RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

Choice Based Credit System Semester-I

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
								Internal	External		Total	
				L	T	P		Max	Max	Min	Max	Min
1	**Basic Science Course**	BT101	Engineering Chemistry	3	0	0	**3**	30	70	21	100	35
2	**Basic Science Course**	BT102	Engineering Mathematics-I	3	1	0	**4**	30	70	21	100	35
3	**Humanities and Social Science**	BT103	Technical Communication	2	0	0	**2**	30	70	21	100	35
4	**Engineering Science Course**	BT104	Basic Electrical & Electronics Engineering	3	0	0	**3**	30	70	21	100	35
5	**Engineering Science Course**	BT105	Engineering Graphics & Design	2	0	0	**2**	30	70	21	100	35
6	**Humanities and Social Science**	BT106	Universal Human Values-2	3	0	0	**3**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	**Basic Science Course**	BT151	Engineering Chemistry Lab	0	0	2	**1**	30	20		50	25
2	**Engineering Science Course**	BT 154	Basic Electrical & Electronics Engineering Lab	0	0	2	**1**	30	20		50	25

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

3	**Engineering Science Course**	BT 155	Engineering Graphics & Design Lab	0	0	2	**1**	30	20		50	25
4	**Engineering Science Course**	BT156	Workshop/ Manufacturing Practices	0	0	4	**2**	30	20		50	25
TOTAL				16	1	10	**22**					

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-I

(Common to all Branches)

Course Code	**BT101**
Course Title	**Engineering Chemistry**
Credits	**3 (L: 3 T: 0 P: 0)**

Course Objectives:

1. To expose the student to a breadth of experimental techniques using modern instrumentation

2. The students will understand the importance of the periodic table of the elements how it cameto be and it's role in organizing chemical information.

3. The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.

Module 1

Electrochemistry and Water:

Electrochemistry: Law of chemical equilibrium, equilibrium constants and their significance, Weak and strong electrolytes, Conductors, Insulators, Dielectrics, galvanic cells, Standard electrode potential and its application to different kinds of half cells, Batteries and Fuel Cells with examples, Arrhenius Theory of Ionization, Degree of Ionization & factors affecting degree of ionization. Ostwald's dilution law, pH, buffer. Numerical problems

Water and corrosion: Sources, Impurities, Hardness & it's different units, Degree of Hardness, softening of water by Zeolite and Ion exchange method, Boiler trouble causes (Sludge and Scale), Characteristics of municipal water & its treatment, Chemical and Electrochemical corrosion, Factors affecting the rate of corrosion, General method of corrosion prevention

Module 2

Periodic Properties and Chemical Bonding:

Periodic properties: Brief introduction to Periodic table, Ionization energy, electron affinity, electro negativity, electronicconfigurations, atomic and ionic sizes, polarizability

Chemical Bonding: VSEPR theory, oxidation states, coordination numbers and geometries, hard soft acids and bases, Crystal field theory, color & magnetic properties of coordination complexes. Types of bonds-Ionic bond, Covalent bonds,Metallic Bonds, Hydrogen bond, etc.

Module 3

Spectroscopy and Photochemistry

Spectroscopy: Principles of spectroscopy and selection rules, electronic spectroscopy- Absorption and emission Spectroscopy, Principles and applications of UV-Visible, Factors influencing for UV-vis spectrum; Rotational and Vibrational spectroscopy, Principle of FT-IR, and NMR spectroscopy. Modern techniques in structural elucidation ofcompounds by UV-Vis, IR, & NMR Spectroscopy.

Photochemistry: Photochemical reaction, Lambert-Beers Law, Fluorescence and Phosphorescence, Jablonski diagram,Einstein photochemical reaction

Module 4

Thermochemistry and Fuels

Thermochemistry: Free energy, entropy, Enthalpy, EMF. Hess's law, entropy, enthalpy and combustion calculations, Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria.

Fuels: Classification of the fuel and its characteristics, Calorific value, HCV, LCV, Determination of calorific value by Bomb calorimeter, application of fossil fuels, solid fuels (coal), liquid fuels (petrol and diesel), gaseous fuels (water gas, producer gas, coal gas and biogas), carbonization and gasification, refining, reforming, , knocking and anti-knocking properties, octane and cetane numbers

Module 5

Polymerization and Common Organic Reactions

Polymers: Introduction, Types, classification and properties of polymers, Different methods of synthesis- Addition, condensation. Molecular weights of polymers (M_n, M_w, M_v), glass transition temperature (T_g), synthesis of commercially important polymers and their uses (Nylon 6, Nylon 6,6, Polyethylene, PET, PS, PVC), an introduction to green chemistry. and, Synthesis of commercially

important polymers and their uses- PVC, Teflon, Nylon 6, Nylon 66, Decoran, Vulcanization of Rubber. Organic reactions: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclizationand ring openings with examples.

Course Outcomes:

1. Students will have a firm foundation in the fundamental and application of current chemical and scientific theories including those analytical, Inorganic, Organic, and Physical Chemistries. Major to be certified by the American chemical Society will have extensive laboratory work and knowledge of biological chem.

2. Students will be able to design and carry out scientific experiments as well as accurately record, and analyze the results of such experiments.

3. Students will have able to explore new areas of research in both chemistry and allied fields of science and technology.

4. Students will able to explain why chemistry is an integral activity for addressing social, economic and environmental problems

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-I

(Common to all Branches)

Course Code	**BT151**
Course Title	**Engineering Chemistry Lab**
Credits	**1 (L: 0 T: 0 P: 2)**

List of Experiments:

1. Determination of Total hardness by EDTA method.
2. Determination of mixed alkalinity
   - OH^- & $CO3^{2-}$
   - $CO3^{2-}$ & $HCO3^-$
3. Determination of Flash & Fire Points by Pensky Marten Apparatus.
4. Determination of Flash & Fire Points by by Abel's Apparatus.
5. Determination of Flash & Fire Points by Cleveland's Open Cup Apparatus.
6. Determination of Calorific Value by Bomb Calorimeter.
7. Determination of Viscosity and Viscosity index by Redwood viscometer No.1.
8. Determination of Viscosity and Viscosity index by Redwood viscometer No.2.
9. Determination of percentage of carbon by Proximate analysis of coal
10. To Determine the Strength of NaOH Solution (Standard Oxalic Acid Solution Supplied)
11. To Determine the Strength of HCl Solution (Standard NaOH Solution Supplied)
12. Salt analysis: Dry Test &Wet Test acid and basic radicals

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

Books Suggested:

1. Chemistry in Engineering and Technology - Vol.1 & 2 Kuriacose and Rajaram, McGraw Hill Education
2. Fundamental of Molecular Spectroscopy C.N. Banwell , McGraw Hill Education
3. Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
4. Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand &Company Ltd., Delhi.
5. Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd.Publishers, New Delhi.
6. Elementary Spectroscopy, Y.R. Sharma, S. Chand Publishing
7. Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International Pvt. Ltd
8. Advanced Inorganic Chemistry, G.R. Chatwal, Goal Publishing house
9. Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna
10. Engineering Chemistry Jain & Jain Dhanpat Rai and Sons

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH

Semester-I

(Common to all Branches)

Course Code	**BT102**
Course Title	**Engineering Mathematics-I**
Credits	**4 (L: 3 T: 1 P: 0)**

Course objectives:

1. To understand the basic problem of calculus
2. To understand basics problems of Matrices
3. To analyze Boolean algebra

Module 1: Calculus: Successive Differentiation, Rolle's theorem, Mean Value theorems, Expansion of functions by Mc. Laurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagrange's Multipliers.

Module 2: Calculus: Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration, Applications of multiple integral for calculating area and volumesof the curves.

Module 3: Sequences and series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 4: Matrices: Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

Module 5: Boolean Algebra: Algebra of Logic, Boolean Algebra, Principle of Duality, Basic Theorems, Boolean Expressions and Functions. Elementary Concept of Fuzzy Logic Graph Theory: Graphs, Subgraphs, Degree andDistance, Tree, cycles and Network.

References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Course Outcomes: students will be able to solve various problems in Matrices, Calculus, Boolean algebra.

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH

Semester-I

(Common to all Branches)

Course Code	**BT103**
Course Title	**Technical Communication**
Credits	**2 (L: 2 T: 0 P: 0)**

Course objectives:

1. to make students able to learn speak read and write the basic English
2. To develop effective communication
3. To write business letters applications etc.

Module I

Identifying Common errors in writing: Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice,Reported Speech: Direct and Indirect, Sentence Structure.

Module II

Vocabulary building and Comprehension: Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension, Paragraph writing, Unseen passage.

Module III

Communication: Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication, Types and forms of Communication, Skills of Communication.

Module IV

Developing Writing Skills: Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report, Note making.

Module V

Business Correspondence: Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender

Books Recommended:

1. 'Technical Communication: Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and Pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood, Macmillan 2007.

Course outcomes:

Students will be able to

1. communicate effectively public ally
2. reading writing basic English will be improved so that it will be helpful in professional work.

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-I

(Common to all Branches)

Course Code	**BT104**
Course Title	**Basic Electrical & Electronics Engineering**
Credits	**3(L: 3 T: 0 P: 0)**

Course Objectives:

1. To make students familiar with basics of AC and DC Circuits and networks
2. To understand the construction and working principles of basic Transformer and Rotating machines
3. To understand the wiring system and Power distribution channel
4. To Design and analyze various electronic circuits

Module I

AC & DC CIRCUITS

Circuit parameters, Ohms law, Kirchhoff's law. Average and RMS values, concept of phasor representation. RLC series circuits and series resonance, RLC parallel circuits (includes simple problems in DC & AC circuits) Introduction to three phase systems – types of connections, relationship between line and phase values. (Qualitative treatment only) Voltage and current sources, dependent and independent sources, source conversion, DC circuits analysis using mesh & nodal method, star-delta transformation. 1-phase AC circuits under sinusoidal steady state, active, reactive and apparent power, physical meaning of reactive power, power factor, 3-phase balanced and unbalanced supply, star and delta connections.

Module II

TRANSFORMERS

Review of laws of electromagnetism, mmf, flux, and their relation, analysis of magnetic circuits. Single-phase transformer, basic concepts and construction features, voltage, current and impedance transformation, equivalent circuits, phasor diagram, voltage regulation, losses and efficiency, OC and SC test.

Module III

ROTATING ELECTRIC MACHINES-

Constructional details of DC machine, induction machine and synchronous machine, Working principle of DC machines, classification of DC machine, EMF equation, armature reaction, characteristic of separately excited and self-excited generator. Working principle of DC motor, Importance of back EMF, Starting of DC motor, speed torque characteristic of separately excited and self-excited DC motor.

Module IV

WIRING & LIGHTING

Types of wiring, wiring accessories, staircase & corridor wiring, Working and characteristics of incandescent, fluorescent, SV & MV lamps. Basic principles of earthling, simple layout of generation, transmission & distribution of power.

Module V

ELECTRONICS:

Binary Number system binary addition, subtraction, multiplication and division, subtraction operation using 1'sand 2's complement forms, Octal number system, hexadecimal number system conversion of number system from one number system to another number system, types of Resistors, Inductor and capacitor, color coding of

resistor and capacitor P-type and N-type semiconductor, semiconductor diode its operation in forwardand reverse bias, V-1 characteristics, half wave and full wave rectification, application.

Course Outcomes:

After studying this course students will be able to

1 Design various AC and DC Circuits

2. Able to explain the various parts of electrical Machines and their functioning.

3. will be able to explain wiring and power distribution.

3. Will be able to design basic electronic circuits such as diode rectifiers etc.

References:

1. Basic Electrical & Electronics Engineering by V.N. Mittle & Arvind Mittle.
2. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
3. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
4. Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
5. Nagrath & Kothari, Basic Electrical Engineering, TMH.
6. J.S. Katre, Basic Electronics Engg, Max Pub. Pune.
7. Hughes, Electrical and Electronic Technology, Pearson Education IX Edition

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-I

(Common to all Branches)

Course Code	**BT154**
Course Title	**Basic Electrical & Electronics Engineering Lab**
Credits	**1 (L: 0 T: 0 P: 2)**

Course Objectives:

1. To enable students to design the DC and AC circuits practically.
2. To enable students to make electrical connections of Transformer and perform various tests on it
3. To enable students to design various electronic circuits like PN Junction, Rectifiers etc.

List of Experiments:

1. To verify Ohm's Law
2. To verify KCL and KVL
3. To perform Open circuit and short circuit test on Single phase transformer.
4. To analyze ratio and polarity test on single phase transformer.
5. To Design various logic gates on breadboard and virtually on software.
6. To study the Pin configuration of various logic gate ICS.
7. To study V-I Characteristics of PN Junction Diode.
8. To design half and full wave rectifiers.
9. To study the construction of DC Motors.
10. To study the construction of Transformer.

Course Outcomes:

The students are expected to

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of basic electronic circuits.

References:

1. Basic Electrical & Electronics Engineering by V.N. Mittle & Arvind Mittle.
2. Vincent Del Toro, Electrical Engineering Fundamentals, PHI Learning, II Edition
3. S.Ghosh, Fundamentals of Electrical and Electronics Engineering, PHI, II Edition.
4. Millman, Halkias & Parikh, Integrated Electronics, Mc Graw Hill, II Edition
5. Nagrath & Kothari, Basic Electrical Engineering, TMH.
6. J.S. Katre, Basic Electronics Engg, Max Pub. Pune.
7. Hughes, Electrical and Electronic Technology, Pearson Education IX Edition

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

Semester-I

(Common to all Branches)

Course Code	**BT105**
Course Title	**Engineering Graphics & Design**
Credits	**2 (L: 2 T: 0 P: 0)**

MODULE - I

GEOMETRICAL CONSTRUCTION, USE OF INSTRUMENTS, SCALES; Representative factor, plain scales, diagonal scales, scale of chords. engineering curves; Construction of ellipse, parabola, hyperbola, Cycloid, Epi-cycloid, Hypo-cycloid, Involutes, Archimedean and logarithmic spirals.

MODULE – II

Projections of points, lines, planes and solids. Section of Solids: Section of right solids by normal and inclinedplanes.

MODULE -III

Development of Surfaces: Parallel line and radial - line method for right solids.

Isometric Projections: Isometric scale, Isometric axes, Isometric Projection from orthographic drawing. Intersection of cylinders.

MODULE IV

Computer Graphics: Introduction to general purpose graphics software, plotting techniques, coordinate system transformations, line drawing, polygon an circle generation. Drawing entity commands of Computer drafting. Sectional and dimensional drawing using computer.

MODULE V

Working in sketcher environment, Drawing sketch, line, circle, rectangle, ellipse, arc, spline etc. Deleting & trimming sketching entities, Dimensioning the sketches , Modifying dimension of sketches, Modifying dimension of sketches, Creating text, Transformation of sketch entiies-mirror, scale, rotate, Drawing views, Determining visible area of the view ,Creating a cross-section views,

Modifying cross-section views, Editing cross-section views, Modify the drawing views, Dimensioning & detailing the drawing views.

Text/ Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. (Corresponding set of) CAD Software Theory and User Manuals

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH

Semester-I

(Common to all Branches)

Course Code	**BT156**
Course Title	**Workshop/ Manufacturing Practices**
Credits	**2 (L: 0 T: 0 P: 4)**

MODULE I

Introduction: Manufacturing Processes and its Classification, Casting, Machining, Plastic deformation and metal forming, Joining Processes, Heat treatment process, Assembly process. Powder Metallurgy, introduction to computers in manufacturing. Black Smithy Shop Use of various smithy tools. Forging operations: Upsetting, Drawing down, Fullering, Swaging, Cutting down, Forge welding, Punching and drafting. Suggested Jobs: Forging of chisel., forging of Screw Driver

MODULE II

Carpentry Shop: Timber : Type, Qualities of timber disease, Timber grains, Structure of timber, Timber, Timber seasoning, Timber preservation .Wood Working tools: Wood working machinery, joints & joinery. Various operations of planning using various carpentry planes sawing & marking of various carpentry joints. Suggested Jobs : Name Plate ,Any of the Carpentry joint like mortise or tennon joint

MODULE III

Fitting Shop: Study and use of Measuring instruments, Engineer steel rule, Surface gauges caliper, Height gauges, feeler gauges, micro meter. Different types of files, File cuts, File grades, Use of surface plate, Surface gauges drilling tapping Fitting operations: Chipping filling, Drilling and tapping. Suggested Jobs: Preparation of job piece by making use of filling, sawing and chipping , drilling and tapping operations.

MODULE IV

Foundry: Pattern Making: Study of Pattern materials, pattern allowances and types of patterns. Core box and core print, .Use and care of tools used for making wooden patterns. Moulding: Properties of good mould & Core sand, Composition of Green, Dry and Loam sand. Methods used to prepare simple green and bench and pit mould dry sand bench mould using single piece and split patterns.

