4	Explore different methods for measuring low, medium, and high resistances. Identify measuring instruments for inductance and capacitance.
CO5	Understand the principles and operation of digital recorders, including their functions, features, and applications in data acquisition and analysis. Identify the knowledge and skills effectively utilize digital recording devices and oscilloscopes

35. Syllabus:

Unit I Introduction

Concepts of Measurement: Measurement System, Classification of instrument system, Methods of Measurement, Static Characteristics like accuracy, precision, sensitivity, linearity, range, reproduciblity, drift, threshold, dead zone etc. Dynamic Characteristics like speed of response, fidelity overshoot etc., Measurement Standards Errors in measurement, Basic statistical evaluation of measurement data and errors -mean, standard deviation, Six Sigma estimation.

Unit II Transducers and Sensors

Transducers and Sensors Definition, different types of transducers, criteria for selection, general characteristics and dynamic characteristics, transducers for measurement of temperature ((Thermocouple and RTD), transducers for measurement of pressure, strain, transducers for measurement of displacement, speed, torque, Hall Effect transducer Sensors –basic concept–Speed and position sensors.

Unit III Measurement of Parameters

Measurement of Parameters: Measurement of resistance, Extending the range of meters-Shunts, Potential divider, Instrument Transformer and their applications in the extension of instrument range, Measurement of voltage, current, power, energy, power factor, and frequency (constructions and operating principles of corresponding instruments)

Unit IV Measurement of R, L, and C

Measurement of R, L, and C Different methods of measuring low, medium, and high resistances, Wheatstone Bridge, Measurement of inductance & capacitance with the help of AC Bridges (Hays Bridge, Schering Bridge, Maxwell bridge, Anderson Bridge), LCR meter working principle with block diagram.

Unit V I/O Digital recorders

D.S.O. Digital recorders, Digital Storage Oscilloscope-Block Diagram, theory and applications, Powerscope.

BOOKS AND REFERENCES

Text Books

1. Modern Electronics Instrumentation & Measurement Techniques, by Albert D.Helstrick and William D. Cooper, Pearson Education. Selected portion from Ch.1,5- 13.

2.Elements of Electronics Instrumentation and Measurement-*3rd Edition* by Joshph J. Carr. Pearson Education. The selected portion from Ch.1,2,4,7,8,9,13,14,18,23 and25.

Reference Books

1. Electronics Instruments and Instrumentation Technology – Anand, PHI 4. Doebelin, E.O.,Measurement systems, McGraw Hill,Fourth edition,Singapore,***1990***

Electrical Measurement and Measuring Instruments LAB

SUB-CODE: ETEE 412 **CREDIT: 02**

Course Objective:

- To expose Students will learn about Kelvin's Double Bridge Method and its application in accurately measuring low resistances.
- To prepare the students will understand the working principle of a galvanometer, its sensitivity, and how to determine galvanometer constants through practical experiments.
- To develop to learn methods for testing single-phase energy meters to verify their accuracy and functionality.

Course Outcomes:

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

- Identify relevant information to supplement the electrical measurements instrument course. Ability to design and solve synchronization problems.
- Learn methods for testing single-phase energy meters to verify their accuracy and functionality.
- Practice different types of electrical measurement instruments keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.
- Develop testing and experimental procedures on electrical measurement instruments analyze their operation under different cases.

Syllabus:

Week 1: Measurement of Low Resistance by Kelvin’s Double Bridge Method.

Week 2: Measurement of Self-Inductance and Capacitance using Bridges.

Week 3: Study of Galvanometer and Determination of Sensitivity and Galvanometer Constants.

Week 4: Calibration of Voltmeters and Ammeters using Potentiometers.

Week 5: Testing of Energy meters (Single phase type).

Week 6: Measurement of Iron Loss from B-H Curve by using CRO.

Week 7: Measurement of R, L, and C using a Q-meter.

Week 8: Measurement of Power in a single-phase circuit by using CTs and PTs.

Week 9: Measurement of Power and Power Factor in a three-phase AC circuit by two-wattmeter method.

Week 10: Study of Spectrum Analyzer

Reference Books

1. Electronics Instruments and Instrumentation Technology – Anand, PHI 4. Doebelin, E.O.,Measurement systems, McGraw Hill,Fourth edition,Singapore,***1990***

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE403**
Course Name	**Signals and Systems**
Course Credits	**3 (L) + + 1 (T) + 0 (P)= 5**
Total Course Credit	**174**

Abbreviations: L- lecture per week T-Theory, P-Practical

36. Course Overview:

Signals and Systems encounter extensively in our day-to-day lives, from making a phone call, listening to a song, editing photos, manipulating audio files, using speech recognition software's like Siri and Google now, to taking EEGs, ECGs and X-Ray images. Each of these involves gathering, storing, transmitting and processing information from the physical world. This course will equip to deal with these tasks efficiently by learning the basic mathematical framework of signals and systems. Here we will explore the various properties of signals and systems, characterization of Linear Time Invariant Systems/ Time variant systems, convolution and Fourier Series and Transform, and also deal with the Sampling theorem, aliasing, Z-Transform, Correlation and Laplace transform. Ideas introduced in this course will be useful in understanding further Electronic/ Electrical Engineering courses which deal with control systems, communication systems, digital signal processing, statistical signal analysis and digital message transmission.

Prerequisite: Engineering Mathematics and Basics of Vector Theory

37. Objective of the Syllabus:

- To study the properties and representation of discrete and continuous signals.
- To understand the complete of the nature of continuous and discrete signals and their applications in electrical/electronics engineering.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To understand the use of transforms for signal classification and analysis.
- To study the analysis and synthesis of discrete time systems.

38. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the concepts of continuous time and discrete time systems.

CO2	Analyze systems in complex frequency domain by applying Fourier transform and Laplace transform.
CO3	Illustrate the sampling Theorem and application of Z transform for analysis of discrete system.
CO4	To recognize the characteristics of linear time invariant systems and Discrete time system.
CO5	To gain concept of random process which is essential for random signals and systems encountered in Communications and Signal Processing areas.

39. Syllabus:

Unit I: Representation of Signals

Continuous and discrete time signals: Classification of Signals - Periodic aperiodic even - odd – energy and power signals-Deterministic and random signals-complex exponential and sinusoidal signals - periodicity - properties of discrete time complex exponential unit impulse -unit step impulse functions - Transformation in independent variable of signals: time scaling, time shifting, Determination of Fourier series representation of continuous time and discrete time periodic signals-Explanation of properties of continuous time and discrete time Fourier series.

Unit II: Analysis of Continuous Time Signals and Systems

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains. Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems, linear and non-linear phase and group delay, Analysis and characterization of LTI systems using Laplace transform: Computation of impulse response and transfer function using Laplace transform.

Unit III: Sampling Theorem and Z–Transforms

Representation of continuous time signals by its sample-Sampling theorem-Reconstruction of a Signal from its samples, aliasing-discrete time processing of continuous time signals, sampling of band pass signals Basic principles of z-transform - z-transform definition - region of convergence - properties of ROC - Properties of z-transform - Poles and Zeros - inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform.

Unit IV: Discrete Time Systems

Computation of Impulse response and Transfer function using Z Transform, DTFT Properties and examples - LTI-DT systems -Characterization using difference equation - Block diagram representation - Properties of convolution and the interconnection of LTI Systems- Causality and stability of LTI Systems.

Unit V: Random Signals

Introduction to probability, Bayes Theorem- concept of random variable- probability density and distribution functions-function of a random variable, Moments-Independence of a random variable, Introduction to random process, Auto and cross correlation, Wide-sense stationarypower spectral density White noise.

BOOKS AND REFERENCES

Text Books

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and systems", Prentice Hall India,1997.
2. J.G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. H.P. Hsu, "Signals and systems", Schaum' series, Mc Graw Hill Education, 2010.

Reference Books

1. S. Haykin and B. V.Veen, "Signals and Systems", John Wiley and Sons, 2007.
2. A.V. Oppenheim and R.W. Schafer, "Discrete- Time Signal Processing", Prentice Hall, 2009.
3. M.J. Robert. "Fundamentals of Signals and Systems", Mc Graw Hill Education, 2007.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETEE404**
Course Name	**Electromagnetic Field**
Course Credits	**3 (L) + 1 (T)+ 0(P) = 4**
Total Course Credit	**174**

Abbreviations: L-**lectures per week**, T-Theory, P-Practical

40. Course Overview:

This course is designed to review the fundamentals and application of electromagnetic field theory. This course also enables the students to understand all Maxwell's equation in time varying field. In this course the students will also learn about Transmission line, smith Chart and reflection and refraction on plane as well oblique plane. The students will also be able to understand to solve real life problem related to electromagnetics.

41. **Prerequisite:** Engineering Mathematics, Engineering Physics.

42. Objective of the Syllabus:

To introduce the concepts of different coordinate systems, Maxwell`s equations, static electric and magnetic fields and methods of solving for the quantities associated with these fields, time varying fields and displacement current, propagation of electromagnetic waves and their applications in practical problems.

43. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	**Review of Vector Calculus:** Apply vector analysis and coordinate systems to solve static electric and magnetic field problems.
CO2	**Static Electric Field:** To understand the basic laws of electromagnetism such as Gauss Law, Coulomb's law and Poisson's equation to determine electrostatic field parameters under static conditions.
CO3	**Static Magnetic Fields:** To determine magnetic fields from current distributions by applying Biot-Savart's law and Amperes Circuital law under static conditions.

CO4	**Time Varying Fields and Maxwell's Equations:** Apply Maxwell Equations for the solution of time varying fields and to understand Maxwell's equation in different forms and different media.
CO5	**Electromagnetic Waves:** Analyze electromagnetic wave propagation in different media.

44. Syllabus:

Unit I: Review of Vector Calculus

Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus-differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl, integral theorems of vectors. Conversion of a vector from one coordinate system to another.

Unit II: Static Electric Field

Coulomb's law, Electric field intensity, Electrical field due to point charges, Line, Surface and Volume charge distributions. Gauss law and its applications, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations, Electric dipole, Electrostatic Energy and Energy density, Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.

Unit III: Static Magnetic Fields

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials, Steady magnetic fields produced by current carrying conductors. Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

Unit IV: Time Varying Fields and Maxwell's Equations

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions.

Unit V: Electromagnetic Waves

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect, Poynting theorem.

BOOKS AND REFERENCES

Text Books

1. M.N.O. Sadiku, “Elements of Electromagnetics”, Oxford University Publication,2014.
2. W. Hayt & J.A Buck, Engineering Electromagnetics 7thEdition, McGraw Hill, 2012.

Reference Books

1.A. Pramanik, “Electromagnetism-Theory and applications”, PHI Learning Pvt. Ltd, New Delhi, 2009.
2.A. Pramanik, “Electromagnetism-Problems with solution”, Prentice Hall India,2012.
3.G.W. Carter, “The electromagnetic field in its engineering aspects”, Longmans,1954.
4.W.J. Duffin, “Electricity and Magnetism”, McGraw Hill Publication, 1980.
5.W.J. Duffin, “Advanced Electricity and Magnetism”, McGrawHill,1968.
6.E.G. Cull wick, “The Fundamentals of Electromagnetism”, Cambridge University Press,1966.
7.D. Popovic, “Introductory Engineering Electromagnetics”, Addison-Wesley Educational Publishers, International Edition,1971.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETEE501**
Course Name	**Power System**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

45. Course Overview:

This comprehensive course provides students with a deep understanding of power systems, renewable energy sources, and their interconnections. Through theoretical learning and practical examples, students will gain insights into the design, operation, and analysis of modern power systems and renewable energy technologies.

46. **Prerequisite:**

Understanding An overview of the historical development of power systems leading up to the current landscape, understand the method of Symmetrical Components introduction to positive, negative, and zero sequence components.

47. Objective of the Syllabus:

a. To learn the fundamentals of the transmission system and parameter for the design of transmission system.

b. To understand the working and performance of transmission line with the help of its circuit mode.

c. To model the transmission lines in terms of mechanical parameter and stresses.

48. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the concepts of power systems.
CO2	Understand the various power system components.
CO3	Evaluate fault currents for different types of faults.
	Understand the generation of over-voltages and insulation coordination.

CO4	
CO5	Understand concepts of HVDC power transmission and renewable energy generation.

49. Syllabus:

UNIT 1 Basic Concepts

Evolution of Power Systems and Present-Day Scenario, Structure of a power system: Bulk Power Grids and Micro grids, Generation: Conventional and Renewable Energy Sources, Distributed Energy Resources, Energy Storage, Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections, Review of Three-phase systems. Analysis of simple three-phase circuits, Power Transfer in AC circuits and Reactive Power.

UNIT 2: Power System Components

Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables, Capacitance and Inductance calculations for simple configurations, Travelling wave Equations, Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power transfer, Voltage profile and Reactive Power, Characteristics of transmission lines, Surge Impedance Loading. Series and Shunt Compensation of transmission lines, Transformers: Three-phase connections and Phase-shifts. Three winding transformers, autotransformers, Neutral Grounding transformers, Tap-Changing in transformers, Transformer Parameters, Single phase equivalent of three-phase transformers Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators, Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per unit System and per-unit calculations.

UNIT 3 Over-voltages

Over-voltages and Insulation Requirements Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination, Propagation of Surges, Voltages produced by traveling surges, Bewley Diagrams.

UNIT 4 Fault Analysis

Method of Symmetrical Components (positive, negative, and zero sequences), Balanced and Unbalanced Faults, Representation of generators, lines, and transformers in sequence networks, and Computation of Fault Currents.

UNIT 5 DC Transmission

Introduction to DC Transmission & Renewable Energy Systems DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC). LCC and VSC based dc link, Real Power Flow control dc link. Comparison of ac and dc transmission, Solar PV systems I-Vand P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines. Permanent Magnetic Synchronous Generators and Induction Generators, Power Electronics interfaces of wind generators to the grid.

BOOKS AND REFERENCES

Text Books

a. J. Grainger and W.D. Stevenson, "Power System Analysis", Mc Graw Hill Education, *1994.*

b. O.I. Elgerd, "Electric Energy Systems Theory", M c Graw Hill Education, *1995.*

c. A.R.BergenandV. Vittal, "Power System Analysis", Pearson Education Inc.,*1999*

Reference Books

a. D.P. Kothari and I.J.Nagrath, "Modern Power System Analysis", McGraw Hill Education,***2003.***

b. B.M.Weedy, B.J.Cory, N.Jenkins, J.Ekanayake and G.Strbac, "Electric Power Systems", Wiley,***2012***

POWER SYSTEM-I LAB SUB-CODE: ETEE 511 CREDIT: 02

Course Objective:

To provide better understanding of power system analysis through digital simulation.

Course Outcomes:

At the end of the course the students are able to:

- Apply modern numerical techniques and analytical methods to address operation-related problems in electric power systems.
- Model synchronous machines, exciters, turbines, and system loads.
- To learn the fundamentals of transmission system and parameter for the design of transmission system.
- Apply compensation techniques to transmission lines in real-world electrical applications.

Syllabus:

Week 1: Determination of the phase sequence of a three phase supply by static method.

Week 2: Determination of zero sequence impedance and currents for different connections of a three phase transformer.

Week 3: Determination of the zero sequence reactance of a synchronous generator.

Week 4: Determination of Negative Sequence Reactance of synchronous generator.

Week 5: Study of the effect of load angle on the stability of synchronous machines.

Week 6: Determination of the fault current in case of three phase fault on a power system.

Week 7: Determination of the fault current in case of line to ground fault on a power system.

Week 8: Determination of the fault current in case of line to line fault on a power system.

Week 9: Determination of the fault current in case of double line to ground fault on a power system.

Week 10: Determination of the change in fault current with the change in the fault location of the power system.

REFERENCE BOOKS:

1. O.I. Elgerd, “Electric Energy Systems Theory”, Mc Graw Hill Education,1995
2. D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education, 2003
3. Kundur P. and Balu N. J., “Power System Stability and Control”, EPRI Series, McGraw-Hill International Book Company, 1998

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE502**
Semester	**5th**
Course Name	**Control System**
Course Credits	**4 (T) + 1 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

50. Course Overview:

Control Systems Engineering is a comprehensive course designed to provide students with a thorough understanding of control theory and its practical applications in engineering systems. The course covers fundamental concepts such as mathematical modeling of physical systems, analysis of time and frequency response, stability analysis, controller design, and state variable analysis. Through lectures, discussions, and hands-on exercises, students will develop the knowledge and skills to design and analyze control systems for various industrial applications.