MODULE V

Welding: Study and use of tools used for Brazing, Soldering, Gas & Arc welding. Preparing Lap & Butt joints using gas and arc welding methods, Study of TIG & MIG welding processes. Safety precaut

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-I

(Common to all Branches)

Course Code	**BT106**
Course Title	**UNIVERSAL HUMAN VALUES-2**
Credits	**3(L: 3 T: 0 P: 0)**

Module 1 –

Introduction to Value Education

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Lecture 3: Self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human AspirationsPractical

Tutorial 1: **Practice Session PS1** Sharing about Oneself

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

Module 2 –

Harmony in the Human Being

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body

Lecture 8: Distinguishing between the Needs of the Self and the Body

Lecture 9: The Body as an Instrument of the Self

Lecture 10: Understanding Harmony in the Self

Lecture 11: Harmony of the Self with the Body

Lecture 12: Programme to ensure self-regulation and HealthPractical

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of Self and Body

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the Self

Tutorial 6: Practice Session PS6 Exploring Harmony of Self with the Body

Module 3

Harmony in the Family and Society

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Lecture 15: 'Respect' – as the Right Evaluation

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society **Lecture 18:** Vision for the Universal Human Order Practical

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

Module 4 – Harmony in the Nature/Existence

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence Practical

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

Lecture 28: Strategies for Transition towards Value-based Life and ProfessionPractical

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME 2023-2027

Choice Based Credit System Semester-II												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
				L	**T**	**P**		**Internal**	**External**		**Total**	
								Max	**Max**	**Min**	**Max**	**Min**
1	**Basic Science Course**	BT201	Engineering Physics	4	0	0	**4**	30	70	21	100	35
2	**Basic Science Course**	BT202	Engineering Mathematics-II	3	1	0	**4**	30	70	21	100	35
3	**Engineering Science Course**	BT203	Basic Mechanical Engineering	2	0	0	**2**	30	70	21	100	35
4	**Engineering Science Course**	BT204	Basic Civil Engineering & Engineering Mechanics	3	0	0	**3**	30	70	21	100	35
5	**Engineering Science Course**	BT205	Programming for Problem Solving With C	2	0	0	**2**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	**Basic Science Course**	BT251	Engineering Physics Lab	0	0	2	**1**	30	20		50	25
2	**Engineering Science Course**	BT253	Basic Mechanical Engineering Lab	0	0	2	**1**	30	20		50	25
3	**Engineering Science Course**	BT255	Programming for Problem Solving In C Lab	0	0	4	**2**	30	20		50	25
4	**Engineering Science Course**	BT254	Basic Civil Engineering & Engineering Mechanics Lab	0	0	2	**1**	30	20		50	25
5	**Humanities and Social Science**	BT256	Language Laboratory	0	0	2	**1**	30	20		50	25
6	**Athletic Union**	BT257	Sports and NSS/YOGA	0	0	2	**1**	30	20		50	25
TOTAL							**22**					

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH

Semester-II

(Common to all Branches)

Course Code	**BT201**
Course Title	**Engineering Physics**
Credits	**4(L: 4 T: 0 P: 0)**

Course objectives:

1. To provide knowledge and develop an understanding of principles and processes of wave optics, optical communication, nano physics etc.
2. To develop the basic skill to apply knowledge by the topics covered in the course to engineering problems.

MODULE - I

Wave Optics

Interference: Fresnel's biprism, Interference in thin films, Newton's rings and Michelson's interferometer experiments. Diffraction at single slit, double slit and n-slit. Diffraction grating. Rayleigh criterion, resolving power of a telescope, grating and prism. Concept of polarized light, Brewster's laws, Double refraction, Nicol prism, quarter & half wave plate. Idea about circularly & elliptically polarized light.

MODULE - II

Nuclear Physics

Nuclear Structure & Nuclear properties, Quantitative treatment of nuclear models: liquid drop and shell models, Linear Particle accelerator, Cyclotron, Synchrotron, Synchrocyclotron, and Betatron, Nuclear cross section, chain reaction, critical size. Application of E = mc2 ,Q-Value, Nuclear fusion & fission, Nuclear reactors, Geiger- Muller Counter, Bainbridge and Auston mass Spectrograph.

MODULE –III

Semiconductors & Nano-Physics

Free Electron model of solids, Qualitative Analysis of Kronig Penny model, Effective mass, Fermi level for Intrinsic and Extrinsic Semiconductors: p-n junctions, Zener break down, photodiode, solar-

cells, Hall effect. Elementary idea about Nano structures and Nano materials.

MODULE -IV

Laser and Fiber Optics

Laser: Stimulated and spontaneous emission, Einstein's A & B Coefficients, transition probabilities, active medium, population inversion, pumping, Optical resonators, characteristics of laser beam. Coherence, directionality and divergence. Principles and working of Ruby, Nd:YAG, He-Ne & Carbon dioxide Lasers with energy level diagram.. Fundamental idea about optical fiber, types of fibers, acceptance angle & cone, numerical aperture, V-number, propagation of light through step index fiber (Ray theory) pulse dispersion, attenuation, losses & various uses. Engineering uses & applications of laser and Optical Fiber

Reference Books: -

1. Engineering Physics- V. S. Yadava, TMH
2. A T.B. of Optics by Brijlal and Subhraininyan.
3. Optics By Ghatak, TMH
4. Engineering physics by M.N. Avadhanulu and P.G. Kshirsagar. S. Chand & Co.
5. Fundamentals of engineering physics by P. Swarup, Laxmi Publications.
6. Atomic and Nuclear physics by Brijlal and Subraminiyan.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT251**
Course Title	**Engineering Physics Lab**
Credits	**1(L: 0 T: 0 P: 2)**

Course Objectives:

1. To learn some basic principles of physics that help students to understand how world around them works.
2. To apply scientific knowledge systematically.
3. To realize fundamental concept of physics and how it can be applied to another field.

List of suggestive Core experiments:

1. Biprism, Newton's Rings, Michelsons Interferometer.
2. Resolving Powers –Telescope, Microscope, and Grating.
3. G.M. Counter
4. Spectrometers-R.I., Wavelength, using prism and grating
5. Optical polarization-based experiments: Brewster's angle, polarimeter etc.
6. Measurements by LASER-Directionality, Numerical aperture, Distance etc.
7. Uses of Potentiometers and Bridges (Electrical)..
8. Experiments connected with diodes and transistor.
9. Measurement of energy band gap of semiconductor.
10. Other conceptual experiments related to theory syllabus.

List of experiments-

1. To determine the wavelength of monochromatic light by Newton's rings.
2. Measurment of wavelength of a laser light using single slit diffraction.
3. To determine the wavelength of monochromatic light with the help of Frensel's biprism.
4. To study the Hall effect and determine the Hall coefficient.
5. To determine the coefficient of viscosity of a liquid.
6. To study the characteristics of Zener diode.
7. To determine the value of plank's constant by a photocell

8. To study the polarization of light by simple reflection using laser light.

9. To calibrate the given ammeter and voltmeter.

10. To verify the Stefan's law by electrical method.

Course Outcomes:

After undergoing the lab work the students will be able to:

1) Takel the problems in physics.

2) Plan, execute, analyze and report the of experiments.

3) Use mathematics to describe the physical world.

Reference Books: -

1. Engineering Physics- V. S. Yadava, TMH
2. A T.B. of Optics by Brijlal and Subhraininyan.
3. Optics By Ghatak, TMH
4. Engineering physics by M.N. Avadhanulu and P.G. Kshirsagar. S. Chand & Co.
5. Fundamentals of engineering physics by P. Swarup, Laxmi Publications.
6. Atomic and Nuclear physics by Brijlal and Subraminiyan.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT202**
Course Title	**Engineering Mathematics-II**
Credits	**4(L: 3 , T: 1 , P: 0)**

Course objectives:

1. **To solve various ordinary and partial differential equations**
2. **Analyze complex variable**
3. **Understand basics of Vector calculus**

Module 1: Ordinary Differential Equations I: Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations

Module 2: Ordinary differential Equations II: Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions ofthe first kind and their properties.

Module 3: Partial Differential Equations: Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Module 4: Vector Calculus: Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems.

Module 5: Functions of Complex Variable: Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn.,Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Course outcomes:

Students will be able to solve problems related to differential equations, vector algebra and complex variable problems.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT203**
Course Title	**Basic Mechanical Engineering**
Credits	**2(L: 2 , T:0 , P: 0)**

Module I

Materials: Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness, ductility, brittleness, malleability etc. of materials, Tensile test- Stress-strain diagram of ductile and brittle materials

,Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.

Module II

Measurement: Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set.

Production Engineering: Elementary theoretical aspects of production processes like casting, carpentry, welding etc Introduction to Lathe and Drilling machines and their various operations.

Module III

Fluids: Fluid properties pressure, density and viscosity etc. Types of fluids, Newton's law of viscosity, Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps .

Module IV:

Thermodynamics: Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering: Classification and working of boilers, mountings and accessories of boilers, Efficiency and performance analysis, natural and artificial draught**,** steam properties, use of steam tables.

Module V:

Reciprocating Machines:

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

Reference Books:

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

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT253**
Course Title	**Basic Mechanical Engineering LAB**
Credits	**1(L: 0, T:0 , P: 2)**

List of Suggestive Core Experiments:

Theory related Eight to Ten experiments including core experiments as follows:

1 Study of Universal Testing machines.

2 Linear and Angular measurement using, Micrometer, Slip Gauges, Dial Gauge and Sine-bar.

3 Study of Lathe Machine.

4 Study of Drilling Machines.

5 Verification of Bernoulli's Theorem.

6 Study of various types of Boilers.

7 Study of different IC Engines.

8 Study of different types of Boilers Mountings and accessories.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT204**
Course Title	**Basic Civil Engineering and Engineering Mechanics**
Credits	**3(L:3 , T:0 , P: 0)**

MODULE I

Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing, Low cost housing building materials.

Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases – types and their suitability

MODULE – II

Surveying & Positioning:

Introduction to surveying Instruments – levels, thedolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by Different methods and different methods of leveling.

MODULE –III

Mapping & Sensing:

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations, Introduction of remote sensing, GIS and GPS and its applications.

Engineering Mechanics

MODULE – IV

Forces and Equilibrium: Graphical and Analytical Treatment of Concurrent and no concurring Co-plannerforces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems

MODULE – V

Centre of Gravity and moment of Inertia: Centroid and Centre of Gravity, Moment Inertia of Area and Mass,Radius of Gyration, Introduction to product of Inertia and Principle Axes.

Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam withconcentrated, distributed load and Couple.

Reference Books:

1. S. Ramamrutam & R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg & Engg. Mechanics; PHI
5. S.P,Timoshenko, Mechanics of stricture, East West press Pvt.Ltd.
6. Surveying by Duggal – Tata McGraw Hill New Delhi.
7. Introduction to GIS by Chang
8. Surveying and Leveling by N.M. Basak, McGraw Hill

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT254**
Course Title	**Basic Civil Engineering and Engineering Mechanics LAB**
Credits	**1(L:0 , T:0 , P: 2)**

List of suggestive core Experiments:

Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting experiments from each unit of syllabus.

1. To perform traverse surveying with prismatic compass, check for local attraction and determine correctedbearings and to balance the traverse by Bowditch's rule.
2. To perform leveling exercise by height of instrument of Rise and fall method.
3. To measure horizontal and vertical angles in the field by using Theodolite.
4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
5. To determine the workability of fresh concrete of given proportions by slump test or compaction factortest.
6. To determine the Compressive Strength of brick.
7. To determine particle size distribution and fineness modulus of course and fine Aggregate.
8. To verify the law of Triangle of forces and Lami's theorem.
9. To verify the law of parallelogram of forces.
10. To verify law of polygon of force

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT205**
Course Title	**Programming for Problem Solving with C**
Credits	**2 (L:2 , T:0 , P: 0)**

MODULE - I

Introduction of Computers: Computer System, System Characteristics and capabilities, Types of Computers: Analog, Digital (Micro, Mini, Mainframe & Super Computers), Generation of Computers. Block Diagram of Computer and its functional units, Input and output Devices, System Software and Application Software, Operating system and its types, Programming languages: History, Classifications- Low Level, Assembly & High - Level languages, Advantages & Disadvantages Programming Languages.

MODULE - II

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

MODULE – III

Overview of C: History of C, character set, tokens, constants, variables, keywords. Operators (arithmetic, Logical, assignment, relational, increment and decrement, conditional, special, operator precedence), Managing Input and output operation: Reading a character, writing a character, Formatted Input and formatted output.

MODULE - IV

Decision Making and Branching: Simple IF statement, Decision Making with IF statement, IF-Else statement. Decision Making and looping: Introduction, The WHILE statement, The DO statement, The FOR statement

MODULE - V

Arrays: Introduction, One-dimensional arrays, declaration of One-dimensional and Initialization of One-dimensional arrays, Two-dimensional arrays, Initialization of two-dimensional arrays.

Basic concept of Stack and queue, operations and Array representation of Stack and queue

TEXT BOOKS:

1. P. K Sinha- Computer Fundamentals, BPB Publication ; 2004
2. Anita .Goel– Computer Fundamentals, 3rd Edn. , Pearson; 2010
3. E. Balagurusamy – Programming in ANSI C, 3rd Edn. , TMH, New Delhi ; 2004
4. Y. Kanetkar – Let us C, 4th Edition, BPB Publication , New Delhi; 2002

Reference Books:

1. Easy Approach to Computer Course By G.K. Iyer
2. Computer Today By S.K. Basandra
3. Schaum's Series C' Programming
4. The complete reference in C Herbert Shield
5. Deitel and Deitel " C How to Program ", Addisson Wesley

Web Link:

https://spoken-tutorial.org/

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT256**
Course Title	**Language Laboratory**
Credits	**1 (L: 0 T:0 P: 2)**

Communicative Language Laboratory: Course objective: The language laboratory focuses on the practice of English through audio-visual aids and Computer software. It intends to enable thestudents to speak English correctly with confidence and intends to help them to overcome their inhibitions and self – consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions:

1. Listening Comprehension
2. Pronunciation, Intonation, Rhythm
3. Practicing everyday dialogues in English
4. Interviews
5. Formal Presentation
6. Public Speaking and oral skills with emphasis on conversational practice, extempore speech,JAM (Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.

Suggested Readings:

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii) On Writing Well. William Zinsser. Harper Resource Book. 2001

(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-II

(Common to all Branches)

Course Code	**BT257**
Course Title	**Sports and NSS/YOGA**
Credits	**1 (L: 0 T:0 P: 2)**

Course Objective(s):

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry aboutYoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk ofinjury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Contents:

Module I: Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education
- Changing trends in Physical Education

Module II: Olympic Movement

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values
- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand
- Award, RajivGandhi Khel Ratna Award etc.)

Module III: Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness & Wellness
- Components of Physical fitness
- Components of Health related fitness
- Components of wellness
- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle

Module IV: Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Module V: Kinesiology, Biomechanics & Sports

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Newton's Law of Motion & its application in sports.
- Friction and its effects in Sports.

Practicals:

1. To practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
2. To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
3. To learn breathing exercises and healthy fitness activities
4. To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
5. To perform yoga movements in various combination and forms.
6. To assess current personal fitness levels.
7. To identify opportModuleies for participation in yoga and sports activities.
8. To develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and bodycomposition etc.
9. To improve personal fitness through participation in sports and yogic activities.
10. To develop understanding of psychological problems associated with the age and lifestyle.

11. To demonstrate an understanding of sound nutritional practices as related to health and physical performance.
12. To assess yoga activities in terms of fitness value.
13. To identify and apply injury prevention principles related to yoga and physical fitness activities.

Text Books/References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga by B.K.S. Iyengar. Health and Physical Education – NCERT (11th and 12th Classes

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME 2023-2027

Choice Based Credit System Semester-III												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
								Internal	**External**		**Total**	
				L	**T**	**P**		**Max**	**Max**	**Min**	**Max**	**Min**
1	**Basic Science Course**	BT301	Engineering Mathematics – III	4	0	0	**4**	30	70	21	100	35
2	**Professional Core Course**	PCCEEE302	Electromagnetic fields	3	0	0	**3**	30	70	21	100	35
3	**Professional Core Course**	PCCEEE303	Electrical Measurement and Measuring Instruments	3	0	0	**3**	30	70	21	100	35
4	**Professional Core Course**	PCCEEE304	Network Analysis	3	1	0	**4**	30	70	21	100	35
5	**Engineering Science Course**	BT305	Object Oriented Programming with C++	2	0	0	**2**	30	70	21	100	35
6	**Basic Science Course**	BT306	Environmental Science (MOOCS)	2	0	0	**2**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	**Professional Core Course**	PCCEEE353	Electrical Measurement and Measuring Instruments Lab	0	0	2	**1**	30	20	10	50	25
2	**Professional Core Course**	PCCEEE354	Network Analysis Lab	0	0	2	**1**	30	20	10	50	25
3	**Engineering Science Course**	BT355	Object Oriented Programming with C++ Lab	0	0	2	**1**	30	20	10	50	25
4	**Extra Activity**	BT357	Extra Activities NSO/NSS/NCC/Yoga Creative Art /Mini Project	0	0	2	**1**	30	20	10	50	25
TOTAL							**22**					

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-III

(Common to all Branches)

Course Code	**BT301**
Course Title	**Engineering Mathematics-III**
Credits	**4 (L: 4 T:0 P: 0)**

Course objectives:

1. To understand Fourier series and their applications
2. To solve problems in numerical methods
3. Solving problems in differential equations and probability

MODULE I

Fourier series: Introduction of Fourier series, Fourier series for Discontinuous functions, and Fourier series for even and odd function. Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations.

MODULE II

Difference Operators: , Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

MODULE III

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi, Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods.

MODULE IV

Solution of Ordinary Differential Equations (Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

MODULE V

Concept of Probability: Probability: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Testing of Hypothesis |: Students t-test, Fisher's z-test, Chi-Square Method.

References

(i) Higher Engineering Mathematics by BS Grewal, Khanna Publication

(ii) Advance Engineering Mathematics by D. G. Guffy

(iii) Mathematics for Engineers by S. Arumungam, SCITECH Publication

(iv) Engineering Mathematics by S S Sastri. P.H.I.

(v) Numerical Methods for Scientific and Engg. Computation by M KJain, Iyengar and RK Jain, New Age International Publication

(vi) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publication

(vii) Probability and Statistics by Ravichandran, Wiley India

(viii) Mathematical Statistics by George R., Sprin

Course outcomes:

1. To understand and solve various problems in Fourier series
2. Solving various problems in differential equations, numerical methods and probability

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH EEE Semester-III

Course Code	**PCCEEE302**
Course Title	**Electromagnetic Fields**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives:

To make the students able to

1. Understand the basics of electric and magnetic field in terms of vector algebra
2. Understand and analyze Maxwell equations and their meaning
3. Analyze the concepts of electromagnetic wave propagation.
4. Understand maxwell equation for time varying fields

MODULE I

STATIC ELECTRIC FIELDS

Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors. Coulomb's law – Electric field intensity – Field due to different types of charges – Stream lines and sketches of fields – Electric flux density – Gauss law and its application to symmetrical charge distributions – Gauss law applied to differential volume element – Concept of divergence – electric potential – Potential field due to different types of charges – Potential gradient – the dipole – field due to dipole – Energy density in electrostatic field.

MODULE II

CONDUCTORS, DIELECTRICS AND CAPACITANCE

Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundary value conditions for electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy density in static electric field, Current density, conduction & convection current density ohms law in point form, equation of continuity.