51. **Prerequisite:** The prerequisite knowledge for the course includes a strong understanding of calculus, linear algebra, and basic physics, along with familiarity with electrical circuits and programming skills in MATLAB or Python. Additionally, some basic knowledge of control theory concepts such as feedback and stability is beneficial.

52. Objective of the Syllabus:

This course is intended to introduce the students to the mathematical foundations of Control Theory. The course aims to allow them to develop new skills and analytical tools required to analyze and design methods for the control of liner systems.

53. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	· Understand industrial control applications and develop mathematical models. · Recognize control hardware and transfer function models. · Differentiate between open-loop and closed-loop systems. · Apply block diagram algebra for system analysis.

CO2	• Analyze time response of first and second-order systems. • Apply initial and final value theorems. • Establish design specifications based on time-response. • Utilize Routh-Hurwitz criteria and Root-Locus technique for stability analysis.
CO3	• Relate time and frequency responses. • Analyze systems using polar and Bode plots. • Apply Nyquist stability criterion and determine gain and phase margin. • Understand closed-loop frequency responses.
CO4	• Evaluate system stability, accuracy, and robustness. • Design feedback controllers using Root-Locus and frequency-domain methods. • Implement Proportional, Integral, and Derivative controllers. • Apply lead and lag compensation techniques.
CO5	• Model systems using state variables and state space. • Analyze stability and design controllers using pole-placement. • Understand performance indices, optimal control, and nonlinear system concepts.

54. Syllabus:

Unit I Introduction to Control Problem

Industrial Control examples, Mathematical models of physical systems, Control hardware, and their models, Transfer function models of linear time-invariant systems. Feedback Control: Open-loop and Closed-loop systems. Benefits of Feedback, Block diagram algebra.

Unit II Time Response Analysis

Standard test signals. Time response of first and second-order systems for standard test inputs Application of initial and final value theorem, Design specifications for second-order systems based on the time response Concept of Stability, Routh- Hurwitz Criteria, Relative Stability analysis, Root-Locus technique, Construction of Root-loci

Unit III Frequency-response analysis

Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion, Relative stability using Nyquist criterion– gain and phase margin. Closed-loop frequency responses.

Unit IV Introduction to Controller Design

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems, Root-loci method of feedback controller design, Design specifications in frequency- domain. Frequency-domain methods of design, Application of Proportional, Integral, and Derivative Controllers, Lead and Lag compensation in designs, and Analog and Digital implementation of controllers.

Unit V State Variable Analysis & Introduction to Optimal Control and Nonlinear Control

Concepts of state variables, State space model, Diagonalization of State Matrix, Solution of state Equations, Eigenvalues and Stability Analysis, Concept of controllability and observe ability, Pole-placement by state feedback, Discrete-time systems, Difference Equations, State-space models of linear discrete-time systems. Stability of linear discrete-time systems Performance Indices, problem, Tracking Problem, Nonlinear system–Basic concepts and analysis Regulator .

BOOKS AND REFERENCES

Text Books

1. **Modern Control Engineering" by Ogata Katsuhiko Edition** (2021).
2. **Control Systems Engineering" by Norman S. Nise**, 8th Edition (2019).
3. Control Systems Engineering" by I. J. Nagrath and M. GopalEdition: 6th Edition (2014)

Reference Books

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
4. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009

.

OPERATING SYSTEMS LAB SUB-CODE: ETEE-512 CREDIT: 02

Course Objective:

- Understand the basic concepts and terminology used in control systems.
- Examine practical applications of control systems in engineering, industry, and everyday life.
- Explore real-world applications of control systems across diverse industries, including industrial automation, robotics, automotive systems, aerospace, and biomedical engineering, understanding their role in enhancing efficiency, safety, and productivity.

Course Outcomes:

At the end of the course, the students can:

- Ability to implement the characteristics and applications of various types of terminology used in control systems.
- Ability to design and develop practical skills.
- Ability to understand and apply basic science, circuit theory, control theory and apply them to electrical engineering problems.

Syllabus:

Week 1: Determination of transfer functions of an AC servomotor.

Week 2: To study a potentiometer as an error detector.

Week 3: . Study of PID controller.

Week 4: Study of bode plot of Type 0, Type I, and Type II systems.
Week 5: To study the lag compensator and lead compensator.
Week 6: To study the lag-lead compensator.
Week 7 To Study the time response of a first and second-order system.
Week 8: Study of P, PI controller on second order system.
Week 9: Speed Torque characteristics of Servomotor.
Week 10: To determine the gain of an open loop and closed loop system.

REFERENCE BOOKS:

1. Control Systems: A Comprehensive Lab Manual
Author(s) :Ch. Chengaiah, G. V. Marutheswar

K. K. UNIVERSITY
BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.
School of Engineering & Technology.
Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE503**
Course Name	**ELECTRICAL ENGINEERING MATERIALS**
Course Credits	**3 (L) + 1 (T)+0 (P)= 4**
Total Course Credit	**174**

Abbreviations: L-Lecture per week, T-Theory, P-Practical

55. Course Overview:

This course will introduce the student with different materials namely conductor, Insulators, dielectrics and Semiconductor depending on the structural properties. It also discusses about the application of special purpose materials in electrical engineering. Students are able to analyze magnetic materials and their behaviors. Development of thought process while designing modern material for various scientific and industrial advancement.

56. **Prerequisite:** Basics Physics and Engineering mathematics.

57. Objective of the Syllabus:

This course will introduce the student with different materials and their characteristics used in manufacturing various electrical equipment. It also emphasizes on the basics of electrical conductivity in metals and alloys along with their variations with respect to temperature and composition. After successful completion of the course students will be able to understand the theory of electrical conduction in semiconductors and to learn about the classifications of magnetic materials and their behaviors based on several properties. Students are able to identify various types

of dielectric materials, their properties in various conditions and to learn about dielectric polarization and its characteristics which eventually outline the modern techniques for material studies.

58. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the basics of electrical conduction in metal and alloys along with the application of Special Purpose Materials in electrical engineering.
CO2	Understand the theory of electrical conduction in semiconductors and to learn about the classification and basic properties of magnetic materials.
CO3	Identify various types of dielectric materials, their properties in various conditions and to learn about dielectric polarization and its characteristics.
CO4	To get basic understanding about material used for solar power.
CO5	To learn about modern techniques for material studies.

59. Syllabus:

Unit I: CONDUCTING MATERIAL

Review of metallic conduction on the basis of free electron theory. Fermi-Dirac distribution – variation of conductivity with temperature and composition, materials for electric resistors- General Electric properties; material for brushes of electrical machines, lamp filaments, fuses and solder.

Unit II: SEMICONDUCTORS & MAGNETIC MATERIALS

SEMI CONDUCTORS: Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors. Magnetic materials: Classification of magnetic materials-origin of permanent magnetic dipoles, Ferro magnetism, hard and soft magnetic materials, magneto materials used in electrical machines, instruments and relays.

Unit III: DIELECTRICS INSULATING MATERIAL

DIELECTRICS: Dielectric, polarization under static fields- electronic ionic and dipolar polarizations, behavior of dielectrics in alternating fields, Factors influencing dielectric strength and capacitor materials. Insulating materials, complex dielectric constant, dipolar relaxation and dielectric loss. INSULATING MATERIALS: Inorganic materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and bake lite), resins and varnishes, liquid insulators (transformer oil) gaseous insulators (air, SF6 and nitrogen) and ageing of insulators.

Unit IV: MATERIALS FOR SPECIAL APPLICATION

Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar elective coatings, Cold mirror coatings, heat mirror coatings, anti-reflection coatings, sintered alloys for breaker and switch contacts.

Unit V: MODERN TECHNIQUES FOR MATERIALS STUDIES

Optical microscopy, Electron microscopy, Photo electron spectroscopy, atomic absorption spectroscopy, magnetic resonance, nuclear magnetic resonance, electron spin resonance and ferromagnetic resonance.

BOOKS AND REFERENCES

Text Books

1. Indulkar, C.S. Thirivengadam, S An Introduction to Electrical Engineering Materials, S Chand Co, 1998.
2. A.J Dekker Electrical Engineering Materials, Prentice Hall of India, 1963.
3. Arumugam, M Materials Science, Anuradha Publishers, 1990.