MODULE III

STEADY MAGNETIC FIELDS

Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoid current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

MODULE IV

MAXWELLS EQUATIONS AND SCALAR, VECTOR PROPERTIES

Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form. Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self-inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy density,

MODULE V

ELECTRO MAGNETIC WAVES

Uniform plane wave in time domain in free space, Sinusoidally time varying uniform plane wave in free space, Wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage, Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

Course outcomes:

After studying this subject, the students will be able to

1. Analyze EM fields in terms of vector algebra
2. Understand the significance of Maxwell equations
3. Analyze propagation of waves in various mediums.
4. Understand refection and refraction of EM waves.

References:

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. P.V. Gupta; Electromagnetic Fields; Dhanpat Rai.
3. N.N. Rao; Element of Engineering Electromagnetic; PHI.
4. William H. Hayt; Engineering Electromagnetic; TMH.
5. John D. Kraus; Electromagnetic; TMH.
6. Jordan Balmian; Electromagnetic wave & Radiating System; PH

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH EEE Semester-III

Course Code	**PCCEEE303**
Course Title	**Electrical Measurement and Measuring Instruments**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives: to make students able to

1. Understand the static and dynamic characteristics of instruments
2. Analyze the principle of working of various electrical instruments
3. Analyze the working of transducers

MODULE I

MEASURING INSTRUMENTS

Static and dynamic characteristics, Principle of operation and construction of PMMC, MI, Dynamometer, Induction, Thermal and Rectifier type instruments – Measurement of voltage and current – use of ammeter shunts and voltmeter multiplier – Use of CT and PT for extending instrument ranges.

MODULE II

MEASUREMENT OF R, L, C

Functional elements of an instrument – static and dynamic characteristics – Errors in measurement. Measurement of R, L, C – Wheatstone, Kelvin's double, Maxwell, Anderson and Schering bridges. Measurement of high resistance – Megger – loss of charge method.

MODULE III

MEASUREMENT OF POWER AND ENERGY

Dynamometer type wattmeter – induction type energy meter- 1 phase & 3 phase – errors and compensation – energy meter calibration by direct and phantom loading – Maximum demand indicator – Measurement of reactive power – Trivector meter.

MODULE IV

MEASUREMENT OF FREQUENCY, POWER FACTOR AND PHASE SEQUENCE

Frequency meters – Powerfactor meter - 1 phase & 3 phase – Synchroscope – Phase sequence indicator. Magnetic tape recorders – Stripchart recorder – X-Y recorder – Cathode Ray Oscilloscope – block diagram – CRT – Dual Trace oscilloscope.

MODUE V

ELECTRONIC INSTRUMENTS

Electronic voltmeters – Digital voltmeter – Multimeter – Signal generator – Function generator. Classification of transducers – resistive, capacitive and inductive – piezoelectric transducer – strain gauges – LVDT – thermoelectric – piezoelectric. Transducers for measurement of displacement – temperature – pressure – velocity.

Course outcomes: Students will be able to

1. Explain the static and dynamic characteristic of instruments
2. Analyze the working of various electrical measuring instruments.
3. Explain the working and applications of transducers.
4. Measure R L and C using various bridges.

TEXT BOOKS

1. Golding, EW. & Widdies, FW. *Measurements & Measuring instruments*, Sir Issar Pitman & sons (P)Ltd. 1998.
2. A.K. Sawhney; Electrical & Electronic Measurements & Instrument; Dhanpat Rai & Sons Pub.
3. Albert D Half ride & William D Cooper, *Modern Electronic instrumentation and measurement techniques*, Prentice Hall of India Pvt Ltd. 1998.

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-III

Course Code	**PCCEEE353**
Course Title	**Electrical Measurement and Measuring Instruments Lab**
Credits	**1 (L: 0 T:0 P: 2)**

Course objective: to make students able to

1. Measure R L and C parameters practically.
2. Analyze the working of wattmeter practically
3. Analyze the working of various transducers practically.

LIST OF EXPERIMENTS (EXPANDABLE):

1. Measurement of low resistance using Kelvin's Double bridge
2. Measurement of medium resistance using Wheatstone's bridge
3. Measurement of high resistance by loss of charge method
4. Measurement of Insulation resistance using Megger
5. Measurement of earth resistance by fall of potential method and verification by using earth tester
6. Measurement of power in a single -phase ac circuit by 3 voltmeter/ 3 Ammeter method
7. Calibration of a dynamometer type of wattmeter with respect to a standard/Sub Standard wattmeter
8. Calibration of a induction type single phase energy meter
9. Calibration of a dynamometer type of wattmeter by Phantom Loading method.
10. Measurement using AC Bridges like Schering Bridge, Maxwells Bridge
11. Verify the working of Strain Guage.

Course outcomes: Students will be able to

1. Analyze various electrical instruments practically
2. Understand and design various transducers.
3. Measure various parameters like R L and C practically.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-III

Course Code	**PCCEEE304**
Course Title	**Network Analysis**
Credits	**4 (L: 3 T:1 P: 0)**

Course objective: to make students able to:

1. Understand basics of AC and DC circuits
2. Understand circuit theorems
3. Understanding transient responses.
4. Understand two port networks.

MODULE I

Introduction to LLBP circuit elements R,L,C and their characteristics in terms of Linearity & time dependent nature, KCL and KVL analysis dual networks analysis of magnetically coupled circuits Dot convention, coupling co-efficient, Tuned circuits. Series & parallel resonance voltage & current sources, controlled sources.

MODULE II

Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices. Network Theorems – Thevenin's & Norton's theorem, superposition, reciprocity, compensation, maximum power transfer and Millman's theorem, problems with controlled sources.

MODULE III

Transient analysis Transients in RL, RC & RLC Circuits initial conditions, time constants. Network driven by constant driving sources & their solutions. Steady state analysis - Concept of phasor & vector, impedance & admittance. Node & mesh analysis of RL,RC and RLC networks with sinusoidal and other driving sources.

MODULE IV

Frequency domain analysis – Laplace transform solution of Integro differential equations. Transform of Waveform – synthesized with step ramp, Gate and sinusoidal functions. Initial & final value theorem. Network Theorems in transform domain. Concept of signal spectra, Fourier series co-efficient of a periodic waveform. Waveform symmetries. Trigonometric and Exponential

form of Fourier series, steady state response to periodic signals.

MODULE V

Network function & Two port networks – concept of complex frequency, port. Network functions of one port & two ports, poles and zeros network of different kinds. Two port parameters – Z, Y, chain parameters relationship between parameters. Interconnection of two ports. Terminated two port networks

Course outcomes: Students will be able to

1. Analyze the AC and DC circuits
2. Solve circuit numerical problems
3. Analyze two port network problem.
4. Analyze transients of circuits

References:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education
9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
13. Nilson & Riedel , Electric circuits ;Pearson

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-III

Course Code	**PCCEEE354**
Course Title	**Network Analysis Lab**
Credits	**1(L: 0 T:0 P: 2)**

Course objective:

To make students able to:

1. Verify circuits theorems practically on breadboard
2. Verify two port networks practically.
3. Analyze AC Circuits and transient in circuits practically

List of experiments (Expandable):

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To verify Zand Y parameters
7. To verify ABCD and h parameters.
8. To analyze the transient response of RC, RL and RLC circuits.
9. To study Series RLC Resonance circuit.
10. To study Parallel RLC Resonance circuit.

Course outcomes: Students will be able to

1. Design circuits on breadboard
2. Analyze and measure the circuit parameters.
3. Analyze transients in circuits.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-III

Course Code	**BT305**
Course Title	**Object Oriented Programming with C and C++**
Credits	**2(L: 2 T:0 P: 0)**

COURSE OBJECTIVES

1. Introduce the student to the concepts of C++ in computer science.
2. Acquire knowledge to Make functions, Files etc

COURSE OUTCOMES

1. Knowledge of programming language. 2. Be aware about OOP's concept.
3. Basic understanding on programming

Module-I

Introduction to C++ and Object-oriented Concepts C++ Standard Library, Basics of a Typical C++ Environment, Pre-processors Directives, illustrative Simple C++ Programs. Header Files and Namespaces, library files. Introduction to Objects and Object Oriented Programming, Encapsulation (Information Hiding), Access Modifiers: Controlling access to a class, method, or variable (public, protected, private, package), Other Modifiers, Polymorphism: Overloading, Inheritance, Overriding Methods, Abstract Classes, Reusability, Class's Behaviors.

Module-II

Classes and Data Abstraction:

Introduction, Structure Definitions, Accessing Members of Structures, Class Scope and accessing Class Members, Separating Interface from Implementation, Controlling Access Function And Utility Functions, Initializing Class Objects: Constructors, Using Default Arguments With Constructors, Using Destructors, Classes : Const(Constant) Object And Const Member Functions, Object as Member of Classes, Friend Function and Friend Classes, Using ThisPointer, Dynamic Memory Allocation with New and Delete, Static Class Members, Container Classes And Integrators, Proxy Classes, Function overloading.

Module-III

Operator Overloading, Inheritance, and Virtual Functions and Polymorphism: Fundamentals of Operator Overloading, Restrictions On Operators Overloading, Operator Functions as Class Members vs. as Friend Functions, Overloading, <<, >> Overloading Unary Operators, Overloading Binary Operators. Introduction to Inheritance, Base Classes And Derived Classes, Protected Members, Casting Base- Class Pointers to Derived- Class Pointers, Using Member Functions, Overriding Base – Class Members in a Derived Class, Public, Protected and Private Inheritance, Using Constructors and Destructors in derived Classes, Implicit Derived –Class Object To Base- Class Object Conversion, Composition Vs. Inheritance. Introduction to Virtual Functions, Abstract Base Classes And Concrete Classes, Polymorphism, New Classes And Dynamic Binding, Virtual Destructors, Polymorphism, Dynamic Binding.

Module-IV

Files and I/O Streams and Templates and Exception Handling:

Files and Streams, Creating a Sequential Access File, Reading Data From A Sequential Access File, Updating Sequential Access Files, Random Access Files, Creating A Random Access File, Writing Data Randomly To a Random Access File, Reading Data Sequentially from a Random Access File. Stream Input/Output Classes and Objects, Stream Output, Stream Input, Unformatted I/O (with read and write), Stream Manipulators, Stream FormatStates, Stream Error States.

Function Templates, Overloading Template Functions, Class Template, Class Templates and Non-Type Parameters, Templates and Inheritance, Templates and Friends, Templates and Static Members. Introduction, Basics of C++ Exception Handling: Try Throw, Catch, Throwing an Exception, Catching an Exception, Rethrowing an Exception, Exception specifications, Processing Unexpected Exceptions, Stack Unwinding, Constructors, Destructors and Exception Handling, Exceptions and Inheritance.

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

TEXT BOOKS:

1.C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall

2. Object Oriented Programming in Turbo C++ by Robert Lafore, 1994, The WAITE Group Press.

3. Programming with C++ By D Ravichandran, 2003, T.M.H

REFERENCE BOOKS:

1 Object oriented Programming with C++ by E Balagurusamy, 2001, Tata McGraw-Hill

2 Computing Concepts with C++ Essentials by Horstmann, 2003, John Wiley,

3 The Complete Reference in C++ By Herbert Schildt, 2002, TMH

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH Semester-III

(Common to all Branches)

Course Code	**BT306**
Course Title	**Environmental Science (MOOCS)**
Credits	**2**

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BTECH Semester-III

(Common to all Branches)

Course Code	**BT 357**
Course Title	**Extra Activities NSO/NSS/NCC/Yoga** **Creative Art** **/Mini Project**
Credits	**1(L: T:0 P: 2)**

Students can choose **Extra Activities NSO/ NSS/ NCC/ Yoga/ Creative Art/ Mini Project**

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME 2023-2027

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

Choice Based Credit System Semester-IV

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
								Internal	External		Total	
				L	T	P		Max	Max	Min	Max	Min
1	**Professional Core Course**	PCCEEE401	Power System-I	3	1	0	**4**	30	70	21	100	35
2	**Professional Core Course**	PCCEEE402	Electrical Machine- I	3	1	0	**4**	30	70	21	100	35
3	**Professional Core Course**	PCCEEE403	Analog Electronics	3	0	0	**3**	30	70	21	100	35
4	**Professional Core Course**	PCCEEE404	Digital Electronics Logic Design	3	0	0	**3**	30	70	21	100	35
5	**Professional Core Course**	PCCEEE405	Signals and Systems	3	0	0	**3**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	**Professional Core Course**	PCCEEE451	Power System-I Lab	0	0	2	**1**	30	20	10	50	25
2	**Professional Core Course**	PCCEEE452	Electrical Machine- I Lab	0	0	2	**1**	30	20	10	50	25
3	**Professional Core Course**	PCCEEE453	Analog and Digital Electronics Logic Design Lab	0	0	2	**1**	30	20	10	50	25
4	Internship	IN456	Internship/Tour and Training /Industrial Training	0	0	0	**1**	30	20	10	50	25
TOTAL							**21**					

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH EEE Semester-IV

Course Code	**PCCEEE401**
Course Title	**Power System-I**
Credits	**4(L: 3 T:1 P: 0)**

Course objective: to make students able to:

1. Understand the power system architecture
2. Understanding Line parameters and calculating it
3. Understand various effects like Corona effect, proximity effect etc
4. Understanding rating of electrical equipment.

MODULE I

An overview of Electrical Energy Generation General background, structure and components of power network. Power generation – Introduction to conventional, non-conventional & distributed generation, Effect of transmission voltage on power system economy. Selection of size of feeder. Comparison of isolated versus interconnected power system. Problems associated with modern large interconnected power system. Power Plant Economics - Load curves, base load, peak load, load factor, demand factor, diversity factor, capacity factor, utilization factor, cost of electricity, capital cost, fuel and operation cost

MODULE II

Transmission Line Components & Under Ground Cabling: Inductance resistance and capacitance of transmission line, Calculation of inductance for 1-Φ and 3- Φ, Single and double circuit line, Concept of GMR and GMD, Symmetrical & asymmetrical conduction configuration, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground or capacitance, Capacitance calculation for symmetrical and asymmetrical 1-phase and three phase, Single and double circuit line, Charging current, Transposition of line, Composite conductor, Skin and proximity effect, bundle conductor. Underground Cable Comparison of cables and overhead transmission lines, Classification of cables, requirement of cable construction, capacitance of single and multi-core cable, economic core diameter, dielectric stress in cable, Grading of cables, ionization of Heating of cables, Phenomena of dielectric losses and sheath loss

in cables, Thermal resistance of cables.

Transmission systems & performance of transmission line: Various systems of transmission, effect of system voltage, comparison of conductor materials required for various overhead systems. Short, Medium & long transmission line and their representation, Nominal T, Nominal Л, Equivalent T and equivalent Л, network models, ABCD constants for symmetrical &asymmetrical network, Mathematical solution to estimate regulation & efficiency of all types of lines. Surge Impedance, loading, Interpretation of long line equation and its equivalent equation. Tuned power lines. Power flow through transmission line, Circle diagram, Method of voltage control, Static & rotating VAR generator, transformer control.

MODULE III

Insulator & Mechanical design, types of conductors used in overhead transmission line, Types of line supports and towers, Distribution of conductors over transmission towers, Spacing between conductors, Length of span and sag tension calculation for transmission line, Wind & ice loading, support of line at two different levels, string chart, Sag template, Stringing of conductor, Vibration and Vibration dampers. Insulator Materials used for transmission line insulations, Types of insulator for overhead transmission line failure of insulator, Voltage distribution of suspension insulator, String efficiency, Shielding and Grading Voltage control & Distribution system: AC single phase, 3 phase, 3wire & 4 wire distribution, Kelvin's law for most economical size of conductor Substation layout showing substation equipment, bus bar single bus bar and sectionalized bus bar, main and transfer for bus bar system, sectionalized double bus bar system, ring mains.

MODULE IV: Introduction to Electrical Estimation and Costing:

Drawing and IE rules: Classification of Electrical Installation. General requirement of Electrical Installation. Reading and Interpretation of Electrical Engineering. Drawings. Various diagrams, plans and layout Important definitions related to Installation IE rules related to Electrical Installation & Testing.

Service Connection: Concept of service connection. Types of service connection & their features. Methods of Installation of service connection. Estimates of underground & overhead service connections.

Residential Building Electrification: General rules guidelines for wiring of Residential: Installation and positioning of equipment's. Principles of circuit design in lighting and power circuits. Procedures for

designing the circuits and deciding the number of circuits. Method of drawing single line diagram. Selection of type of wiring and rating of wires & cables Load calculations and selection of size of conductor. Selection of rating of main switch, distributions board, protective switchgear ELCB and MCB and wiring accessories. Earthing of Residential Installation. Sequence to be followed for preparing Estimate Preparation of detailed estimates and costing of Residential Installation.

MODULE V Electrification of commercial Installation:

Concept of commercial Installation. Differentiate between electrification of Residential and commercial Installation. Fundamental considerations for planning of an electrical Installation system for commercial building. Design considerations of electrical Installation system for commercial building. Load calculations & selection of size of service connection and nature of supply. . Deciding the size of cables, busbar and busbar chambers. Mounting arrangements and positioning of switchboards, distribution boards main switch etc. Earthing of the electrical Installation. Selection of type wire, wiring system & layout. Sequence to be followed to prepare estimate. Preparation of detailed estimate and costing of commercial Installation.

Electrification of factory unit Installation: Concept of Industrial load. Concept of Motor wiring circuit and single line diagram. Important guidelines about power wiring and Motor wiring. Design consideration of Electrical Installation in small Industry/Factory/workshop. Motor current calculations. Selection and rating of wire, cable size & conduct. Deciding fuse rating, starter, distribution boards main switch etc. Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. Sequence to be followed to prepare estimate. Preparations of detailed estimate and costing of small factory unit/ workshop

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

Course outcomes: students will be able to

1. Analyze the structure of power system.
2. Understanding line parameters and losses.
3. Analyze rating of electrical accessories

Reference books:

1. K.B. Raina, S.K.Bhattacharya , Electrical Design; Estimating and costing, New Age International (p) Limited, New Delhi
2. Surjit Singh, Electrical Estimating and costing, Dhanpat Rai and company, New Delhi
3. N. Alagappan, S. Ekambaram, Electrical Estimating and costing, Tata Mc Graw Hill Publication, New Delhi
4. S.L. Uappal, Electrical wiring Estimating and Costing, Khanna Publication.
5. B.D.Arora, Electrical wiring, Estimating, and costing R.B. Publication, New Delhi
6. John Grainger and William Stevenson, Power system Analysis, McGraw Hill.
7. C.L. Wadhwa, Electrical Power System Analysis, New Age International.
8. D.P. Kothari, I.J. Nagrath, Power System Engineering TMH II Ed. Reprint 2009

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

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BTECH ELECTRICAL AND ELECTRONICS ENGINEERING (COURSE SCHEME 2023-2027)

BTECH EEE Semester-IV

Course Code	**PCCEEE451**
Course Title	**Power System-I Lab**
Credits	**1(L: 0 T:0 P: 2)**

Course objectives:

1. to make electrical circuit connections properly.
2. Follow the safety rules
3. Measuring various parameters experimentally

List of Experiments (Expandable)

1. OC and SC Test of Transformer
2. Ratio and Polarity test of single-phase transformer.
3. To study the construction of three phase transformer.
4. Measurement of various line and phase voltage of three phase systems
5. Verify the working of Electromagnetic relay.
6. Verify the working of CT and PT.

Course outcomes: students will be able to

1. Connections of experiments based on transformers.
2. Analyze various losses in transformers practically.
3. Analyze parameters experimentally

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BTECH EEE Semester-IV

Course Code	**PCCEEE402**
Course Title	**Electrical Machine- I**
Credits	**4 (L: 3 T:1 P: 0)**

Course objectives:

1. To make students aware of various aspects of single phase and three phase transformers.
2. To make students aware of construction and working of DC Motors and generators
3. To make students aware of construction and working of Single and three phase Induction motors

MODULE I

Transformer-I: Working principle, emf. equation, construction, phasor diagrams, equivalent circuit, voltage regulation, losses, separation of hysteresis and eddy current losses, efficiency, tests: open circuit and short circuit, load, Sumpner's test, Condition for maximum efficiency and regulation, Power and distribution transformer, allday efficiency, Excitation phenomenon. Autotransformer: working, advantages, its equivalent circuit and phasor diagram.

Transformer-II: Three phase transformer: its construction, groups and connections, their working and applications; Scott connection; Parallel operation of Transformers: application, advantages, requirement and load sharing; Tap changers, cooling, conservator and breather. Pulse and high frequency transformers

MODULE II

Principles of operation Constructional feature, Armature winding, Back pitch, Front pitch, Resultant pitch and commentator pitch, Simple Lap and wave winding (problems on winding diagram), Different types of D.C. Machines, Shunt, Series and Compound machines, Armature reaction in D.C. machine and Commutation, Methods of improving commutation (Resistance and emf commutation), Inter poles and compensating winding Characteristics of D.C. Generators and uses of Different types of D.C. Generators. Concept of critical resistance, causes of failure of Development of emf, Losses and efficiency of D.C. Machines, condition for maximum efficiency, Parallel operation of D.C. Generators.

D.C. Motor principles, Signification of back emf in D.C. Motor, Voltage equation of Motor, Torque (equation of armature torque and shaft torque), Performance characteristics of shunt, series and compound motors and their application.

Methods of starting shunt, series and compound Motors, study of starters (3-point, 4-point starters and Drum controller type, problems in starter, Speed control of D.C. shunt motors 2.7.1 Flux control Method 2.7.2 Armature voltage (rheostatic) control method.

Ward Leonard method Speed control of series motors — Flux control method and series parallel control method.

Efficiency of DC machine by brake test, Efficiency of DC machine by Swinburne's test, Losses & efficiency and condition for maximum power

MODULE III

Single Phase Motors: Single Phase Induction motor; double revolving field theory, equivalent circuit and its determination, performance calculation, starting methods and types of single-phase Induction motors: their working principle and applications, comparison with three phases Induction Motor. Single phase A.C. series motor, Servo motors, Linear Induction Motor

MODULE IV

Three phase Induction Motor- I: Working principle, construction, comparison of slip ring and squirrel cage motors, steady state analysis, phasor diagram and equivalent circuit, power flow diagram, torque-speed and power-speed characteristics, Losses and efficiency, No load and block rotor test, circle diagram

Three phase Induction Motor-II: Starting of squirrel cage and slip ring motors, power factor control, Cogging & Crawling, Double cage &Deep bar Indication Motor, impact of unbalanced supply and harmonics on performance, speed control, braking, Induction Generator. Application

Course outcomes: Students will be able to

1. Analyze the working and construction and losses of single and three phase transformers
2. Analyze the working of DC Motors dc generators and its various aspects
3. Analyze the working of Induction motors and its various aspects

TEXT BOOKS:

1. Electrical Machines by Nagrath and Kothari, McGraw-Hill
2. P.S. Bimbhra, Electrical Machines, Khanna Publishers

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REFERENCES:

1. V.Del Toro, “Electrical Machines & Power Systems”, 1985, Prentice-Hall, Inc., Englewood Cliffs
2. S K Bhattacharya, Electrical Machines, McGraw-Hill
3. Ashfaq Hussain, Electrical Machines, Dhanpat Rai & Co
4. Langsdorf, A.C. Machines, McGraw-Hil

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BTECH EEE Semester-IV

Course Code	**PCCEEE452**
Course Title	**Electrical Machine- I Lab**
Credits	**1(L: 0 T:0 P: 2)**

Course objectives:

1. To make students familiar with making connection of transformers-based circuits.
2. To make students perform experiments based on DC Motor, DC Generator and Induction motors
3. Making connection diagrams and following safety while doing experiments.

List of Experiments/ Field work (Expandable):

1. Perform turn ratio and polarity test on 1-phase transformer
2. Perform load test on a 1-phase transformer and plot its load characteristic
3. Perform OC and SC tests on a 1-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
4. Perform OC and SC tests on a 3-phase transformer and determine its equivalent circuit. Also find its efficiency and regulation at different load and power factor.
5. Perform Sumpner's test on two 1-phase transformer and determine its efficiency at various load.
6. Perform No-load and block rotor test on a 3- phase IM and determine its equivalent circuit.
7. Perform speed control of DC shunt motor
8. Perform load test on a 3- phase IM and plot its performance characteristics
9. Study various types of starters used for 3- IMs.
10. Perform No-load and block rotor test on a 1- phase IM and determine its equivalent circuit

Course outcomes: Students will be able to

1. Make connection of transformer, DC Motors, DC generators, Induction motors
2. Follow safety precautions
3. Analyzing various parameters mathematically and graphically.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-IV

Course Code	**PCCEEE403**
Course Title	**Analog Electronics**
Credits	**3(L: 3 T:0 P: 0)**

Course Objectives:

1. To understand the basics of Diode, and MOSFET circuit and characteristics
2. Understanding basics of OP amp and its linear applications
3. Understanding basics of OP amp and its nonlinear applications

Module 1: Diode circuits and BJT Circuits

Junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, **Zener diodes,** clamping and clipping circuits. Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common- collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

Module 2: MOSFET circuits

MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans- conductance, high frequency equivalent circuit.

Module 3: Differential, multi-stage and operational amplifiers

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module 4: Linear applications of op-amp

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift).

Analog to Digital Conversion.

Module 5: Non-Linear applications of op-amp

Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.

Course outcomes:

Students will be able to

1. Analyze Diode, BJT and MOSFET Circuits and applications
2. Design linear and non-linear applications of OP AMP.

Text/References:

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications",McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
4. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
5. P. R. Gray, R. G. Meyer and S. Lewis, " Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

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BTECH EEE Semester-IV

Course Code	**PCCEEE404**
Course Title	**Digital electronics Logic design**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives: to make students

1. Understand various number system, K map, Boolean algebra
2. Understand flip flop registers and counters.
3. Understand PLA, PLDS etc

Module 1

Number Systems and Codes: Digital number systems, base conversion, Binary, Decimal, octal, Hexadecimal, number system with radix r, Gray codes. Alphanumeric codes – ASCII code and BCD codes, concept of parity, complement's& (r-1)'s, subtraction with complements, signed Binary numbers, Error Detecting & Correcting codes. Basic Theorems & Properties of Boolean algebra: AND, OR, NOT operators, laws of Boolean algebra, Demorgon's theorem, Boolean expression & logic diagram. Negative logic, Alternate logic gate representation (concept of bubbled gates) canonical and standard Forms (Minterms & Maxterms), sum of minterms & product of maxterms, conversion between canonical forms. Truth table & maps, 2,3,4,5 and 6 variable maps, solving digital problems using Maps, don't care conditions, Tabular minimization. Sum of product & product of sum reduction, Exclusive OR & Exclusive NOR circuits, Parity generator &checker.

Module 2

Combinational Circuits: Design procedure, Adders (half and Full), subtractor (half and full) code convertors, Analysis of design, Universal building blocks, Implementation of any logic circuit with only NAND gates or with only NOR gates, Binary serial adder, parallel adder, serial/parallel adder, look ahead carry generator, BCD adder, Binary multiplier, Magnitude comparator, Decoder, Demultiplexer, Encoders, priority encoder, Multiplexers & implementation of combinational logic diagram

Module 3

Sequential Logic Circuit: Latches, SR latch with NAND & NOR gates, D latch, edge triggered flip flop, J-K flip flop, T flip flop, Master slave flip flop, Analysis of clocked sequential circuit, state table, state diagram, state reduction state equations, state assignments, flip flop excitation table & characteristic equations, Design procedure for sequential circuits, Design with state reduction, Applications of flipflop.

Module 4

Registers and Counters : Asynchronous and Synchronous counter, counters with MOD numbers, Down counter, UP/DOWN counter, propagation delay in ripple counter, programmable counter, Pre- settable counter, BCD counter, cascading, counter applications, Decoding in counter, Decoding glitches, Ring Counter, Johnson counter, Rotate left & Rotate right counter, Registers – Buffer, Shift left, shift right, shift left/Right registers, parallel in parallel out, serial in serial out, parallel in serial out, serial in parallel out registers.

Module 5

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

Course Outcomes:

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

1. Understand basics of numbers system, Boolean algebra, K map etc.
2. Design Flip Flop, Shift registers, Counters
3. Design PLA , PAL, PLDS etc

References:

1. A. Anand Kumar, Fundamentals of digital circuits, PHI
2. A K Maini, Digital Electronics, Wiley India
3. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience.
4. Jain RP; Modern digital electronic

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BTECH Semester-IV

Course Code	**PCCEEE453**
Course Title	**Analog and Digital Electronics Logic Design Lab**
Credits	**1(L: 0 T:0 P: 2)**

Course objectives:

1. To design circuits based on diode, BJT, MOSFET etc.
2. To design circuits based on OP AMP 741
3. To design digital electronic circuits on Breadboard and trainer kit.

List of Experiments (Expandable)

1. To study the characteristics of PN Junction Diode.
2. To study the working of Zener Diode
3. To design Rectifier half wave and full wave
4. To design Clipper and Clamper Circuits.
5. To study the characteristics of BJT.
6. To study the characteristics of MOSFET
7. To study the characteristics of Non- Inverting OP AMP using OP AMP 741
8. To study the characteristics of Inverting OP AMP using OP AMP 741
9. Design of PID Controller using OP AMP 741.
10. To design Mono stable multivibrator.
11. Verification of all the logic gates.
12. Design of BCD to Excess-3 code converter.
13. Implementation of NAND & NOR as Universal gate.
14. Design of RS, JK, T& D Flipflop.
15. Multiplexer /Demultiplexer based Boolean function
16. Design of combinational circuit for the (i) Half adder (ii) Full adder (iii) Half subtractor (iv) Full subtractor
17. Design various A-D & D-A convertors.
18. Verify the truth table of SR flip flop

Course Outcomes:

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

1. Design analog circuits on breadboard.
2. Design digital circuits using ICS on breadboard

References

1. A. Anand Kumar, Fundamentals of digital circuits, PHI
2. A K Maini, Digital Electronics, Wiley India
3. Thomas Blakeslee; Digital Design with standard MSI and LSI; Wiley Interscience.
4. Jain RP; Modern digital e

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BTECH EEE Semester-IV

Course Code	**PCCEEE405**
Course Title	**Signals and Systems**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives:

1. To understand the basics of various types of systems
2. Analyzing analog signals using Laplace and Fourier
3. Analyze digital signals using Z transforms

MODULE I

Classification of signals and systems: Continuous time signals (CT signals), Discrete time signals (DT signals) - Step, ramp, pulse, impulse, sinusoidal and exponential signals, basic operations on signals, classifications of CT and DT signals- Periodic and aperiodic signals, energy and power signals, random signals, CT systems and DT systems, basic properties of systems, basic properties of systems, linear time invariant systems and properties.

MODULE II

Analysis of continuous time signals: Time and frequency domain analysis, Fourier series analysis, spectrum of CT signals, Fourier transform and Laplace transform, region of convergence, wavelet transform

MODULE III

Linear time invariant continuous time systems: Differential equations representation, block diagram representation, state variable representation and matrix representation of systems, impulse response, step response, frequency response, realizability of systems, analog filters.

MODULE IV

Analysis of discrete time signals: Convolution sum and properties, sampling of CT signals and aliasing, DTFT and properties, Z transform and properties, inverse Z transform.

MODULE V

Linear time invariant discrete time systems: Difference equations, block diagram representation, impulse response, analysis of DT LTI systems using DTFT and Z transform, state variable equations and matrix representation of systems, Digital filters

Course Outcomes:

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

1. Solve numerical problems based on various signals.
2. Analyze signals using Laplace, Fourier and Z transforms
3. Design Digital filters

REFERENCES:

1. Alan V. Oppenheim, Alan S. Willsky, S Hamid Nawab, 'Signals and Systems', 2nd edition 2015 Pearson New International Edition
2. A. Anand Kumar, Signals and Systems, PHI, III edition, 2015
3. Mahmood Nahvi, Signals and Systems, McGraw Hill
4. Simon Haykins and Barry Van Veen, Signals and Systems, Wiley India
5. A. Nagoor Kani; 'Signals and Systems' McGraw Hill
6. Robert A. Gabel and Richard A.Roberts, Signals & Linear Systems, Wiley.
7. Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. Signals & systems, Pearson Education.

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME

2023-2027

Choice Based Credit System Semester-V												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
								Internal	**External**		**Total**	
				L	**T**	**P**		**Max**	**Max**	**Min**	**Max**	**Min**
1	Professional Core Course	PCCEEE501	Electrical Machines-II	3	1	0	**4**	30	70	21	100	35
2	Professional Core Course	PCCEEE502	Power System-II	3	1	0	**4**	30	70	21	100	35
3	Professional Core Course	PCCEEE503	Control Systems	3	1	0	**4**	30	70	21	100	35
4	Professional Elective Course	PECEEE501	Professional Elective I	3	0	0	**3**	30	70	21	100	35
5	Open Elective Course	OECEEE501	Open Elective I/MOOCS-I	3	0	0	**3**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	Professional Core Course	PCCEEE551	Electrical Machines-II Lab	0	0	2	**1**	30	20		50	25
2	Professional Core Course	PCCEEE552	Power System-II Lab	0	0	2	**1**	30	20		50	25
3	Professional Core Course	PCCEEE553	Control System Lab	0	0	2	**1**	30	20		50	25

TOTAL				**21**					

Departmental Elective-I (Choose any one)
Digital Signal Processing
Power Systems Dynamics and Control
Power System Protection
Industrial Instrumentation

Open Elective -I (Choose any One)
Python Programming
Hydrology and water resources
Energy System and Management
MOOCS-I

R.K.D.F. UNIVERSITY, RANCHI

B. TECH. EEE Semester-V

Course Code	**PCCEEE501**
Course Title	**ELECTRICAL MACHINE -II**
Credits	**4(L: 3 T:1 P: 0)**

Courses objectives: students will be able to

1. Understand construction and working principle of 3 phase induction motor.
2. Understand starting and speed control methods.
3. Understand the construction and working principle of synchronous motor
4. Analyze characteristics of synchronous motor and its speed control

MODULE I

THREE PHASE INDUCTION MOTOR Construction and principle of operation of three phase induction motor

– Equivalent circuit – Torque & Power equations – Slip – Torque characteristics – No load & blocked rotor tests

– Separation of core loss – circle diagram.

MODULE II

STARTING AND SPEED CONTROL OF INDUCTION MOTOR Starting methods of three phase induction motor – Cogging & Crawling – Speed control – Voltage control – Rotor resistance control – Pole changing – Frequency control – Slip – energy recovery scheme – Double cage rotor – Induction generator – Synchronous induction motor.

MODULE III

SYNCHRONOUS MACHINE-I Construction; types of prime movers; excitation system including brushless excitation; polyphase distributive winding, integral slot and fractional slot windings; emf equation, generation of harmonics and their elimination; armature reaction; synchronous reactance and impedance, equivalent circuit of alternator, relation between generated voltage and terminal voltage, voltage regulation of alternators using synchronous impedance, mmf, zpf and new A.S.A method.

MODULE IV

SYNCHRONOUS MACHINE-II Salient pole machines; two reaction theory equivalent circuit model and phasor diagram; determination of Xd and Xq by slip test; SCR and its significance; regulation of salient pole alternator, power angle equation and characteristics; synchronizing of alternator with

infinite busbar, parallel operation and load sharing; synchronizing current, synchronizing power and synchronizing torque coefficient; synchroscopes and phase sequence indicator; effect of varying excitation and mechanical torque,.

MODULE V

SYNCHRONOUS MACHINE-III Synchronous motor operation, starting and stopping of synchronous motor, pull in torque, motor under load power and torque, reluctance torque, effect of excitation, effect of armature reaction, power factor adjustment, V curves, inverted V curves, synchronous motors as power factor correcting device, super synchronous and sub synchronous motors, hunting and damper winding efficiency and losses.

Analysis of short circuit oscillogram, determination of various transient, sub transient and steady reactances and time constants, expression of transient and sub transient reactances in terms of self and mutual inductances of various winding, short circuit current, equivalent circuit. Single phase synchronous motors- hysteresis motor, reluctance motor. Repulsion motor, stepper motor, switched reluctance, BLDC Motor

Courses outcomes: students will be able to

1. Understand working principle of 3 phase induction motor.
2. Understand starting and speed control methods.
3. Understand the working principle of synchronous motor
4. Analyze characteristics of synchronous motor.