Reference Books

1. Agnihotri O.P, Gupta B. K. Solar Selective Surfaces, John Wiley, 1981.
2. Kapoor P.L Textbook of Electrical & Electronics Engineering Materials, Khanna Publications, 2016.
3. Tiwari, G. N. Solar Energy, Narosa Publication, 2002.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE 504**
Course Name	**Numerical Methods and computer programming**
Course Credits	**3 (L) + 2 (P)= 5**
Total Course Credit	**174**

Abbreviations: L-Lecture per week, P-Practical

60. Course Overview:

The development of fast, efficient and inexpensive computers has significantly increased the range of engineering problems that can be solved reliably. Numerical Methods use computers to solve problems by step-wise, repeated and iterative solution methods, which would otherwise be tedious or unsolvable by hand-calculations. This course is designed to give an overview of numerical methods of interest to scientists and engineers. The students will improve their ability to think critically, to analyze a real problem and solve it using a wide array of mathematical tools. They will also be able to apply these ideas to a wide range of problems that include the Engineering applications using Python programming.

61. **Prerequisite:**

- Basic knowledge of Probability.
- Basic knowledge of Statistics.
- Basic knowledge of calculation of basic formulas.
- Basic knowledge of permutations and combinations.
- Mathematics courses of first year of study.

62. Objective of the Syllabus:

- To emphasize the need of computational techniques and analyze errors involved in the computation.
- To provide sound knowledge of various numerical methods.
- To apply various numerical methods to obtain solution of different types of equations such as transcendental, simultaneous, ODE etc. and also for interpolation, integration and differentiation.
- To impart skills to develop algorithms and programs for various numerical methods.

63. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Demonstrate types of errors in computation and their causes of occurrence
CO2	Calculate root of algebraic and transcendental equations using various methods.
CO3	Apply numerical methods for various mathematical problems such as interpolation, numerical differentiation, integration and ordinary differential equation.
CO4	Solve linear simultaneous equation using direct and indirect method.
CO5	Develop algorithms and write computer programs for various numerical methods.

64. Syllabus:

Module1:

Numerical Computations, Errors and Concept of root of equation (6hrs)

A) Basic principle of numerical computation. Floating point algebra with normalized floating-point technique, Significant digits. Errors: Different types of errors, causes of occurrence and remedies to minimize them, Generalized error formula (Derivation and Numerical)

B) Concept of roots of an equation. Descartes' rule of signs, Intermediate value theorem, Roots of Polynomial Equations using Birge-Vieta method.

Module2:

Solution of Transcendental and polynomial equation and Curve Fitting: (6hrs)

A) Solution of Transcendental and polynomial equation using Bisection, Regula- Falsi, Newton-Raphson method for single variable and two variables.

B) Curve fitting using least square approximation – First order and second order.

Module3:

Interpolation (6hrs) Forward, Backward, Central and Divided Difference operators, Introduction to interpolation.

A) Interpolation with equal Intervals - Newton's forward, backward interpolation formula (Derivations and numerical), Stirling's and Bessel's central difference formula (Only numerical)

B) Interpolation with unequal Intervals- Newton's divided difference formula and Lagrange's interpolation (Derivations and numerical).

Module4:

Numerical Differentiation and Integration (6hrs)

A) Numerical Differentiation using Newton's forward and backward interpolation formula (Derivation and numerical).

B) Numerical Integration: Trapezoidal and Simpson's rules as special cases of Newton-Cote's quadrature technique for single integral. Numerical on double integrals using Trapezoidal and Simpson's 1/3 rd. rule.

Module5:

(A) Solution of linear simultaneous equation (6hrs): Direct methods - Gauss elimination method, concept of pivoting – partial and complete. Gauss Jordan method, Iterative methods – Jacobi method and Gauss Seidel method. B) Matrix Inversion using Gauss Jordan method.

(B) Solution of Ordinary Differential Equation (ODE) (6hrs) A) Solution of First order Ordinary Differential Equation (ODE) using Taylor's series method, Euler's method, Modified Euler's method (Derivation and numerical). Runge-Kutta fourth order method (Numerical). B) Solution of Second order ODE using 4th order Runge-Kutta method (Numerical).

BOOKS AND REFERENCES

Text Books

1. M. K. Jain, S.R.K. Iyangar, R. K. Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Publications.
2. Dr. B. S. Grewal, "Numerical Methods in Engineering & Sciences", Khanna Publishers.
3. P.P. Gupta & G.S Malik, "Calculus of Finite Difference and Numerical Analysis", Krishna Prakashan Media Ltd, Meerut.
4. S Arumugam, "Numerical Methods" SciTech Publication.

Reference Books

1. J. B. Scarborough, "Numerical Mathematical Analysis", Oxford & IBH, New Delhi.
2. Steven Chapra, Raymond P. Canale, "Numerical Methods for Engineers", Tata McGraw Hill Publication.
3. S.S. Sastry, "Introductory methods of Numerical Analysis", PHI Learning Private Ltd.
4. P. Thangaraj, "Computer oriented Numerical Methods", PHI Learning Private Ltd.

NUMERICAL METHODS AND COMPUTER PROGRAMMING LAB

SUB-CODE: ETEE 514 **CREDIT: 01**

Course Objective:

- To provide knowledge for implementation of Numerical Methods in Python programming.

Course Outcomes:

At the end of the course the students are able to:

- Obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis.
- Trace error in these methods and need to analyze and predict it.
- Provide knowledge of various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Statistical Methods.
- Demonstrate the concepts of numerical methods used for different applications.

Syllabus: Develop computer program using Python language Compulsory Experiments-1,2,3,4,7,10 Any one from 5 or 6 and any one from 8 or 9

Week 1:

Develop algorithm, draw flow chart and write a program to implement following:

(a) for loop and while loop-- application in Descarte's rule of sign.

(b) if-else and functions-- application in Intermediate value theorem. (c) 2DArray formation-- application in matrix data entry, transposition and printing matrix.

Week 2:

Develop algorithm, draw flow chart and write a program to implement Birge-Vieta method.

Week 3:

Develop algorithm, draw flow chart and write a program to implement Bisection/Regula falsi /Newton Raphson method (single variable) in following applications (formulate problem statement in any one of following area (but not limited to)) (a) Finding critical clearing angle in power system stability (give equation directly) (b) Relation between voltage and current in solar PV.

Week 4:

Develop algorithm, draw flow chart and write a program to implement curve fitting using least square approximation in following applications (formulate problem statement in any one of following area (but not limited to)) (a) Voltage across capacitor during charging. (b) Relate temperature and resistance in thermocouple. (c) Current through inductor during excitation.

Week 5:

Develop algorithm, draw flow chart and write a program to apply Newton's forward/backward interpolation method in following applications (formulate problem statement in any one of following area (but not limited to)) (a) Voltage across capacitor during charging (b) Relation of speed and armature voltage in DC motor.

Week 6:

Develop algorithm, draw flow chart and write a program to apply Newton's divided difference/Lagrange's interpolation method in following applications (formulate problem statement in any one of following area (but not limited to))

(a) Power transfer equation to find power at particular angle

(b) Transformer efficiency at particular loading (data of % loading and efficiency in known at a particular power factor).

(c) Growth of electricity consumption in India (year Vs. Per capita electrical consumption).

Week 7:

Develop algorithm, draw flow chart and write a program to implement trapezoidal/ Simpson (1/3) rd. rule in following applications (formulate problem statement in any one of following area (but not limited to))

(a) RMS/Average value of given waveform.

(b) Finding current through first order circuit (RL series circuit)

(c) kWh consumption from load curve

(d) Magnetic field intensity in overhead transmission line

Week 8:

Develop algorithm, draw flow chart and write a program to implement Gauss elimination/Jordan in following applications (formulate problem statement in any one of following area (but not limited to))

(a) Electrical network using KVL (b) Electrical Network using KCL

Week 9:

Develop algorithm, draw flow chart and write a program to implement Gauss Jacobi/Seidel in following applications (formulate problem statement in any one of following area (but not limited to))

(a) Electrical network using KVL (b) Electrical Network using KCL

Week 10:

Develop algorithm, draw flow chart and write a program to implement Modified Euler's/4th order RK method in following applications (formulate problem statement in any one of following area (but not limited to)

(a) Response of RC series circuit with DC

(b) Response of RL circuit with DC

(c) Deflection angle in MI type instrument.