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BTECH EEE Semester-V

Course Code	**PCCEEE551**
Course Title	**ELECTRICAL MACHINE -II Lab**
Credits	**1(L: 0 T:0 P: 2)**

Courses objectives:

1. Understanding starting and speed control methods of induction motor practically.
2. Understanding starting and speed control methods of synchronous motor practically
3. Understanding the characteristics of BLDC Motors
4. Understanding the characteristics of Reluctance motor.
5. Understanding the characteristics of Stepper motor.

List of Experiments Expandable:

1. Starting methods of Single -phase Induction motor
2. Speed Control of single- phase induction motor
3. Staring and speed control of synchronous motor
4. Starting methods of Three -phase Induction motor
5. Speed Control of Three - Phase induction motor
6. To study the characteristics of BLDC Motors
7. To study the characteristics of Reluctance motor.
8. To study the characteristics of Stepper motor.

Courses outcomes: students will be able to

1. Make connection for various experiments on induction motor, Synchronous motor, BLDC and stepper motor.
2. Follow safety precautions

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BTECH EEE Semester-V

Course Code	**PCCEEE502**
Course Title	**Power Systems-II**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives:

1. Understand interconnected power systems
2. Understand various method of power flow study
3. Understand the frequency control
4. Analyze power system stability.
5. To understand the concept of power flow mathematically

MODULE I

General - Problems associated with modern interconnected power Systems, deregulation, power systems restructuring, distributed generation, congestion, available transfer capacities, pricing of energy and transmission services.

MODULE II

Power flow studies - Formulation of static power flow equations and solutions using Gauss- Seidel, Newton Raphson and FDLF methods, comparison of these methods, Economic operation of power system – Economic dispatch, Emission dispatch, line loss, ITL, economic dispatch using lagrangian multiplier method.

MODULE III

MW Frequency control- Coherency, control area, modeling of speed control mechanism, load damping, block diagrammatic representation of single and two area interconnected system, static and dynamic response, optimum parameter adjustment.

MVAR Voltage control Problem- Difference in control strategy over MW – f control, characteristics of an excitation system, DC AC and static excitation system, General block diagram representation of voltage regulators.

MODULE IV

Power System Stability - Steady state, dynamic and transients' stability, Swing equation, equal area criterion, solution of swing equation using step by step method modified Eulers method and Runge-Kutta method, methods of improving transient stability.

Courses outcomes: students will be able to

1. Analyze interconnected power systems
2. Analyze various method of power flow study
3. Analyze the frequency control methods
4. Analyze power system stability.

Reference Books:

1. Modern Power System Analysis-by I.J. Nagrath & D.P. Kothari Tata Mc Graw – Hill Publication Company Ltd. 2nd edition.
2. Electrical Power Systems-by C.L. Wadhwa New Age International (P) Limited Publishers, 2nd edition 1998.
3. Reactive power Control in Electric Systems-by T.J.E. Miller, John Wiley & Sons.
4. T.K. Nagsarkar, M.S. Sukhiza, - "Power System Analysis", Oxford University Press.
5. Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
6. Prabha Kundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993.

Switch gear and Protection:

1. B. Ravindran and M Chander, Power System protection and Switchgear, New Age International reprint 2006.
2. Badrirka, Power System protection and switchgear, TMH.
3. CL Wadhwa, Electrical Power systems, New age International.
4. Haddi Saadet, Power System Analysis, TMH
5. A.R. Bergen, Vijay Vittal, "Power System Analysis, Pearson Education, Asia. Switchgear & protection Sunil S. Rao. Khanna Publication.

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BTECH EEE Semester-V

Course Code	**PCCEEE552**
Course Title	**Power Systems-II Lab**
Credits	**1(L: 0 T:0 P: 2)**

Course objective:

To understand practically faults, transmission line parameters, CT /PT relays etc**.**

List of Experiments:

1. To verify various faults in transmission lines.
2. To measure the electrical power
3. Study of phase lag and phase lead.
4. Measurement of transmission line Inductance and capacitance
5. Working of CT and PT.

Course Outcomes:

Students will be able

1. To analyze fault types in transmission line
1. can measure transmission line parameters and
2. use of relay CT and PT

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BTECH EEE Semester-V

Course Code	**PCCEEE503**
Course Title	**Control Systems**
Credits	**4(L: 3 T:1 P: 0)**

Courses outcomes: students will be able to

1. Understand the basic block diagram of control systems and components with examples.
2. Understand Time response and frequency response of systems
3. Design various controllers
4. Design control system using state space approach.

Module 1: 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.

Module 2: 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.

Module 3: 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 response.

Module 4: 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.

Analog and Digital implementation of controllers.

Module 5: State variable Analysis

Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability.

Pole-placement by state feedback.

Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems technique.

Introduction to Optimal Control and Nonlinear Control

Performance Indices. Regulator problem, Tracking Problem. Nonlinear system–Basic concepts and analysis.

Text/References:

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

Course Outcomes:

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

1. Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.
2. Understand the concept of stability and its assessment for linear-time invariant systems.
3. Design simple feedback controllers.

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BTECH EEE Semester-V

Course Code	**PCCEEE553**
Course Title	**Control Systems Lab**
Credits	**1(L: 0 , T:0 P: 2)**

Course Objectives:

1. To understand how to form transfer function and to obtain response with various inputs
2. To analyze systems using BODE PLOT ROOT LOCUS etc
3. Obtain Controllers responses with systems

List of Experiments (Expandable)

1. Study of various parameters of Time domain analysis in MATLAB
2. To study the Bode plot of systems in MATLAB
3. Study of Nyquist Plot In MATLAB
4. Root Locus design in MATLAB
5. Stability of systems in MATLAB
6. State space formation of systems in MATLAB
7. Use of MATLAB and Simulink for the design of controllers like PID
8. Controllers design using OP AMP
9. Design using open source software SCILAB/OCTAVE

Course Outcomes: Students will be able to

1. Analyze responses of systems using MATLAB
2. Also, can use SIMULINK for analysis

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BTECH EEE Semester-V

Course Code	**PECEEE501**
Course Title	**Digital Signal Processing**
Credits	**3(L: 3 T:0 P: 0)**

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

1. Understand Discrete time systems and Z Transform
2. Understanding ROC of discrete signals
3. Understand DFT
4. Design FIR and IIR filters

Module 1: Discrete-time signals and systems

Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.

Module 2: Z-transform

Z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z- transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

Module 3: Discrete Fourier Transform

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Connvolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

Module 4: Design of Digital filters (12 hours)

Designof FIR Digital filters: Window method,Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Band- stop and High-pass filters.

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing.

Module 5: Applications of Digital Signal Processing

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter

Text/Reference Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, " Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.
4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing" , Prentice Hall, 1992.
5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
6. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, " Digital Signal Processing" , John Wiley & Sons, 1988.

Course Outcomes:

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

1. Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
2. Analyse discrete-time systems using z-transform.
3. Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
4. Design digital filters for various applications.
5. Apply digital signal processing for the analysis of real-life signal

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-V

Course Code	**PECEEE501**
Course Title	**Power System Dynamics and Control**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives:

1. To understand the causes of instability of power system
2. Understand the modelling of power system components for stability

Module 1: Introduction to Power System Operations

Introduction to power system stability. Power System Operations and Control. Stability problems in Power System. Impact on Power System Operations and control.

Module 2 : Analysis of Linear Dynamical System and Numerical Methods

Analysis of dynamical System, Concept of Equilibrium, Small and Large Disturbance Stability. Modal Analysis of Linear, System., Analysis using Numerical Integration Techniques. Issues in Modeling: Slow and Fast Transients, Stiff System.

Module 3 : Modeling of Synchronous Machines and Associated Controllers Modeling of synchronous machine: Physical Characteristics. Rotor position dependent model. D-Q Transformation. Model with Standard Parameters. Steady State Analysis of Synchronous Machine. Short Circuit Transient Analysis of a Synchronous Machine. Synchronization of Synchronous Machine to an Infinite Bus. Modeling of Excitation and Prime Mover Systems. Physical Characteristics and Models. Excitation System Control. Automatic Voltage Regulator. Prime Mover Control Systems. Speed Governors.

Module 4 : Modeling of other Power System Components

Modeling of Transmission Lines and Loads. Transmission Line Physical Characteristics. Transmission Line Modeling. Load Models - induction machine model. Frequency and Voltage Dependence of Loads. Other Subsystems – HVDC and FACTS controllers, Wind Energy Systems.

Module 5 : Stability Analysis

Angular stability analysis in Single Machine Infinite Bus System. Angular Stability in multi- machine systems – Intra-plant, Local and Inter-area modes. Frequency Stability: Centre of Inertia Motion. Load Sharing: Governordroop.

Single Machine Load Bus System: Voltage Stability. Introduction to Torsional Oscillations and the SSR phenomenon. Stability Analysis Tools:Transient Stability Programs, Small Signal Analysis Programs.

Module 6 : Enhancing System Stability

Planning Measures. Stabilizing Controllers (Power System Stabilizers). Operational Measures-Preventive Control. Emergency Contr

Text/Reference Books

1. K.R. Padiyar, " Power System Dynamics, Stability and Control", B. S. Publications, 2002.
2. P. Kundur, "Power System Stability and Control", McGraw Hill, 1995.
3. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997.

Course Outcomes:

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

- Understand the problem of power system stability and its impact on the system.
- Analyse linear dynamical systems and use of numerical integration methods.
- Model different power system components for the study of stability.
- Understand the methods to improve stability.

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BTECH EEE Semester-V

Course Code	**PECEEE501**
Course Title	**Power System Protection**
Credits	**3(L: 3 T:0 P: 0)**

Course objectives:

1. To understand causes of various faults and its protection methods
2. Understanding use of various relays in power system

Module 1: Introduction and Components of a Protection System

Principles of Power System Protection, Relays, Instrument transformers, Circuit Breakers

Module 2: Faults and Over-Current Protection

Review of Fault Analysis, Sequence Networks. Introduction to Overcurrent Protection and overcurrent relay co-ordination.

Module 3: **Equipment Protection Schemes**

Directional, Distance, Differential protection. Transformer and Generator protection. Bus bar Protection, Bus Bar arrangement schemes.

Module 4: **Digital Protection**

Computer-aided protection, Fourier analysis and estimation of Phasors from DFT. Sampling, aliasing issues.

Module 5: **Modeling and Simulation of Protection Schemes**

CT/PT modeling and standards, Simulation of transients using Electro-Magnetic Transients (EMT) programs. Relay Testing.

Module 6: **System Protection**

Effect of Power Swings on Distance Relaying. System Protection Schemes. Under-frequency, under-voltage and df/dt relays, Out-of-step protection, Synchro-phasors, Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.

Text/References

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.

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.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-V

Course Code	**PECEEE501**
Course Title	**INDUSTRIAL INSTRUMENTATION**
Credits	**3(L: 3 T:0 P: 0)**

COURSE OBJECTIVES

1. To introduce the measurement techniques of force, torque and sped.
2. To introduce the measurement techniques of acceleration, Vibration and density
3. To introduce the measurement Viscosity, Humidity and moisture.
4. To introduce the temperature measurement techniques
5. To introduce the pressure measurement techniques

MODULE I

MEASUREMENT OF FORCE, TORQUE AND SPEED

Different types of load cells: Hydraulic, Pneumatic, Strain gauge, Magneto-elastic and Piezoelectric load cells – Different methods of torque measurement: Strain gauge, Relative angular twist. Sped measurement: Capacitive tacho, Drag cup type tacho, D.C and A.C tacho generators – Stroboscope.

MODULE II

MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY

Accelerometers: LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers – Mechanical type vibration instruments – Seismic instruments as accelerometer – Vibration sensor – Calibration of vibration pickups – Units of density and specific gravity – Baume scale and API scale – Densitometers: Pressure type densitometers, Float type densitometers, Ultrasonic densitometer and gas densitometer.

MODULE III

MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE

Viscosity: Say bolt viscometer – Rotameter type and Torque type viscometers – Consistency Meters – Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers – Dew cell – Commercial type dew meter. Moisture: Different methods of moisture measurements –Thermal, Conductivity and Capacitive sensors, Microwave, IR and NMR sensors, Application of moisture measurement – Moisture measurement in solids.

MODULE IV

TEMPERATURE MEASUREMENT

Definitions and standards – Primary and secondary fixed points – Different types of filed in system thermometers – Sources of errors in filed in systems and their compensation – Bimetallic thermometers – IC sensors – Thermocouples: Laws of thermocouple, Fabrication of industrial thermocouples, Reference junctions compensation, Signal conditioning for thermocouple, Commercial circuits for cold junction compensation, Response of thermocouple, Special techniques for measuring high temperature using thermocouple – Radiation fundamentals – Radiation methods of temperature measurement – Total radiation pyrometers – Optical pyrometers – Two colour radiation pyrometers – Fibre optic sensor for temperature measurement – Thermograph, Temperature switches and thermostats – Temperature sensor selection, Installation and Calibration.

MODULE V

PRESSURE MEASUREMENT

Units of pressure – Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules – Electrical methods: Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor-Resonator pressure sensor – Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, lionization gauges, Cold cathode type and hot cathode type – Pressure gauge selection, installation and calibration using dead weight ester.

Reference Books:

1. A Sawhney-A course in Electrical and Electronic Measurements and Instrumentation
2. Industrial Instrumentation: Krishnaswamy, K, Vijyachitra,
3. Fundamentals of Industrial Instrumentation and Process Control William C. Dunn, 2005
4. Industrial Instrumentation and control by SK Singh

Course Outcomes: students will be able to understand

1. The measurement techniques of force, torque and speed.
2. The measurement techniques of acceleration, Vibration and density
3. The measurement Viscosity, Humidity and moisture.
4. The temperature and pressure measurement techniques

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-V

Course Code	**OECEEE501**
Course Title	**Hydrology and Water resources**
Credits	**3(L: 2 T:0 P:1)**

Course Objectives:

This course will enable students to

1. Understand the concept of hydrology and components of hydrologic cycle such as precipitation, infiltration,evaporation and transpiration.
2. Quantify runoff and use concept of unit hydrograph.
3. Demonstrate different methods of irrigation, methods of application of water and irrigation procedure.
4. Design canals and canal network based on the water requirement of various crops. Determine the reservoir capacity

Module 1

Definition and scope of hydrology, importance of water, hydrological cycle, water storages – glaciers, river channels, lakes and reservoirs, soil moisture, ground water,

Module 2

Surface water: sources and factors affecting quality and quantity; precipitation: forms and factors; interception: factors; runoff: sources and factors affecting runoff; evaporation: measurement and factors; evapotranspiration: control and factors.

Module 3

Ground water: characteristics of stream flow, Darcy's law, permeability, infiltration, ground water storage, ground water aquifers in different rock systems, movement and discharge.

Module 4

Environmental influences on water resources; sectoral demands for water; urban water supply; water management; water harvesting; water pollution and control.

References:

1. Timothy, Davie. 2003. Fundamentals of Hydrology. Routledge, Taylor and FrancisGroup, U.K.
2. Todd, D.K. 2009. Groundwater Hydrology. John Wiley & Sons Inc.
3. Mahajan, G. 1989. Evaluation and Development of Groundwater. Ashish PublishingHouse, New Delhi.
4. Karanth, K.R.C. 1988.Ground Water: Exploration, Assessment and Development. Tata-Mcgraw Hill, New Delhi.
5. Andrew D. Ward and Stanley Trimble. 2004(2nd edition). Environmental Hydrology. Lewis Publishers.

Course Outcomes:

1 Student will know the different terminologies related with hydrology .

2 Students will analyze hydrological parameters required for water resource management.

3 Student will assess ground water potential .

4 Students will identify suitable method of irrigation and drainage of waterlogged area .

RKDF UNIVERSITY, RANCHI

New Scheme Based on AICTE Flexible CurriculaSemester- V

Course Content

Course	Subject Title	Subject Code
B.Tech	**PE-I (Python Programming)**	**OECEEE501**

Learning Objectives:

When students complete Intro to Programming with Python, they will be able to: Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions. Work with user input to create fun and interactive programs.

Module – I

Introduction to Computers, Programs, and Python: Introduction, Programming Languages, Operating Systems, The History of Python, Features of python language, Getting Started with Python, Programming Style and Documentation, Programming Errors.

Elementary Programming: Introduction, writing a Simple Program, Reading Input from the Console, Identifiers, Variables, Assignment Statements, and Expressions, Simultaneous Assignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding.

Module – II

Mathematical Functions, Strings, and Objects: Introduction, Common Python Functions, Strings and Characters, Introduction to Objects and Methods, Formatting Numbers and Strings.

Control Structures: Selections: Introduction, Boolean Types, Values, and Expressions, if Statements, Two-Way if-else Statements, Nested if and Multi-Way if-elif-else Statements, Logical Operators, Conditional Expressions, Loops: Introduction, The while Loop, The for Loop, Nested Loops, Keywords break and continue

Module – III

Functions: Introduction, defining a Function, calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, Modularizing code, The Scope of Variables, Default Arguments, Returning Multiple Values.

Lists: Introduction, List Basics, Copying Lists, Passing Lists to Functions, returning a List from a Function, Searching Lists, Sorting, Processing Two-Dimensional Lists, Passing Two-Dimensional Lists to Functions, Multidimensional Lists.

Module – IV

Tuples, Sets, and Dictionaries: Introduction, Tuples: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets, Subset and Superset, Set Operations, Comparing the Performance of Sets and Lists, Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.

Module – V

Objects and Classes: Introduction, Defining Classes for Objects, Immutable Objects vs. Mutable Objects, Hiding Data Fields, Class Abstraction and Encapsulation, Object-Oriented Thinking. Inheritance and Polymorphism: Introduction, Super classes and Subclasses, Overriding Methods, The **object** Class, Polymorphism and Dynamic Binding, The **is instance** Function. Class Relationships: Association, Aggregation, composition.

Files and Exception Handling: Introduction, text input and ouput: opening a file, Writing Data, Testing a File's Existence, Reading All Data from a File, Writing and Reading Numeric Data, Binary IO Using Pickling, Exception Handling, Raising Exceptions.

TEXT BOOK

1. Y. Daniel Liang, "Introduction to programming using python", Pearson Education; First edition (2017).

REFERENCE BOOK

1. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education; Forth edition (2018)
2. Mark Lutz, "Learning Python" O′Reilly Fifth edition (2013)
3. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language" Pearson Education; Second edition (2018)

Course Outcomes:

1. Create your first program in Python IDLE.
2. Implement OOPs concepts in your programming.
3. Use Arrays, and Data structures.
4. Create an application with the support of graphics in Python.
5. Implement error handling.

Python Programming:

Lab SYLLABUS

List of Programs as Assignments:

1. Write a program that displays “Hello to Python programming”.
2. Write a program to read two integers and perform arithmetic operations on them (addition, subtraction, multiplication and division).
3. Write a program to read the marks of three subjects and find the average of them.
4. Surface area of a prism can be calculated if the lengths of the three sides are known. Write a program that takes the sides as input (read it as integer) and prints the surface area of the prism (Surface Area = 2ab + 2bc + 2ca)
5. plane travels 395,000 meters in 9000 seconds. Write a program to find the speed of theplane (Speed = Distance / Time).
6. You need to empty out the rectangular swimming pool which is 12 meters long, 7 meters wide and 2 meter depth. You have a pump which can move 17 cubic meters of water in an hour. Write a program to find how long it will take to empty your pool? (Volume = l * w * h, and flow = volume/time).
7. Write a program to convert temperature from centigrade (read it as float value) toFahrenheit.
8. A car starts from a stoplight and is traveling with a velocity of 10 m/sec east in 20 seconds. Write a program to find the acceleration of the car. [acc = (V_{final}–$V_{initial}$)/ Time].
9. Write a Program to Prompt for a Score between 0.0 and 1.0. If the Score Is Out of Range, Print an Error. If the Score Is between 0.0 and 1.0, Print a Grade Using the Following Table

Score	Grade
>= 0.9	A
>= 0.8	B
>= 0.7	C
>= 0.6	D
< 0.6	F

10. Write a Program to find the maximum of three numbers.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-V

Course Code	**OECEEE501**
Course Title	**Energy systems and management**
Credits	**3(L: 3 T:0 P: 0)**

Objectives:

1. To understand the basics of Energy Resources.
2. To understand the Energy Conversion Systems and Management.
3. To learn about basic concept of Power Systems Engineering

Module-I

Energy resources and their utilization: Indian and global energy sources, Energy exploited, Energy planning, Energy Parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation.

Module-II

Solar radiations: Extra-terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India.

Module-III

Energy Conversion Systems I: Energy, Conversion routes, Direct and indirect way of Energy Conversion, Principles of heat and mass transfer, Thermodynamics, Fluid static and dynamics, Electricity generation, distribution and use, Basic of Solar Thermal Conversion, Technology of Selective Coating, Fundamentals of Flat Plate Collector and Evacuated Collector, Basic of Wind Energy Conversion, Wind machine, Wind electric generator, Wind pump.

Module-IV

Energy Conversion Systems II: Basics of Photovoltaic Conversion technology and PV systems, PV system design methodologies, Basics of Bio-energy conversion, biomethanation technology, Thermochemical Conversion through Pyrolysis, Gasification and Esterification, Bio Oil, Application of Ocean Thermal Gradient and Geothermal gradient for power generation, Basics of hydropower, Tidal and Wave power, Basics of Hydrogen fuel, Fundamentals of Fuel Cells, Basics of Fusion power, Energy Storage Technologies, Mechanical storage, Chemical storage and Electrical storage, Details of Pb-acid battery, Ni- Cd-alkaline battery, Ni-iron and Na-S batteries, battery maintenance and safety precautions.

Module-V

Energy Management: Fundamental of Energy conservation, Energy Management and Audit, Basics of Energy Demand and Supply, Principles of Economic analysis in the Energy Management and Audit Programme, Supply side and demand side energy management, Boilers and Firing System, Steam, Condensation Systems, Energy Conservation and Management in power plant, Energy conservation in Buildings, Heating, Ventilation and Air Conditioning System, Degree day in energy use monitoring, Energy Conservation Opportunities, in chemical industries, Waste heat recovery, Co-generation, Energy Conservation in Agricultural Sector, Energy conservation in illumination engineering, Combustion stoichiometry, air-fuel ratio, optimum loading in boilers, etc

Module-VI

Industrial Energy Analysis: Materials and energy balance in the industries, Products and the process, industrial demand and supply networking, Optimization techniques, efficiency analysis, methods, Energy monitoring and ongoing information dissertation in terms of energy consumption, production and cumulative sum of differences. Energy efficiency analysis in various conversion systems like boilers, furnaces, compression systems, controlling systems, etc. Case studies for large scale, medium scale and small-scale industries, efficiency integration methodologies.

Reference Books: -

1. Albert Thumann, Handbook of Energy Audits, The Fairmont Press Inc., Atlanta gergia, 1979.
2. Murphy W.R and Mckay G, Energy Management, Butterworths, London, 1982.
3. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, Van Nost and Reinhold Co., Newyork.
4. Energy Audits, E.E.O.-Book-lets, U.K. 1988.

5. Craig B.Smith, “Energy Management Principles”, Pergamon Press.

6. The role of Energy Manager, E.E.O., U.K.

7. The Energy conservation Design Resource Hand Book-The Royal architectural Institute of Canada.

8. Non-Conventional Energy Resources by B.H . Khan, Tata McGraw Hill

9. Solar Energy – S.P.Sukhatme, Tata mcgraw hill co.

Course outcomes: students will be able to understand

1. Various types of energy sources and their applications
2. Techniques of energy conservation and management

RKDF UNIVERSITY RANCHI

BTECH ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME 2023-24

Choice Based Credit System Semester-VI

SL. No.	Category	Subject Code	Subject Name	Periods			Credits	Marks Distribution				
								Internal	External		Total	
				L	T	P		Max	Max	Min	Max	Min
1	Professional Core Course	**PCC EEE601**	Power Electronics	3	0	0	**3**	30	70	21	100	35
2	Professional Core Course	**PCC EEE602**	Microprocessors and Microcontrollers	3	0	0	**3**	30	70	21	100	35
3	Professional Elective Course	**PECEEE601**	Professional Elective II	3	0	0	**3**	30	70	21	100	35
4	Professional Elective Course	**PECEEE602**	Professional Elective III	3	0	0	**3**	30	70	21	100	35
5	Humanities and Social Science	**HSMC601**	HSS/Management Elective I	3	0	0	**3**	30	70	21	100	35
6	Open Elective Course	**OECEEE601**	Open Elective II	3	0	0	**3**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	Professional Core Course	**PCC EEE651**	Power Electronics Lab	0	0	2	**1**	30	20		50	25
2	Professional Core Course	**PCC EEE652**	Microprocessors and Microcontrollers Lab	0	0	2	**1**	30	20		50	25
3	Humanities and Social Science	**HSMC602**	Introduction to SOFT SKILL	1	0	2	**1**	30	70	21	100	35
4	Internship	**INT601**	Internship/ Tour and Training/ Industrial Training	0	0	4	**2**	30	20		50	25
TOTAL							**23**					

Departmental Elective-II (Choose any one)
Electrical Drives
Electric Hybrid Vehicles
Digital Control Systems
PLC and SCADA

Departmental Elective-III (Choose any one)
High Voltage Engineering
HVDC Transmission Systems
Industrial Electrical Systems

Open Elective II (Choose any one)
REMOTE SENSING AND GIS
Renewal Energy Engineering
Soft Computing
MOOCS-II

HSS/ Management Elective I
Project Management
Operations Research
Managerial Economics

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BTECH Semester-VI

Course Code	**PCCEEE601**
Course Title	**Power Electronics**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the principle of power electronic switches
2. To understand the working of various power electronic converters

Module 1: 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.

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.

Module 2: DC-DC buck 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.

Module 3: DC-DC boost converter

Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

Module 4: 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

Module 5: 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

Text/References:

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”, Wiley India, 2009.

Course Outcomes:

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

1. Understand the differences between signal level and power level devices.
2. Analyze controlled rectifier circuits.
3. Analyze the operation of DC-DC choppers.
4. Analyze the operation of voltage source inverters.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VI

Course Code	**PCCEEE602**
Course Title	**Microprocessors and Microcontrollers**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the architecture and parts of basic microprocessor system addressing modes and programming
2. To understand the basics of architecture and programming of 8051 microcontroller

Module 1: Fundamentals of Microprocessors:

Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.

Module 2: The 8051 Architecture

Internal Block Diagram, CPU, ALU, address, data and control bus, working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Module 3: Instruction Set and Programming

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

Module4: Memory and I/O Interfacing

Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices.

Module 5: External Communication Interface

Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.

LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.

Text / References:

1. M.A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C" Pearson Education, 2007.
2. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning,2004.
3. R. Kamal, "Embedded System", McGraw Hill Education,2009.
4. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996

Course Outcomes:

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

1. Do assembly language programming.
2. Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.
3. Develop systems using different microcontrollers.

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BTECH EEE Semester-VI

Course Code	**PCCEEE652**
Course Title	**Microprocessors and microcontrollers LAB**
Credits	**1 (L: 3, T:0 P: 0)**

Course objectives:

1. To understand the ALP for 8085/8051 using trainer kit, Keil compiler etc
2. To interface various hardware using 8085/8086/8051 etc

List of experiments (expandable)

1. Store data in memory location and registers in 8085
2. Store data in memory location and registers in 8085
3. ALP of addition of two numbers in 8085/8086/8051
4. ALP of addition of two numbers in 8085/8086/8051
5. Programming using Kiel C51 software

Course outcomes: students will be able to develop ALP and execute them on trainer kit or Keil compiler etc.

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BTECH EEE Semester-VI

Course Code	**PECEEE601**
Course Title	**Electric Drives**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

1. To understand the concept and advantages of electrical drive system
2. To understand the mechanism for DC and AC drives

Module 1: DC motor characteristics

Review of emf and torque equations of DC machine, review of torque-speed characteristics of separately excited dc motor, change in torque-speed curve with armature voltage, example load torque-speed characteristics, operating point, armature voltage control for varying motor speed, flux weakening for high-speed operation.

Module 2: Chopper fed DC drives

Review of dc chopper and duty ratio control, chopper fed dc motor for speed control, steady state operation of a chopper fed drive, armature current waveform and ripple, calculation of losses in dc motor and chopper, efficiency of dc drive, smooth starting.

Module 3: Multi-quadrant DC drive

Review of motoring and generating modes operation of a separately excited dc machine, four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers; steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking.

Module 4: Closed-loop control of DC Drive

Control structure of DC drive, inner current loop and outer speed loop, dynamic model of dc motor – dynamic equations and transfer functions, modeling of chopper as gain with switching delay, plant transfer function, for controller design, current controller specification and design, speed controller specification and design.

Module 5: Induction motor characteristics

Review of induction motor equivalent circuit and torque-speed characteristic, variation of torque-speed curve with (i) applied voltage, (ii) applied frequency and (iii) applied voltage and frequency, typical torque-speed curves of fan and pump loads, operating point, constant flux operation, flux weakening operation.

Module 6: Scalar control or constant V/f control of induction motor

Review of three-phase voltage source inverter, generation of three-phase PWM signals, sinusoidal modulation, space vector theory, conventional space vector modulation; constant V/f control of induction motor, steady-state performance analysis based on equivalent circuit, speed drop with loading, slip regulation. Control of slip ring induction motor Impact of rotor resistance of the induction motor torque-speed curve, operation of slip-ring induction motor with external rotor resistance, starting torque, power electronic based rotor side control of slip ring motor, slip power recovery.

Text / References:

1. G. K. Dubey, "Power Semiconductor Controlled Drives", Prentice Hall, 1989.
2. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control , Prentice Hall, 2001.
3. G. K. Dubey, "Fundamentals of Electrical Drives", CRC Press, 2002.
4. W. Leonhard, "Control of Electric Drives", Springer Science & Business Media

Course Outcomes:

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

1. Understand the characteristics of dc motors and induction motors.
2. Understand the principles of speed-control of dc motors and induction motors.
3. Understand the power electronic converters used for dc motor and induction motor speed control.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VI

Course Code	**PECEEE601**
Course Title	**Electric Hybrid Vehicles**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the basics of hybrid mode of operation of vehicles
2. To understand the basic mechanism of electrical energy storage mechanisms.

Module 1: Introduction

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Module 2: Electric Trains

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive- train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Module 3: Energy Storage

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

Module 4: Energy Management Strategies

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text / References:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
4. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

Course Outcomes:

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

- Understand the models to describe hybrid vehicles and their performance.
- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems.

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BTECH EEE Semester-VI

Course Code	**PECEEE601**
Course Title	**Digital Control Systems**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the representation of control systems is discrete mode
2. To understand state space and other tools for digital control systems

Module 1: Discrete Representation of Continuous Systems

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

Module 2: Discrete System Analysis

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

Module 3: Stability of Discrete Time System

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

Module 4: State Space Approach for discrete time systems

State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Reconstructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.

Module 5: Design of Digital Control System

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

Module 6: Discrete output feedback control

Design of discrete output feedback control. Fast output sampling FOS) and periodic output feedback controller design for discrete time systems.

Text Books:

1. K. Ogata, "Digital Control Engineering", Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
3. G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of Dynamic Systems", Addison-Wesley, 1998.
4. B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.

Course Outcomes:

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

1. Obtain discrete representation of LTI systems.
2. Analyse stability of open loop and closed loop discrete-time systems.
3. Design and analyse digital controllers.
4. Design state feedback and output feedback controllers.

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BTECH EEE Semester-VI

Course Code	**PECEEE601**
Course Title	**PLC and SCADA**
Credits	**3 (L: 3, T:0 P: 0)**

COURSE OBJECTIVES:

To get familiar with industrial automation working with PLC and SCADA

Module 1

Programmable Logic Controllers: Introduction, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. PLC Hardware Components: The I/O Section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O Specifications, The Central Processing Unit (CPU), Memory Design, Memory Types, Programming Terminal Devices, Recording and Retrieving Data, Human Machine Interfaces (HMIs). Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of operation

Module2

Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs: Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-in Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description. Programming Timers: Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers.

Module 3

SCADA Fundamentals: Introduction, Open system: Need and advantages, Building blocks of SCADA systems, Remote terminal unit (RTU): Evolution of RTUs, Components of RTU, Communication subsystem, Logic subsystem, Termination subsystem,

Module 4

Human-Machine Interface (HMI): HMI components, HMI software functionalities, Situational awareness, Intelligent alarm filtering: Need and technique, Alarm suppression techniques, Operator needs and requirements,

Module 5

SCADA Systems: Building the SCADA systems, legacy, hybrid, and new systems, Classification of SCADA systems, SCADA implementation: A laboratory model: The SCADA laboratory, System hardware, System software, SCADA lab field design.

Text Books:

1. Programmable Logic Controllers Frank D Petruzella McGraw Hill 4th Edition, 2011
2. Power System SCADA and Smart Grids Mini S. Thomas CRC Press 3rd Edition,2015

Course outcomes:

1. Students will be able to analyze the working of PLC
2. Students will be able to design PLC ladder Logic programming
3. Students will be able to analyze working of SCADA
4. Students will be able to analyze working of HMI

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BTECH EEE Semester-VI

Course Code	**PECEEE602**
Course Title	**High Voltage Engineering**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

1. To understand breakdown mechanisms in Solid liquid and gaseous dielectrics
2. Measurement and generation of high voltage
3. Testing of high voltage

Module 1: Breakdown in Gases

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

Module 2: Breakdown in liquid and solid Insulating materials (7 Hours)

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

Module 3: Generation of High Voltages

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

Module 4: Measurements of High Voltages and Currents

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

Module 5: Lightning and Switching Over-voltages

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching over- voltages, Protection against over-voltages, Surge diverters, Surge modifiers.

Module 6: High Voltage Testing of Electrical Apparatus and

High Voltage Laboratories

Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing

facility requirements, safety precautions in H. V. Labs.

Text/Reference Books

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), " High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, " High Voltage Engineering Fundamentals", Newnes Publication, 2000.
3. R. Arora and W. Mosch " High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing
5. M. S. Naidu and V. Kamaraju, " High Voltage Engineering", McGraw Hill Education, 2013.
6. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

Course outcomes:

At the end of the course, the student will demonstrate

1. Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
2. Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.
3. Knowledge of testson H. V. equipment and on insulating materials, as per the standards.
4. Knowledge of how over-voltages arise in a power system, and protectionagainst these over-voltages.

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BTECH EEE Semester-VI

Course Code	**PECEEE602**
Course Title	**HVDC Transmission System**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand Components of HVDC systems
2. To understand the generation and transmission of power in HVDC systems

Module 1: DC Transmission Technology

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

Module 2: 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.

Module 3: Control of HVdc Converters:

Principles of Link Control in a LCCHVdc 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.

Module 3: Components of HVdc systems:

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. Ground Electrodes.

Module 4: 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.

Module 5: MTdc Links

Multi-Terminal and Multi-Infeed Systems. Series and Parallel MTdc systems using LCCs. MTdc systems using VSCs. Modern Trends in HVdc Technology. Introduction to Modular Multi-level Converters.

Text/References:

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.

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

Course Outcomes:

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

- Understand the advantages of dc transmission over ac transmission.
- Understand the operation of Line Commutated Converters and Voltage Source Converters.
- Understand the control strategies used in HVdc transmission system.
- Understand the improvement of power system stability using an HVdc system

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BTECH EEE Semester-VI

Course Code	**PECEEE602**
Course Title	**Industrial Electrical Systems**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

1. To understand the rating of switches/MCB /Cables for residential and industrial applications
2. Understanding various illumination schemes for industries and residential purpose.
3. Understanding PLC and SCADA for industries.

Module 1: Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

Module 2: Residential and Commercial Electrical Systems

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Module 3: Illumination Systems

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Module 4: Industrial Electrical Systems I

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Module 5: Industrial Electrical Systems II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Module 6: Industrial Electrical System Automation

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Text/Reference Books

3. S. L. Uppal and G. C. Garg, " Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
4. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.
5. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
6. Web site for IS Standards.
7. H. Joshi, " Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

Course Outcomes:

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

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components

BTECH EEE Semester-VI

Course Code	**HSMC601**
Course Title	**Project Management**
Credits	**3 (L: 3, T:0 P: 0)**

Objective:

To facilitate the understanding of project management principles and processes

Contents:

Module- I

Introduction: Introduction to Project Management, definitions, History of Project Management, project identifications establishing a project, Project Life Cycle.