REFERENCE BOOKS:

4. T. Veerarajan and T. Ramchandran, "Numerical Methods with Programs in C and C++", Tata McGraw Hill Publication.

5. Yashwant Kanitkar, "Let us Python", pbp publications.

6. Jaan Kiusalaas, "Numerical methods in Engineering with Python", Cambridge University Press.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE 601**
Course Name	**Power System II**
Course Credits	**3 (L) + 2 (P)= 5**
Total Course Credit	**174**

Abbreviations: L-Lecture per week, P-Practical

65. Course Overview:

This course is an extension of Electrical Power systems course. It deals with basic theory of transmission line modeling and their performance analysis. A detailed study of Power System stability, Load flow studies and economic power dispatch is part of the curriculum for students. It also provides an overview of control techniques adopted to ensure economic operation. It covers concepts related to frequency, voltage, and power flow control in integrated grids. In this course, students learn about synchronous machine modeling, reference frame transformation, automatic voltage regulation, power system stabilizers, transient stability for multimachine systems and automatic generation control (especially in deregulated environments).

66. Prerequisite: A solid understanding of power system components, network analysis and basic concept related to generation, transmission and distribution of electrical energy. Proficiency in mathematical concept is essential. Topics such as linear algebra, calculus and probability are relevant for power system analysis and control.

67. Objective of the Syllabus:

This course POWER SYSTEM II is an extension of Power system I that covers various aspects related to managing and regulating electrical power systems. It also helps to develop understanding and managing real power flow within the system to ensure reliable supply and to analyze various techniques for controlling reactive power through various compensation techniques. This course also helps in recognizing the significance of maintaining system frequency, transient and steady state stability.

68. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Acquire knowledge to apply numerical techniques (such as the Gauss-Seidel method or Newton-Raphson method) to determine the steady-state operating characteristics of a power system for a given load and generator conditions.

CO2	Analyze the modeling of synchronous machines, exciters, turbines and system loads for stability studies and understand stability constraints in a synchronous grid.
CO3	Understand methods to control the voltage, frequency and reactive power control for maintaining system stability.
CO4	Understand the monitoring and control of a power system through SCADA system by exploring preventive control measures and emergency response strategies.
CO5	To gain knowledge of generator cost curves, utility functions, and spot pricing mechanisms through economic dispatch, load scheduling and optimizing power generation.

69. Syllabus:

Module1: Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications, Application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations, Computational Issues in Large-scale Power Systems.

Module2: Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve, Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault, Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4th order methods), as well as the Equal Area Criterion, Impact of stability constraints on Power System Operation. Effect of generation rescheduling and series compensation of transmission lines on stability.

Module3: Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing, Automatic Generation Control, Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators, Static VAR compensators and STATCOMs. Tap Changing Transformers, Power flow control using embedded clinks, phase shifters.

Module4: Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement Units and Wide-Area Measurement Systems, State-estimation, System Security Assessment, Normal, Alert, Emergency, Extremis states of a Power System, Contingency Analysis, Preventive Control and Emergency Control.

Module5: Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing, Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole -sale competition, Retail Competition), Demand Side-management, Transmission and Distributions charges, Ancillary Services, Regulatory framework.

BOOKS AND REFERENCES

Text Books

1. J. Grainger and W.D. Stevenson, “Power System Analysis”, McGrawHillEducation,1994
2. O.I. Elgerd, “Electric Energy Systems Theory”, Mc Graw Hill Education,1995

3. A.R. Bergen and V. Vittal, “Power System Analysis”, PearsonEducationInc.,1999
4. B.M. Weedy, B.J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012

Reference Books

1. D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education, 2003
2. Kundur P. and Balu N. J., “Power System Stability and Control”, EPRI Series, McGraw-Hill International Book Company, 1998
3. Zhong J., Power System Economic and Market Operations, CRC Press, 2018
4. Grainger J., Stevenson W., Power System Analysis, McGraw Hill Education, 2017

POWER SYSTEM-II LAB SUB-CODE: ETEE 611 CREDIT: 02

Course Objective:

To provide better understanding of power system analysis through digital simulation.

Course Outcomes:

At the end of the course the students are able to:

- Apply modern numerical techniques and analytical methods to address operation-related problems in electric power systems.
- Model synchronous machines, exciters, turbines, and system loads.
- Acquire in-depth knowledge of economic operation techniques for power systems.
- apply compensation techniques to transmission lines in real-world electrical applications.

Syllabus:

Week 1: Introduction to MATLAB and other Simulation software.
Week 2: Z-bus and Y-bus formulation and their inversion.
Week 3: Load flow studies (Gauss-Siedle method, Newton Raphson method).
Week 4: Fault analysis (balanced and unbalanced)
Week 5: Solution of Swing equations by modified Euler’s method.
Week 6: Solution of Swing equations using Runge– Kutta method (RK4).
Week 7: Solution of Power System equations using Modified Euler’s Method.
Week 8: Simulating Power Systems with Simulink.
Week 9: Power system simulation by MATLAB using the Sim Power Systems Toolbox.
Week 10: Analysis of PV & QV curves for voltage stability.

REFERENCE BOOKS:

7. O.I. Elgerd, “Electric Energy Systems Theory”, Mc Graw Hill Education,1995
8. D.P. Kothari and I.J. Nagrath, “Modern Power System Analysis”, McGraw Hill Education, 2003
9. Kundur P. and Balu N. J., “Power System Stability and Control”, EPRI Series, McGraw-Hill International Book Company, 1998

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE 602**
Course Name	**Power Electronics**
Course Credits	**3 (L) + 2 (P)= 5**
Total Course Credit	**174**

Abbreviations: L-Lecture per week, P-Practical

70. Course Overview:

Power Electronics is the study of switching electronic circuits in order to control the flow of electrical energy. Power Electronics is the technology behind switching power supplies, power converters, power inverters, motor drives, and motor soft starters. As the trend towards electrification and renewable energies increases, enabling technologies such as power electronics are becoming ever more important. Power electronics encompasses the systems and products involved in converting and controlling the flow of electrical energy. To understand the concepts and applications of power electronics by studying the basic types of converters such as AC to DC, DC to AC, AC to AC and DC to DC. To examine and also to understand the specific applications, such as DC and AC drives. To study basic concepts of power semiconductor devices, phase-controlled rectifier, choppers, AC voltage converter, inverter their analysis and applications.

71. **Prerequisite:** Knowledge about mathematics, Semiconductor Devices, Electronic Circuits and Network Theory.

72. Objective of the Syllabus:

This course POWER ELECTRONICS is an essential division of Electrical engineering branch. The purpose of this course is to acquire knowledge, identify and define the basic elements of power electronics devices and their characteristics, specifications, operation and protection. To understand fundamentals of phase-controlled rectifiers (1ph and 3ph) and line commutated inverters. To acquire ability to analyze and design of DC-DC converters (choppers), AC-AC converters, DC-AC converters and various control strategies. Familiarize the various power electronics converters employing for various drives and finally apply knowledge to choose an appropriate power electronics converters for various applications.

73. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Acquire knowledge about the characteristics of different types of power electronic devices and commutation circuits.
CO2	Analyze the operation and waveforms of phase-controlled converters (AC-DC) with various loads.
CO3	Analyze the operation and waveforms of Chopper (DC-DC) with various loads and control strategy.
CO4	Analyze the operation and waveforms of Inverter (DC-AC) and control techniques.
CO5	Engage independent learning to apply power converter for a specific application.

74. Syllabus:

Module1: Power switching devices Diode, Thyristor, MOSFET, IGBT, I-V Characteristics; Firing circuit for thyristor Voltage and current commutation of a thyristor, Gate drive circuits for MOSFET and IGBT.

Module2: Thyristor rectifiers Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor.

Module3: DC-DC boost converter& DC-DC boost converter Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output Voltage, Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

Module4: Single-phase voltage source inverter Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage.

Module5: Three-phase voltage source inverter Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation.

BOOKS AND REFERENCES

Text Books

1. M.H. Rashid, "Power electronics: circuits, devices and applications", Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland,"Power Electronics: Converters, Applications and Design ", John Wiley&Sons,2007.
3. R.W. Erickson and D.Maksimovic,"Fundamentals of Power Electronics", Springer Science & Business Media,2007.
4. L. Umanand, "Power Electronics: Essentials and Applications", WileyIndia,2009.