Module- II

Project Analysis: Facets of Project Analysis, Resource Allocation, Market Analysis, Technical Analysis, Economic and Ecological Analysis.

Module- III

Financial Analysis: Financial Estimates and Projections, Investment Criteria, Financing of Projects.

Module- IV

Network Methods in PM: Origin of Network Techniques, AON and AOA differentiation, CPM network, PERT network, other network models.

Module- V

Optimization in PM: Time and Cost trade-off in CPM, crashing procedure, Scheduling when resources are limited.

Module- VI

Project Risk Management: Risk analysis, Work Breakdown Structure, Earned Value Management.

Course Outcomes:

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

1. Understand the importance of projects and its phases.
2. Analyze projects from marketing, operational and financial perspectives.
3. Evaluate projects based on discount and non-discount methods.
4. Develop network diagrams for planning and execution of a given project.
5. Apply crashing procedures for time and cost optimization.

Text Books:

1. Prasanna Chandra, Project: A Planning Analysis, Tata McGraw Hill Book Company, New Delhi, 4th Edition, 2009.
2. Cleland, Gray and Laudon, Project Management, Tata McGraw Hill Book Company, New Delhi, 3rd Edition, 2007.
3. Jack R. Meredith., Samuel J. Jr. Mantel., Project Management - A Managerial Approach, John Wiley, 6th Edition, 2011.

BTECH EEE Semester-VI

Course Code	**HSMC601**
Course Title	**Operations Research**
Credits	**3 (L: 3, T:0 P: 0)**

COURSE OBJECTIVES:

Industrial/ business scenario involving limited resources and finding the optimal solution within constraints. The objective of this course is to enable the student to understand and analyse managerial and engineering problems

to equip him to use the resources such as capitals, materials, productions, controlling, directing, staffing, and machines more effectively.

Module-I

Introduction: Scope and limitations of O.R., Linear Programming: Mathematical formulation of the problem. Graphical solution and Simplex Method.

Module-II

Linear Programming: Big-M Method, Concept of duality, Dual simplex method.

Module-III

Transportation Model: Basic feasible solution by different methods, Finding optimal solutions, Degeneracy in transportation problems, Unbalanced transportation problems. Assignment Model: Balanced and unbalanced assignments, Assignment to given schedules.

Module-IV

Sequencing: Processing of 2 jobs through machines –graphical method, Processing of n jobs through two machines, processing n jobs through three machines.

Module-V

Games Theory: Two-persons zero sum games, Pure and mixed strategies, Rules of dominance, Solution methods without saddle point.\

Module-VI

Queuing Model: Queuing systems and their characteristics, The M/M/1/FIFO/ system, Introduction to dynamic programming.

Text Books:

1. P. Rama Murthy , Operations Research, New Age, New Delhi
2. P.K. Gupta & D. S. Hira, Operations Research, S. Chand & Company Ltd, New Delhi.

References Books:

1. Hamdy A Taha, 1999. Introduction to Operations Research, PHI Limited, New Delhi.
2. Sharma, J.K., 1989. Mathematical Models in Operations Research, Tata McGraw Hill publishing Company Ltd., and New Delhi.
3. Beer, Stafford, 1966. Decision and Control, John Wiley & Sons, Inc., New York.

Course Outcomes:

1. Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
2. Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems
1. Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

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BTECH EEE Semester-VI

Course Code	**HSMC601**
Course Title	**Managerial Economics**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

This course enables the students:

A. To explain the basics of economics and describe its application in managerial problems.
B. To demonstrate the effect of demand and cost on business decisions and make a relation between cost and production.
C. To analyse different types of market and explain pricing decisions in the markets.
D. To familiarize the concept of investment criteria. .
2. E To explain the concept of national income and analyse for managerial decisions.

Module 1: Introduction: Nature and scope, Definitions, Importance, Application to Business Decisions, Profit Maximization as Business Objectives, Sales and Revenue Maximization Objective of Business Firms.

Module2: Demand and Supply Introduction, Determinants of Demand and Supply, Demand Function, Demand and Supply Curves, Law of Demand, Elasticity of Demand, Demand Forecasting,

Module3: Production Analysis and Cost Classification of Cost, Cost-Output Relationship, Economies of Scale, Break-even Analysis Production Process and Function-One Variable and Two Variable Inputs, Iso-quant and Iso-cost, Optimal Factor Combination.

Module4: Market Introduction, Market Types- Perfect Competition, Imperfect Competition, Monopoly and Oligopoly- Price Leadership Model, Collusive Oligopoly and Kinked Demand Curve Model, Equilibrium of a Firm under Perfect Competition, Price Determination under Different Markets

Module5: Capital Budgeting & National Income Introduction, Meaning and Significance of Capital Budgeting, Methods of Investment Appraisal, Concept of National Income, Measurement of National Income- Methods and Problems.

Text Books

1. Managerial Economics, Atmanand, Excel Books

2. Managerial Economics, H. Craig Petersen & W. Cris Lewis, Pearson Education

Course Outcomes: After the completion of this course, students will be:

1. Analyse economic problems and can corelate scarcity with the requirements.
2. Evaluate demand and can analyse cost in order to optimise cost-production combination.
3. Recognise the existing market and can take appropriate decisions. 4. Evaluate the investment criteria and can frame appropriate plan.
4. Analyse national income components for effective economic decisions.

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BTECH EEE Semester-VI

Course Code	**HSMC602**
Course Title	**Introduction to Soft Skills**
Credits	**1 (L: 0, T:0 P: 2)**

Course Objectives:

1. To encourage the all-round development of students by focusing on soft skills.
2. To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
3. To develop and nurture the soft skills of the students through individual and group activities.
4. To expose students to right attitudinal and behavioral aspects and to build the same through activities

Soft skill development

Module-I: Speaking skill

Module-II: Introduction to Group discussion

Module-III: Process of Group Discussion

Module-IV: Leadership skill

Module-V: Instant public speaking

Suggested books:

1. Contemporary English Grammar Structures and Composition; David Green, Macmillan
2. English Grammar and composition; R. C. Jain, Macmillan
3. Effective Technical Communication; M. Ashraf Rizvi, Tata McGraw Hill Companies
4. Developing Communication Skills; Krushna Mohan, Meera Baneji, Macmillan

Course outcomes:

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

1. Effectively communicate through verbal/oral communication and improve the listening skills
2. Write precise briefs or reports and technical documents .
3. Actively participate in group discussion / meetings / interviews and prepare & deliver presentations

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BTECH EEE Semester-VI

Course Code	**OECEEE601**
Course Title	**REMOTE SENSING & GIS**
Credits	**3 (L: 3, T:0 P: 0)**

COURSE OBJECTIVES:

1. Apply the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain.
2. Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
3. Understand different components of GIS and Learning about map projection and coordinate system
4. Develop knowledge on conversion of data from analogue to digital and working with GIS software

Module-I

Remote Sensing: Definition and Development; Platforms and Types; Photogrammetry.

Module-II

Satellite Remote Sensing: Principles, EMR Interaction with Atmosphere and Earth Surface; Satellites (Landsat and IRS); Sensors

Module-III

Geographical Information System (GIS): Definition and Components.

Module-IV

Global Positioning System (GPS) – Principles and Uses; DGPS.

Module-V

GIS Data Structures: Types (spatial and Non-spatial), Raster and Vector Data Structure

Books/references

1. Bhatta, B. (2008) Remote Sensing and GIS, Oxford University Press, New Delhi.
2. Campbell J. B., 2007: Introduction to Remote Sensing, Guildford Press
3. Jensen, J. R. (2005) Introductory Digital Image Processing: A Remote Sensing.
4. Bhatta, B. (2010) Analysis of Urban Growth and Sprawl from Remote Sensing, Springer, Berlin Heidelberg.

Couse Outcomes:

1. Understand the concepts of Photogrammetry and compute the heights of objects
2. Understand the principles of aerial and satellite remote sensing, Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies.
3. Understand the basic concept of GIS and its applications, know different types of data representation in GIS
4. Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer are Apply knowledge of GIS software and able to work with GIS software in various application fields

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BTECH EEE Semester-VI

Course Code	**OECEEE601**
Course Title	**Soft Computing**
Credits	**3(L: 3 T:0 P: 0)**

Course Objectives:

The main objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing.

Upon completion of this course, the student should be able to get an idea on :

1. Artificial Intelligence, Various types of production systems, characteristics of production systems.
2. Neural Networks, architecture, functions and various algorithms involved.
3. Fuzzy Logic, Various fuzzy systems and their functions.
4. Genetic algorithms, its applications and advances

Module 1

FUZZY SET THEORY Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology– Set theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning –Fuzzy Inference Systems – Input Space Partitioning and Fuzzy Modeling.

Module II

OPTIMIZATION Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

MODULE III

NEURAL NETWORKS Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Multilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

MODULE IV

NEURO FUZZY MODELING AND OTHER TECHNIQUES Adaptive Neuro-Fuzzy Inference Systems – Architecture – Support Vector Machines – Independent Component Analysis.

MODULE V

APPLICATIONS OF COMPUTATIONAL INTELLIGENCE Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction

Course Outcomes:

At the end of the course the student should be able to

1. Learn about soft computing techniques and their applications
2. Analyze various neural network architectures
3. Understand perceptron and counter propagation networks.
4. Define the fuzzy systems
5. Analyze the genetic algorithms and their applications

TEXT BOOK/References:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

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BTECH EEE Semester-VI

Course Code	**OECEEE601**
Course Title	**Renewable Energy Engineering**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives

1. Graduates will be known for their skill set in the field of research in renewable energy sectors.
2. Graduates will be enriched with blended interdisciplinary knowledge required to establish as an entrepreneur and industry centric in renewable energy.
3. Graduates will be manifested for their adherence to professional, social and ethical responsibilities in implementing sustainable energy solutions.

Module -I

Introduction, Importance of Energy Consumption as Measure of Prosperity, Per Capita Energy Consumption, Needs of renewable energy, Classification of Energy Resources, Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations, Comparison of Conventional and Non-Conventional Energy Resources, World Energy Scenario, Indian Energy Scenario.

Module –II

Introduction, Solar Radiation, Solar Constant, Basic Sun-Earth Angles, Solar Radiation Geometry and its relation, Measurement of Solar Radiation, Principle of Conversion of Solar Radiation into Heat, Collectors (Flat Plate and Concentrating Collectors), Solar Water Heaters, Solar Cookers , Solar driers, Solar Still, Solar Furnaces, Solar Green Houses. Solar Photovoltaic, Solar Cell fundamentals, characteristics, classification,

construction of module, panel and array. Solar PV Systems (stand-alone and grid connected), Solar PV Applications.

Module III Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basics of lift and drag, Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Wind site selection
consideration, wind farm, Advantages and Disadvantages of WECS.

Module - IV

Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation,
types of biogas plants, energy plantation, Biomass program in India.

Module –V

Tidal Energy, Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants. Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude
cycle), Closed Cycle (Anderson cycle). Geothermal Energy, Resources of geothermal energy, Hydrogen and Storage, Fuel Cell Systems, Hybrid Systems.

Text books:

1. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 1996.
2. Rai. G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2011.
3. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.

Reference books:

1. Sukhatme. S.P., "Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
2. Tiwari. G.N., Solar Energy – "Fundamentals Design, Modelling& Applications", Narosa Publishing House, New Delhi, 2002.
3. Freris. L.L., "Wind Energy Conversion Systems", Prentice Hall, UK, 1990.
4. Chetan Singh Solanki, Solar Photovoltaics, "Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2009.

COURSE OUTCOMES

1. An ability to independently carry out research /investigation and development work to solve practical problems

2. An ability to write and present a substantial technical report/document

3. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery
should be at a level higher than the requirements in the appropriate bachelor program

4. Ability to design, implement and perform analysis using cutting edge technologies for harnessing renewable energy in multidisciplinary
applications
5. Ability to work in contemporary and futuristic renewable energy research towards industry and society for sustainable energy solutions.

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Choice Based Credit System Semester-VII												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
								Internal	**External**		**Total**	
				L	**T**	**P**		**Max**	**Max**	**Min**	**Max**	**Min**
1	Professional Core Course	PCC EEE701	Switch Gear and Protection	**3**	**0**	**0**	**3**	**30**	**70**	**21**	**100**	**35**
2	Professional Elective Course	PECEEE701	Departmental Elective IV	3	0	0	**3**	30	70	21	100	35
3	Professional Elective Course	PECEEE702	Departmental Elective V	3	0	0	**3**	30	70	21	100	35
4	Open Elective Course	OECEEE701	Open Elective III	3	0	0	**3**	30	70	21	100	35
5	Humanities and Social Science	HSMC 701	Industrial Psychology	3	0	0	**3**	30	70	21	100	35
PRACTICAL DEMONSTRATION												
1	**Project-I**	PROJEEE701	Project-I	0	0	6	**3**	30	20	10	50	25
2	Professional Core Course	PCCEEE753	Electronic Design Laboratory	0	0	2	**1**	30	20	10	50	25
3	Professional Core Course	PCC EEE751	Switch Gear and Protection Lab	0	0	2	**1**	30	20	10	50	25
4	Seminar	SEM756	Seminar	0	0	2	**1**	30	20	10	50	25
TOTAL							**21**					

B. TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME 2023-24

Professional Elective-IV (Choose any one)
Wind and Solar Energy Systems
Electrical Energy Conservation and Auditing
Power Quality and FACTS

Professional Elective-V (Choose any one)
Electrical Machine Design
Utilization of Electrical Power
Line Commutated and Active Rectifiers

Open Elective III (choose any one)
Artificial Intelligence
AUTOCAD
Power plant Engineering
Refrigeration and air conditioning

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BTECH EEE Semester-VII

Course Code	**PCC EEE701**
Course Title	**Switch Gear and Protection**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

- To understand types of faults in power systems
- To know the working of relay and Circuit breaker
- To understand the protection of power system equipment

Module I

FAULT ANALYSIS Fault Analysis per unit, representation and its advantages, faults in power systems (Symmetrical & Unsymmetrical), Single line and equivalent impendence diagram representation of power system components. Symmetrical components and its application to power systems, fault analysis, Sequence networks and their interconnection for different types of faults, Effect of fault impedance, Current limiting reactors, its location and application, short circuit calculation.

Module-II

PROTECTIVE RELAYS Introduction to protective relaying-classification of relays – over current relays - directional over current relays - differential relays-distance relays - frequency relays-negative sequence relays - Introduction to static relays - comparison of electromagnetic and static relays, Bucholz Relay.

Module III

PROTECTION OF GENERATOR, TRANSFORMER AND BUSBAR Generator protection-differential protection, balanced earth fault protection, restricted earth fault protection, stator inter-turn protection. Transformer protection-percentage differential protection-station bus zone protection differential, Fault bus protection- protection of transmission lines-time graded, differential, distance protection.

Module IV

CIRCUIT BREAKERS Theory of arcing and arc quenching-RRRV-current chopping-capacitive current breaking-DC circuit breaking switchgear- fault clearing and interruption of current-Breakers-classification of circuit breakers-construction and operation of circuit breakers-minimum oil circuit breaker-air-blast circuit breaker-vacuum circuit breaker-SF6 circuit breaker-circuit breaker rating-circuit breaker testing.

Module V

FUSES & MICROPROESSOR BASED RELAYS Definitions-characteristics of fuses-types of fuses-low voltage fuses-HRC fuses-high voltage fuses Introduction to Microprocessor based over current relays, impedance relays, Directional and reactance relay.

References:

1. B. Ravindran and M Chander, Power System protection and Switchgear, New Age International reprint 2006.
2. Badrirka, Power System protection and switchgear, TMH.
3. CL Wadhwa, Electrical Power systems, New age International.
5. Haddi Saadet, Power System Analysis, TMH
6. A.R. Bergen, Vijay Vittal, "Power System Analysis, Pearson Education, Asia. Switchgear & protection Sunil S. Rao. Khanna Publication.

Course Outcomes:

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

- Understand the various types of faults
- Explain the principle and working of various relays
- Analyze the protection measures of generator transformer and busbar
- Explain the working principles of circuit breakers and fuses.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VII

Course Code	**PECEEE701**
Course Title	**Wind and Solar Energy Systems**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

- To understand the principle of generation of electrical energy using Wind and solar resources
- To understand the installation and applications of wind and solar based generations

Module 1: 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.

Module 2: 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.

Module 3: The Solar Resource:

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Module 4: Solar photovoltaic:

Technologies-Amorphous, monocrystalline, 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.

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.

Solar thermal power generation:

Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

Text / References:

1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 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.
4. H. Siegfried and R. Waddington, " Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
5. G. N. Tiwari and M. K. Ghosal, " Renewable Energy Applications", Narosa Publications, 2004.
6. J. A. Duffie and W. A. Beckman, " Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

Course Outcomes:

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

1. Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
2. Understand the basic physics of wind and solar power generation.
3. Understand the power electronic interfaces for wind and solar generation.
4. Understand the issues related to the grid-integration of solar and wind energy systems.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VII

Course Code	**PECEEE701**
Course Title	**Electrical Energy Conservation and Auditing**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

1. To understand the basics of energy conservation methods
2. To understand the principle of energy efficient electrical devices

Module 1: Energy Scenario (6 Hours)

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

Module 2: Basics of Energy and its various forms (7 Hours)

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.

Module 3: Energy Management & Audit (6 Hours)

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.

Module 4: Energy Efficiency in Electrical Systems (7 Hours)

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 replacement issues, energy saving opportunities with energy efficient motors.

Module 5: Energy Efficiency in Industrial Systems (8 Hours)

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.

Module 6: Energy Efficient Technologies in Electrical Systems (8Hours)

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.

Text/Reference 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. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

Course Outcomes:

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

1. Understand the current energy scenario and importance of energy conservation.
2. Understand the concepts of energy management.
3. Understand the methods of improving energy efficiency in different electrical systems.
4. Understand the concepts of different energy efficient devices.