Reference Books

1. "V. R. Murthy", "Power Electronics", Oxford University Press, 1st Edition 2005.
2. "P. C. Sen", "Power Electronics", Tata Mc Graw-Hill Publishing, 2001.
3. "M. S. Jamil Asghar", "Power Electronics", PHI Private Limited, 2004.
4. "Vedam Subramanyam", "Power Electronics", New Age International (P) Limited, Publications, 2nd Edition 2008.

POWER ELECTRONICS LAB SUB-CODE: ETEE 612 CREDIT: 02

Course Objective:

- To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.

Course Outcomes:

At the end of the course the students are able to:

- Relate the differences between signal level and power level devices.
- Illustrate the principle of operation, characteristics of commonly employed power electronic switching devices.
- Elaborate the performance of controlled rectifier circuits.
- Interpret the operation of DC-DC choppers.
- Analyze the operation of voltage source inverters.

Syllabus:

Week 1: To study the V-I characteristics of SCR**.**
Week 2: To study the V-I characteristics of TRIAC.
Week 3: To study the performance and wave of UJT triggering of SCR.
Week 4: Simulate MVT and MFT.
Week 5: To study AC voltage control by using TRIAC and DIAC combination.
Week 6: To study step-down and step-up chopper circuit.
Week 7: To study single-phase half-wave bridge controlled rectifier for R and RL load.
Week 8: To study single-phase full-wave bridge controlled rectifier for R and RL load with and without freewheeling diode.

Week 9: To study of three-phase half-wave controlled rectifier for resistive load.
Week 10: To study of three-phase full-wave controlled rectifier for resistive load.
Week 11: To study Single Phase series inverter with R and RL loads.
Week 12: To study Single Phase parallel inverter with R and RL loads.
Week 13: To study the bipolar and unipolar switching scheme of a single phase full bridge inverter using MATLAB /PSPICE simulation.
Week 14: To study the three phase VSI for 180/120 mode of conduction using MATLAB/PSPICE simulation.

REFERENCE BOOKS:

10. "John G. Kassakian, Martin, F. Schlect, Geroge C. Verghese", "Principles of Power Electronics", Pearson Education, 1st Edition 2010.
11. "M. S. Jamil Asghar", "Power Electronics", PHI Private Limited, 2004.
12. "M.H. Rashid", "Power Electronics: Circuit, Devices and Applications", Prentice Hall of India, 2nd edition, 1998.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE603**
Course Name	**Switchgear and Protection**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

Course Overview: This course provides a comprehensive understanding of the principles, methods, and devices used in protecting electrical power systems. It covers various aspects of protective relays, transmission line protection, synchronous generators and transformers protection, bus-bar protection, current and voltage transformers, and circuit breakers

Prerequisite: To understand the basic fault system, per unit system, basic of electrical measurement, transmission lines, transformer, and rotating machines.

Objective of the Syllabus:

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

Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the fundamental principles of protective relays and their role in electrical power systems
CO2	Apply overcurrent protection techniques to radial feeders, parallel feeders, and ring mains, considering time and current grading principles.
CO3	Identify common faults in alternator stator windings and apply appropriate differential protection schemes.
CO4	Analyze the causes of frame leakage and circulating currents in bus-bars and implement protective measures.
CO5	Classify different types of switchgear and assess their applications and relative merits in power systems.

75. Syllabus:

Unit I Introduction

Protective relays preliminaries, functional characteristics of relays, primary and backup protection, classification of relays, and types of electromagnetic relays. Types, characteristics, and settings of overcurrent relays, operation, and characteristics and connection of directional overcurrent relays and percentage differential relay, Distance Relays: - types, characteristics, and operation of distance relays for line and earth protection.

Unit II Protection of Transmission Line

Over-current protection of radial feeder, parallel feeder, and ring mains using time and current grading. Distance Protection- Effect of arcing and power swings on the performance different distance relays. Carrier current protection of Transmission Lines:- Basic apparatus used for power line carrier system. Principle of operation of directional comparison carrier protection, Carrier assisted distance protection.

Unit III Protection of Synchronous Generators and Transformers

Faults in the stator winding of alternators, differential protection, the effect of resistance in the star point earthing, single and multiple ground faults on the rotor protection against excitation failure, negative sequence protection, differential protection of generator and transformer Unit, the effect of magnetizing inrush current and methods for minimizing the effects, CT connection and Buchholz protection

Unit IV Bus-Bar Protection & Current and Voltage Transformer

Frame leakage and Circulating current protection, Steady-state performance of CT, equivalent circuit, phasor diagram, and accuracy. Steady-state performance of VT, Equivalent Circuit, phasor diagram, coupling capacitor voltage transformer, and its analysis.

Unit V Circuit Breakers

Classification of switch gear and fields of application and relative merits, theories of current interruption, energy balance and recovery rate theories, and practical systems of arc quenching PCBs. All types of circuit breakers, recent trends in HV CBs, and testing of CBs.

BOOKS AND REFERENCES

Text Books

1. Protection & Switchgear, B. Bhalja, R.P. Maheshwari, N.G.Chothani, Oxford 2013.
2. Power system protection & switchgear, B.Ram & D.N. Vishwakarma, Tata McGraw Hil 2011.

Reference Books

1. J. L. Blackburn, “Protective Relaying: Principles and Applications”, Marcel Dekker, New York, 1987.
2. Y. G.Paithankar and S. R. Bhide, “Fundamentals of power system protection”, Prentice Hall, India, 2010.

3. A. G. Phadke and J. S. Thorp, “Computer Relaying for Power Systems”, John Wiley & Sons, 1988.
4. A. G. Phadke and J. S. Thorp, “Synchronized Phasor Measurements and their Applications”, Springer,**2008.**
5. D. Reimert, “Protective Relaying for Power Generation Systems”, Taylor and Francis, 2006.

Switchgear and Protection LAB SUB-CODE: ETEE613 CREDIT: 02

Course Objective:

- Explain various protection strategies applied for power system protection.
- Select the protection elements namely fuse, circuit breakers, and relays for a given configuration.
- Select required protection measures against overcurrent and overvoltage in transmission lines.
- Select a suitable protection scheme for different power system equipment.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:-

- Understand the different components of a protection system.
- Evaluate fault current due to different types of fault in a network.
- Understand the protection schemes for different power system components.
- Understand the basic principles of digital protection.
- Understand system protection schemes and the use of wide-area measurements.

Syllabus:

Week 1 To study Over Current Relay static type& draw characteristics.

Week 2: To study IDMT over Current relay Electromechanical Type & draw current verses time characteristics.

Week 3: To study different types of circuit breakers.

Week 4: To study different protection schemes for alternators.

Week 5: To study the characteristics of Instantaneous relays.

Week 6: To study the construction and operation of Buchholz Relay

Week 7: To Study the operating characteristics of Differential Relay

Week 8: To study Static type Negative Sequence relay.

Week 9: To study Under Voltage relay electromechanical type & draw characteristics

Week 10: To study Over Voltage relay electromechanical type & draw characteristics.

REFERENCE BOOKS:

- A. G. Phadke and J. S. Thorp, “Synchronized Phasor Measurements and their Applications”, Springer,**2008.**
- D. Reimert, “Protective Relaying for Power Generation Systems”, Taylor and Francis, 2006.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETEE621**
Course Name	**HVDC Transmission system**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

76. Course Overview:

This course provides a comprehensive exploration of Direct Current (DC) Transmission Technology, covering various aspects ranging from economic considerations to technical performance and reliability. The modules delve into the comparison between AC and DC transmission systems, highlighting their respective advantages and applications. Additionally, it examines different types of HVDC (High Voltage Direct Current) systems, their components, and operational principles.

77. **Prerequisite:** To understand the Basics of Transmission Systems knowledge of AC transmission systems, including transmission line parameters, power flow, and voltage regulation, will provide a basis for comparing and contrasting AC and DC transmission systems.

78. Objective of the Syllabus:

The course aims to provide a comprehensive understanding of HVDC transmission technology, from its basic principles to advanced control strategies and emerging trends, enabling students to analyze, design, and operate HVDC systems effectively. It helps to Learn about the control strategies employed in HVDC converters, including firing angle control, current and extinction angle control, and higher-level control functions. Understand the fundamental differences between AC and DC transmission systems in terms of economics, technical performance, and reliability.

79. Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the advantages of DC transmission over AC transmission.
CO2	Identify different types of HVDC systems and their key components, understanding their operational principles and application scenarios.

CO3	Perform detailed analysis of line-commutated converters (LCCs) and voltage source converters (VSCs), including harmonic analysis, commutation effects, and power quality considerations.
CO4	Design and implement control strategies for HVDC converters, including firing angle control, current control, and reactive power control, to ensure stable and efficient operation of HVDC systems.
CO5	Understand the principles and operation of Multi-Terminal DC (MTDC) systems, and analyze their role in enabling flexible and resilient power grid architectures.

80. Syllabus:

Unit I Introduction

DC Transmission Technology Comparison of AC and DC Transmission (Economics, Technical Performance, and Reliability), Application of DC Transmission, Types of HVdc Systems, Components of an HVdc system, Line Commutated Converter and Voltage Source Converter based systems.

Unit II Analysis of Converters

Analysis of Line Commutated and Voltage Source Converters Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap, harmonics, Twelve Pulse Converters, Inverter Operation, Effect of Commutation Overlap, Expressions for average DC voltage, AC current and reactive power absorbed by the converters, Effect of Commutation Failure, Misfire and Current Extinction in LCC links, Voltage Source Converters (VSCs): Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six-pulse converter, Equations in the rotating frame. Real and Reactive power control using a VSC.

Unit III Control Process

Control of HVdc Converters & Components of HVdc systems Principles of Link Control in an LCC HVdc system. Control Hierarchy, Firing Angle Controls – Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers Power control, Frequency Control, Stability Controllers, reactive power Control, Principles of Link Control in a VSC HVDC system: Power flow and DC voltage control. Reactive Power Control/AC voltage regulation Smoothing Reactors, Reactive Power Sources and Filters in LCC HVdc systems DC line: Corona Effects. Insulators, Transient Over-voltages, DC line faults in LCC systems, DC line faults in VSC systems, DC breakers, Monopolar Operation, and Ground Electrodes.

Unit IV Stability Enhancement

Stability Enhancement using HVdc Control Basic Concepts: Power System Angular, Voltage and Frequency Stability. Power Modulation basic principles – synchronous and asynchronous links, Voltage Stability Problem in AC/DC systems.

Unit V I/O MTDC links

MTDC links Multi-Terminal and Multi-In feed Systems, Series and Parallel MTDC systems using LCCs, MTDC systems using VSCs. Modern Trends in HVdc technology. Introduction to Modular Multi-level Converter.

BOOKS AND REFERENCES

Text Books

1. K.R. Padiyar,"HVDC Power Transmission Systems", New Age International Publishers, ***2011***
2. J.Arrillaga, "High Voltage Direct Current Transmission", Peter Peregrinus Ltd.,***1983***.

Reference Books

1. E.W.Kimbark, "Direct Current Transmission", Vol.1, Wiley-Interscience,***1971***

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHAR SHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Program Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE 701**
Course Name	**Utilization of Electrical Power**
Course Credits	**3 (T) + 0 (P)= 3**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

Course Overview:

This course offers a comprehensive exploration of advanced topics in electrical engineering, focusing on heating and welding, illumination, electric traction, braking systems, and electric vehicles. Participants will delve into various heating methods, including electric, induction, and dielectric heating, alongside modern welding techniques. Additionally, they will gain an understanding of illumination principles, electric traction systems, braking techniques, and the emerging field of electric and hybrid electric vehicles. Through theoretical study and practical applications, participants will develop the skills and knowledge necessary for addressing complex challenges in the rapidly evolving field of electrical engineering.

Prerequisite:

Participants should have a foundational understanding of basic electrical engineering principles and concepts, including circuit theory, electromagnetism, and electrical systems. Familiarity with mathematical calculations, particularly about voltage, current, and power, will be beneficial. Additionally, a basic understanding of engineering materials and their properties, especially in the context of heating and welding, is recommended.

Objective of the Syllabus:

The primary objective of this syllabus is to equip participants with advanced knowledge and practical skills in various areas of electrical engineering, including heating and welding, illumination, electric traction, braking systems, and electric vehicles. Through a combination of theoretical learning and hands-on experiences, participants will develop the expertise needed to analyze, design, and implement solutions for complex electrical engineering challenges. Additionally, the syllabus aims to prepare participants for the evolving demands of the industry by focusing on emerging technologies and sustainable practices in the field of electrical engineering.

Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Participants will gain proficiency in various heating methods and modern welding techniques, enabling them to apply these skills effectively in industrial settings.
CO2	Participants will develop a comprehensive understanding of illumination principles and techniques, allowing them to design efficient lighting systems for different purposes.
CO3	Electric Traction Speed-Time Curves and Mechanics of Train Movement Participants will acquire knowledge of electric traction systems and train movement mechanics, facilitating their ability to design and optimize electric traction systems for efficient train operations.
CO4	Participants will learn about different braking techniques in electric traction systems and gain insight into the infrastructure required for efficient power supply in electric traction systems.
CO5	Participants will understand the configurations, performance characteristics, and architectures of electric and hybrid electric vehicles, enabling them to contribute to the development of sustainable transportation solutions.

81. Syllabus:

Unit I Heating and Welding

Participants will learn about various heating methods including electric heating, induction heating, and dielectric heating, as well as modern welding techniques. Additionally, they will understand the principles of electrolytic electro-metallurgical processes, including ionization, Faraday's laws of electrolysis, and the extraction and refining of metals through electro-deposition.

Unit II Illumination

This module introduces participants to the principles of illumination, covering radiant energy, laws of illumination, photometry, and measurement techniques. They will gain knowledge of electric lamps, lighting fittings, and illumination requirements for different purposes, emphasizing the importance of good lighting design.

Unit III Electric Traction Speed-Time Curves and Mechanics of Train Movement

Participants will explore electric traction systems, including speed-time curves for train movement and the mechanics of train movement. They will understand different systems of electric traction, train resistance, adhesive weight, and the coefficient of adhesion, essential for efficient train operations.

Unit IV Braking and Electric Traction Systems

This module covers braking techniques in electric traction systems, including regenerative braking and mechanical braking methods. Participants will also learn about the power supply infrastructure for electric traction, including AC electrification, transmission lines, sub-stations, and feeding and distribution systems for both AC and DC traction.

Unit V Electric Vehicles and Hybrid Electric Vehicles

Participants will study the configurations and performance of electric vehicles, including tractive effort and energy consumption. They will also explore the concept and architectures of hybrid electric drive trains, providing insights into the future of sustainable transportation.

BOOKS AND REFERENCES

Text Books

1 A Textbook on Power System Engineering A. Chakrabartietal Dhanpat Rai and Co2nd Edition,2010

2 Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals Theory, and Design (Chapters 04 and 05 for module5) Mehrdad Ehsanietal CRC Press 1st Edition,2005

Reference Books

1 Utilization, Generation and Conservation of Electrical Energy Sunil S Rao Khanna Publishers 1st Edition,2011

2 Utilization of Electric Power and Electric Traction G.C. Garg Khanna Publishers 9th Edition, 2014

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEC721**
Course Name	**ELECTRONIC DESIGN**
Course Credits	**3 (L) + 1 (T) + 0 (P) = 4**
Total Course Credit	**174**

Abbreviations: L- Lecture per week, T-Theory, P-Practical

Course Overview:

This course will introduce the core concepts of electronic system design that involves a multidisciplinary approach to create efficient and reliable electronic products in the modern era of Semiconductor technology. It will cover various aspects of electronic design, including linear and switching regulators, power amplifiers, sinusoidal oscillators, and isolation amplifier. Electronic design is a field that involves designing, testing, and implementing digital circuits and systems. The use of electronic devices has become prevalent in many industries, including telecommunications, computing, and consumer electronics. Now a days it plays a crucial role in designing modern IoTs based embedded system.

Prerequisite: To understand the basic analog and digital circuit along with the concepts of power electronics devices and switches.

Objective of the Syllabus:

This course Electronic Design is a core subject of Electrical and Electronics Engineering that deals with a multidisciplinary approach to create efficient and reliable electronic products in the modern era of Semiconductor technology especially the modern emerging trends in IoTs and Embedded system. This course helps explore integrated regulators such as LM78xx, LM79xx, LM317, and LM723 to understand their design principles and protection circuits. Further develops learning about designing and specification of boost-type switch-mode power supplies (SMPS). Through this course students also explore various types of switching amplifiers, power amplifiers, oscillators and PLL based on the application and their designing using discrete components & IC's meeting realistic constraints.

Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Explore integrated regulators such as LM78xx, LM79xx, LM317, and LM723. Understand their design principles and protection circuits.
CO2	Learn about designing buck-type and boost-type switch-mode power supplies (SMPS) and design aspect of various switching regulators.
CO3	Explore fundamentals and designing aspects of audio power amplifier, Integrated power amplifier and class D switching amplifier.
CO4	To understand the design specification of sinusoidal oscillators, voltage-controlled oscillators and phase-locked loop (PLL).
CO5	Explore the application of converters, grounding, shielding, Filters and data acquisition system in Digital communication networks.

Syllabus:

Unit I: DESIGN ASPECTS OF REGULATORS

Design aspects of regulators -Linear Design aspects of integrated regulators LM78xx, LM79xx, LM317, LM723, Protection circuits.

Unit II: DESIGN ASPECTS OF SWITCHING REGULATORS

Design aspects of regulators - Design of boost type SMPS, Buck Type SMPS, LM78S40, DC-DC Converter.

Unit III: POWER AMPLIFIER FUNDAMENTALS

Power amplifier fundamentals and Classification based on application, Design aspects of Audio Power Amplifiers, Design aspects of class D switching amplifier, Design aspects of integrated power amplifier TBA810, TDA2005.

Unit IV: DESIGN FUNDAMENTALS OF SINUSOIDAL OSCILLLATORS

Design fundamentals of sinusoidal oscillators- Performance specification, Design aspects of VCO, PLL Introduction, Concept of Synchronization, Basic Structure of PLL, Transfer function, PLL Applications.

Unit V: ARCHITECTURE OF ISOLATION AMPLIFIER

Architecture of Isolation amplifier- Grounding and shielding, Architecture of DAC and ADC, Design aspects of Data acquisition system, Design of active Butterworth filters up to sixth order, Infinite Gain Multiple Feedback filter, Sallen Key filters.

BOOKS AND REFERENCES

Text Books

1. Op-amps for Everyone, Ron Mancini, Design reference manual. 4. Regulated Power supply Handbook, Texas Instrument, 2002.

2. TI-Design considerations for class D audio Power Amplifiers, Application report, 1999.
3. Texas Instruments Data Sheets Catalog.
4. A Mono graph on Electronic Design Principles, N. C. Goyal, R. K. Khetan, Khanna Publications, 5th Edition, 2006.

Reference Books

1. "Elements of Electronics Engineering" by Prof Bhutiyani S R, 3rd Edition, Everest Publishing House, 2001.
2. "Electronic Circuits, 4th edition: Fundamentals and applications" by Mike Tooley, 2019.

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering Engineering.

Programme Structure	**B. Tech (Electrical Engineering)**
Subject Code	**ETEE723**
Course Name	**Wind and Solar Energy**
Course Credits	**3 (T) + 2 (P)= 5**
Total Course Credit	**177**

Abbreviations: T-Theory, P-Practical

Course Overview:

This course offers a comprehensive exploration into the fascinating world of renewable energy systems, focusing on wind and solar power technologies and understanding the fundamental principles underlying wind energy conversion. Understanding the methods for assessing solar energy potential.

Prerequisite:

To successfully navigate through the Renewable Energy Systems - Wind and Solar Power course.

Objective of the Syllabus:

d. Understanding basic characteristics of renewable sources of energy and technologies for their utilization

e. To give a review on utilization trends of renewable sources of energy

f. To give a review of legislative and regulatory rules related to the utilization of renewable sources of energy

Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	Understand the energy scenario and the consequent growth of power generation from renewable energy sources.
CO2	Understand the basic physics of wind and solar power generation.
CO3	Understand the power electronic interfaces for wind and solar generation.

CO4	Understand the issues related to the grid-integration of solar and wind energy systems.
CO5	Understand the operation of hybrid solar PV and wind systems in both grid-connected and isolated modes.

Syllabus:

Unit I Introduction

Physics of Wind Power History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall, and pitch control, Wind speed statistics-probability distributions, Wind speed, and power-cumulative distribution functions.

Unit II Wind generator topologies

Wind generator topologies Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent Magnet Synchronous Generators, Power electronics converters. Generator Converter configurations, Converter Control.

Unit III The Solar Resource & Solar thermal power generation

The Solar Resource & Solar thermal power generation Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar daylength, Estimation of solar energy availability Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

Unit IV Solar photovoltaic

Solar photovoltaic Technologies-Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT)algorithms, Converter Control

Unit V Network Integration Issues

Network Integration Issues Overview of grid code technical requirements, Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues, Power system interconnection experiences in the world, Hybrid and isolated operations of solar PV and wind systems.

BOOKS AND REFERENCES

Text Books

1. T.Ackermann, “Wind Power in Power Systems”, John Wiley and SonsLtd.,***2005***
2. G.M. Masters, “Renewable and Efficient Electric Power Systems”, John Wiley and Sons,***2004.***

3. S.P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw-Hill,***1984.***

Reference Books

1. H. Siegfried and R.Waddington, “Grid integration of wind energy conversion systems”, John Wiley and “Sons Ltd.,***2006***

2. G.N. Tiwari and M.K.Ghosal, “Renewable Energy Applications”, Narosa Publications,***2004.***

3. J.A Duffie and W.A. Beckman,“Solar Engineering of Thermal Processes”, John Wiley &Sons ***1991***

K. K. UNIVERSITY

BERAUTI, NEPURA, BIHARSHARIF, NALANDA, BIHAR-803115.

School of Engineering & Technology.

Department of Electrical Engineering.

Programme Structure	**B. Tech (Electrical Engineering))**
Subject Code	**ETEE821**
Course Name	**ELECTRICAL ENERGY CONSERVATION & AUDITING**
Course Credits	**3 (T) + 0 (P)= 3**
Total Course Credit	**174**

Abbreviations: T-Theory, P-Practical

Course Overview:

This course will introduce the conceptual knowledge of the technology, economics and regulation related issues associated with energy conservation and energy auditing in current scenario. It will develop the ability to analyze the viability of energy conservation projects. The main aim of this course is to develop the capability to integrate various options and assess the business and policy environment regarding energy conservation and energy auditing through the awareness about the energy conservation and energy management.

Prerequisite:

- Basic Physics
- Environmental engineering
- Network theory
- Electric motor and drives.

Objective of the Syllabus:

This course Electrical Energy Conservation and Auditing is introduced as a subject of Electrical Engineering to develop the ability to identify the energy management skills and strategies in the energy management system. It also focusses on the ability to understand various energy conservation methods useful in a particular industry and ability to select appropriate energy conservation method for the critical area identified. At the end of this course students will develop the Conceptual knowledge of the technology, economics and regulation related issues associated with energy conservation and energy auditing to integrate various options and assess the business and policy environment to prepare an energy audit report.

Course Outcomes:

S. No.	Course Outcomes (Cos)
CO1	To develop the conceptual understanding and awareness of energy conservation, energy pricing, and the interplay between energy and the environment through legislative act i.e. **Energy Conservation Act of 2001**
CO2	To gain knowledge about heat transfer mechanisms, temperature, pressure and different energy forms and analyze electricity tariff structures, load management techniques, and power factor improvement.
CO3	Discuss about the energy audits, their types, and the instruments used for assessment and to create material and energy balance diagrams to analyze energy flows within a facility.
CO4	Outline the load management and energy saving strategies related to efficient motors and electrical loads.
CO5	To introduce cutting-edge technologies that enhance energy efficiency in electrical systems used within Industries.

Syllabus:

Unit I: Energy Scenario

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

Unit II: Basics of Energy and its various forms

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

Unit III: Energy Management & Audit

Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

Unit IV: Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control,

power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replace men tissues, energy saving opportunities with energy efficient motors.

Unit V: Energy Efficiency in Industrial Systems & Energy Efficient Technologies in Electrical Systems

Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Cooling Tower: Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities, assessment of cooling towers, Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

BOOKS AND REFERENCES

Text Books

1. Guide books for National Certification Examination for Energy Manager/Energy Auditors Book-1,General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager/Energy Auditors Book-3, Electrical Utilities (available online)
3. Success stories of Energy Conservation by BEE, New Delhi(www.bee-india.org)

Reference Books

1. S.C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill,1991.
2. **"Electrical Energy Conservation & Auditing"** by Udit Mamodiya, 2020.
3. "Energy Management Handbook" by W.C. Turner, 9th edition: 2018.