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BTECH Semester-VII

Course Code	**PECEEE701**
Course Title	**Power Quality and FACTS**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

1. To understand the principle of transmission line compensators
2. Understand the basics of FACTS, STATCOM etc.

Module 1: Transmission Lines and Series/Shunt Reactive Power Compensation

Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

Module 2: Thyristor-based Flexible AC Transmission Controllers (FACTS) Description and Characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch. Configurations/Modes of Operation, Harmonics and control of SVC and TCSC. Fault Current Limiter

Module 3: Voltage Source Converter based (FACTS) controllers

Voltage Source Converters (VSC): Six Pulse VSC, Multi-pulse and Multi-level Converters, Pulse-Width Modulation for VSCs. Selective Harmonic Elimination, Sinusoidal PWM and Space Vector Modulation. STATCOM: Principle of Operation, Reactive Power Control: Type I and Type II controllers, Static Synchronous Series Compensator (SSSC) and Unified Power Flow Controller (UPFC): Principle of Operation and Control. Working principle of Interphase Power Flow Controller. Other Devices: GTO Controlled Series Compensator. Fault Current Limiter.

Module 4: Application of FACTS

Application of FACTS devices for power-flow control and stability improvement. Simulation example of power swing damping in a single-machine infinite bus system using a TCSC. Simulation example of voltage regulation of transmission mid-point voltage using a STATCOM.

Module 5: Power Quality Problems in Distribution Systems

Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement. Tolerance of Equipment: CBEMA curve.

Module 6: DSTATCOM

Reactive Power Compensation, Harmonics and Unbalance mitigation in Distribution Systems using DSTATCOM and Shunt Active Filters. Synchronous Reference Frame Extraction of Reference Currents. Current Control Techniques in for DSTATCOM.

Module 6: Dynamic Voltage Restorer and Unified Power Quality Conditioner (6 hours) Voltage Sag/Swell mitigation: Dynamic Voltage Restorer – Working Principle and Control Strategies. Series Active Filtering. Unified Power Quality Conditioner (UPQC): Working Principle. Capabilities and Control Strategies.

Text/References

1. N. G. Hingorani and L. Gyugyi, "Understanding FACTS: Concepts and Technology of FACTS Systems", Wiley-IEEE Press, 1999.
2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
3. T. J. E. Miller, "Reactive Power Control in Electric Systems", John Wiley and Sons, New York, 1983.
4. R. C. Dugan, "Electrical Power Systems Quality", McGraw Hill Education, 2012.
5. G. T. Heydt, "Electric Power Quality", Stars in a Circle Publications, 1991

Course Outcomes:

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

1. Understand the characteristics of ac transmission and the effect of shunt and series reactive compensation.
2. Understand the working principles of FACTS devices and their operating characteristics.
3. Understand the basic concepts of power quality.
4. Understand the working principles of devices to improve power quality.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VII

Course Code	**PECEEE702**
Course Title	**Electrical Machine Design**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

- To know the design process for electric motors and generators based on fundamental theories.
- Understand the basics of CAD.

Module 1: Introduction

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines

Module 2: Transformers

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

Module 3: Induction Motors

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

Module 4: Synchronous Machines

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

Module 5: **Computer aided Design (CAD):**

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem

formulation. Introduction to FEM based machine design. Introduction to **c**omplex structures of modern machines - PMSMs, BLDCs, SRM and claw-pole machines.

Text / References:

1. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.
3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
4. K. L. Narang, "A Text Book of Electrical Engineering Drawings", SatyaPrakashan, 1969
5. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book" , New Age International, 1979.
6. K. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
7. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

Course Outcomes:

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

1. Understand the construction and performance characteristics of electrical machines.
2. Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
3. Understand the principles of electrical machine design and carry out a basic design of an ac machine.
4. Use software tools to do design calculations.

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BTECH EEE Semester-VII

Course Code	**PECEEE702**
Course Title	**Utilization of Electrical Power**
Credits	**3(L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the application of electrical power in welding illumination, Traction etc.

To know the basics of PLC

MODULE – I

Electric Traction: Introduction, Requirements of Ideal Traction System Supply system for electric traction, Train movement Energy consumption. Co-efficient of adhesion, The traction motors starting, Breaking of Traction motors.

Speed Control of Traction Motor: Semiconductor converter controlled drives of Traction Motor, Chopper controlled DC traction motor drives. PWM Voltage source inverter (VSI) Induction motor drives, Load commutated inverter fed synchronous motor drivers, CSI squirrel Cage IM drive, PWM VSI Squirrel cage IM drive. Drives of Diesel Electric Traction Motors: Diesel Engine driven D.C Generator Feeding dc series motors. Diesel Engine driven three-phase alternator supplying dc motors.

MODULE – II

Heating & Welding: Introduction, Different methods of heating, Temperature control of resistance furnace, Induction heating, Dielectric heating, Electric welding, Different welding methods, current control of welding transformer, Ultrasonic and laser welding.

Illumination: Introduction, Nature of radiations, Definitions. Polar curve, Laws of Illumination, Luminous Efficacy, Source of light, Incandescent, Vapour, Flourescent Lighting calculations, Flood lighting, Street lighting.

MODULE – III

PLC: Introduction, Ladder diagram fundamentals of PLC: Introduction, Basic components and their symbol, Fundamentals of ladder diagram. PLC configurations. System Block Diagram, Update-solve the ladder Network

MODULE –I V

Fundamental PLC Programming: Physical components Vs. Programme components, Internal Relays, Disagreement circuit. Ladder programme, Execution sequence, Flip-Flop circuits, Mnemonic programming code: AND ladder rung, Entering normally closed contracts, OR ladder rung, Simple branches, Complex branches.

Text Books:

1. Generation, Distribution and Utilisation of Electric Power C.L. Wadhwa, Wiley - 1993.
2. Electrical Design and Estimating and costing - K.B.Raina and S.K.Bhattacyarya, Wiley Delhi - 1993.
3. Fundamentals of Electrical Drives , G.K.Dubey , Narosa publication,New Delhi

Reference Books:

1. Utilization of Electric Power, N.V. Suryanarayana, Wiley - 1994.
2. Utilization of Electric Power - Taylor.

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

- Analyze various types of traction systems
- Explain the principles of electric welding
- Explain the principles of PLC Programming
- Explain the fundamentals of illumination engineering

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VII

PECEEE702	**PECEEE702**
Course Title	**Line-Commutated and Active PWM Rectifiers**
Credits	**3(L: 3, T:0 P: 0)**

Course Objectives:

1. To introduce basics of Line commutated and active PWM rectifiers
2. To know the principle of various converters.

Module 1: Diode rectifiers with passive filtering (6 Hours)

Half-wave diode rectifier with RL and RC loads; 1-phase full-wave diode rectifier with L, C and LC filter; 3-phase diode rectifier with L, C and LC filter; continuous and discontinuous conduction, input current waveshape, effect of source inductance; commutation overlap.

Module 2: Thyristor rectifiers with passive filtering (6 Hours)

Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current waveshape.

Module 3: Multi-Pulse converter (6 Lectures)

Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6- pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

Module 4: Single-phase ac-dc single-switch boost converter (6 Hours)

Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.

Module 5: Ac-dc bidirectional boost converter (6 Hours)

Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure

Module 6: Isolated single-phase ac-dc flyback converter (10 Hours)

Dc-dc flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

Course Outcomes:

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

- Analyze controlled rectifier circuits.
- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.
- Understand the operation of PWM rectifiers – operation in rectification and regeneration modes and lagging, leading and unity power factor mode.

Text / References:

1. G. De, "Principles of Thyristorised Converters", Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, "Principles of Power Electronics", Addison- Wesley, 1991.
3. L. Umanand, " Power Electronics: Essentials and Applications", Wiley India, 2009.
4. N. Mohan and T. M. Undeland, " Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
5. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2001.

R.K.D.F. UNIVERSITY, RANCHI

BTECH EEE Semester-VII

Course Code	**OECEEE701**
Course Title	**Artificial Intelligence**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

- To understand the basic principles techniques and applications of AI
- To know various search algorithms and probabilistic reasoning
- To know basics of NLP and Robotics

Module I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem. Intelligent Agents: Agents & Environment, Nature Of Environment, Structure Of Agents, Goal Based Agents, Utility Based Agents, Learning Agents. Problem Solving: Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs.

Module II

Search Techniques: Solving Problems By Searching, Problem Solving Agents, Searching For Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies. Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems. Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Mini Max Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening.

Module III

Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation. Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction. Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward

Reasoning, Matching, Control Knowledge.

Module IV

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory. Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning. Learning: Forms of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning.

Module V

Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing. Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains.

Course outcomes: students will be able to

1. Know basics of search algorithms
2. To develop LISP
3. Will understand probabilistic based reasoning.

Text Books:

1. Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3rd edition, Pearson Education.
2. Rich E. & Knight K., Artificial Intelligence, 3rd edition, TMH, New Delhi.

Reference books:

1. Patterson Dan W., Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.
2. Rolston D.W., Principles of AI & Expert System Development, TMH, New Delhi.

R.K.D.F. UNIVERSITY, RANCHI

BTECH Semester-VII

Course Code	**OECEEE701**
Course Title	**AUTO CAD**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives: The objective of this lab is to teach the student usage of Auto cad and basic drawing fundamentals in various civil engineering applications, specially in building drawing.

Theory

Introduction

Principle of drafting, Terminology, & fundamentals. Size & shape descriptions. Geometric Construction.

Views

Plan views, Auxiliary views, Section Views.

Projection , Method of Projection. Multi-view Orthographic Projection. Projection Techniques.

CADD

Introduction of CADD (Computer Aided Drafting & Designing). Function keys, Shortcut keys, Different sizes of paper. Application of CADD – Automatic Drafting , Geometric Modeling Geometric Modeling – Wire frame Modeling, Surface Modeling, and Solid Modeling. CADD Application & it's feature Introduction to Standard based 2D drafting (Based on International standard for representation & conformation)

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

1. Use the Autocad commands for drawing 2D & 3D building drawings required for different
2. civil engg applications.
3. Plan and draw Civil Engineering Buildings as per aspect and orientation.
4. 3.Presenting drawings as per user requirements and preparation of technical report

Practical Competencies

- Practice on Drawing basics
- Geometrical Drawing Practice
- Making plan of Projection.
- Creation Multi-view Orthographic projection.
- Drafting views in First angle & Third angle Projection.

- Creating Auxiliary views & Sections.
- Freehand Sketching.
- Representing Standard base 2D drafting.
- Drawing Elementary CADD command – Line, Polyline, Polygon, Circle, Polyline, arc, ellipse, Text Single Text, Multi text, D text.
- Modifying Elementary Commands – Erase, Move, Copy , Mirror, Offset, Scale, Stretch, Chamfer, fillet & explode.
- Making layers, line type &Lineweight.
- Different menus of Auto-Cad, Function keys, Shortcut keys, Paper size.
- Making Title Block, Writing it & inserting it in any drawing file with scale, angle & explode options.
- Creating a new template file (.Dwt file) & applying it to every drawing file.
- Drafting of building plan , Elevation , Section Views.

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BTECH Semester-VII

Course Code	**OECEEE701**
Course Title	**Refrigeration & Air Conditioning**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the concept of refrigeration
2. To acquire knowledge of methods of refrigeration
3. To acquire knowledge of Air refrigeration system
4. To acquire knowledge of vapour compression and vapour absorption refrigeration system.
5. To acquire knowledge of refrigerants

Module-I

Introduction: Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule's cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.

Module-II

Vapour compression system: Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi-pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquefaction system,

Module-III

Vapour absorption system: Theoretical and practical systems such as aqua-ammonia, Electrolux & other systems; Steam jet refrigeration: Principles and working, simple cycle of operation, description and working of simple system, refrigerants: nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties

Module-IV

Psychrometric: Calculation of psychrometric properties of air by table and charts; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body,

Module-V

Air conditioning loads: calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems.

Course Outcomes:

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

A. Describe the concept of refrigeration and its unit.

B. Describe different methods of refrigeration.

C. Explain air refrigeration cycle and its application in air craft.

D. Explain vapour compression refrigeration system

E. Explain vapour absorption refrigeration system

F. Explain properties of refrigerants

References:

1. Arora CP; Refrigeration and Air Conditioning; MH

2. Sapali SN; Refrigeration and Air Conditioning; PHI

3. Ananthanarayan; Basic Refrigeration and Air conditioning; TMH

4. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub

5. Ameen; Refrigeration and Air Conditioning; PHI

6. Pita ; Air conditioning Principles and systems: an energy approach; PHI

7. Stoecker W.F, Jones J; Refrigeration and Air conditioning; McGH, Singapore

R.K.D.F. UNIVERSITY, RANCHI

BTECH Semester-VII

Course Code	**OECEEE701**
Course Title	**Power plant engineering**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objective:

1. To introduce students to different aspects of power plant engineering.
2. To familiarize the students to the working of power plants based on different fuels
3. To expose the students to the principles of safety and environmental issues.

Module-I

Introduction Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant Power plant economics and selection Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

Module-II

Steam power plant General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

Module-III

Diesel power plant General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

Gas turbine power plant Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

Module-IV

Nuclear power plant Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants. Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems. Non Conventional Power Plants Introduction to non-conventional power plants (Solar, wind, geothermal, tidal) etc.

Module-V

Electrical system Generators and generator cooling, transformers and their cooling, bus bar, etc. Instrumentation Purpose, classification, selection and application, recorders and their use, listing of various control rooms. Pollution due to power generation.

Course Outcomes:

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

1. Describe and analyze different types of sources and mathematical expressions related to thermodynamics and various terms and factors involved with power plant operation.
2. Analyze the working and layout of steam power plants and the different systems comprising the
3. plant and discuss about its economic and safety impacts
4. Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types.

References

1. “Power Plant Engineering” F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras.
2. Power Plant Engineering” Mahesh Verma, Metropolitan Book Company Pvt. Ltd. New Delhi
3. “Power Plant Technology” El-Vakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.

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BTECH Semester-VII

Course Code	**PROJEEE701**
Course Title	**PROJECT-I**
Credits	**3 (L: , T:0 P: 6)**

SOP:

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the college. Participation in any technical event/ competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.

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BTECH Semester-VII

Course Code	**PCCEEE751**
Course Title	**Switch gear and protection lab**
Credits	**1 (L: T:0 P: 2)**

Course Objectives:

1. To understand working of relay circuit breaker etc.
2. To analyze fault in power systems.

List of experiments (expandable)

1. To verify the working of electromagnetic Relay
2. To verify the working of MCB
3. To verify the working of Circuit breaker
4. Fault analysis
5. Protective relays

Course outcomes:

1. To understand working of relay and MCB experimentally
2. To analyze various faults in power systems.

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BTECH Semester-VII

Course Code	**HSMC701**
Course Title	**Industrial Psychology**
Credits	**3 (L: 3, T:0 P: 0)**

Course objectives:

1.To understand the culture of industrial working

2.To understand human behavior in work place

Module-I Introduction: The role of the psychologist in industry, the field of occupational Psychology: Study of behavior in work situation and applications of psychological principles to problems of selection, Placement, Counselling and training

Module-II Design of Work Environments: Human engineering and physical environment techniques of job analysis, social environment: Group dynamics in Industry Personal psychology, Selection, training, placement, promotion, counselling, job motivations, job satisfaction. Special study of problem of fatigue, boredom and accidents

Module-III Understanding Consumer Behavior: Consumer behavior, study of consumer preference, effects of advertising, Industrial morale: The nature and scope of engineering psychology, its application to industry

Module-IV Work Methods: Efficiency at work, the concept of efficiency, the work curve, its characteristics, the work methods; hours of work, nature of work, fatigue and boredom, rest pauses. The personal factors; age abilities, interest, job satisfaction, the working environment, noise, illumination, atmospheric conditions, increasing efficiency at work; improving the work methods, Time and motion study, its contribution and failure resistance to time and motion studies, need for allowances in time and motion study.

Module-V Work and Equipment Design: Criteria in evaluation of job-related factor, job design, human factors, Engineering information, input processes, mediation processes, action processes, methods design, work space and its arrangement, human factors in job design. Accident and Safety: The human and economic costs of accidents, accident record and statistics, the causes of accidents situational and individual factors related to accident reduction.

Course outcomes:

Students will be able to:

1. Engage in ethical and lawful decision making and problem-solving about people at work
2. Acquire the necessary interpersonal behavioral and technical skill for workplace

Suggested readings:

1. Tiffin, J and McCormic E.J., Industrial Psychology, Prentice Hall, 6th Edn., 1975.
2. McCormic E.J., Human Factors Engineering and Design, McGraw Hill, 4th Edn.,1976.
3. Mair, N.R.F., Principles of Human relations
4. Gilmer, Industrial Psychology
5. Ghiselli & Brown, Personnel and Industrial Psychology.
6. Myer, Industrial Psychology.
7. Dunnete, M.D., Handbook of Industrial and Organizational Psychology.
8. Blum & Taylor, Industrial Psychology

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BTECH Semester-VII

Course Code	**PCCEEE753**
Course Title	**Electronic design Laboratory**
Credits	**3 (L: 3, T:0 P: 0)**

Course Objectives:

1. To understand the principle of basic electronic components
2. To be able to design electronic circuits on their own
3. Design circuits on FPGA and CPLDS.
4. To make the students able to design circuits on PCB and breadboard

SOP:

Basic concepts on measurements; Noise in electronic systems; Sensors and signal conditioning circuits; Introduction to electronic instrumentation and PC based data acquisition; Electronic system design, Analog system design, Interfacing of analog and digital systems, Embedded systems, Electronic system design employing microcontrollers, CPLDs, and FPGAs, PCB design and layout; System assembly considerations. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application.

Course Outcomes:

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

1. Understand the practical issues related to practical implementation of applications using electronic circuits.
2. Choose appropriate components, software and hardware platforms.
3. Design a Printed Circuit Board, get it made and populate/solder it with components.
4. Work as a team with other students to implement an application.

Text/Reference Books

1. A. S. Sedra and K. C. Smith, " Microelectronic circuits", Oxford UniversityPress, 2007.
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1997.
3. H.W.Ott, "Noise Reduction Techniques in Electronic Systems", Wiley, 1989.
4. W.C. Bosshart, "Printed Circuit Boards: Design and Technology", Tata McGraw Hill, 1983.
5. G.L. Ginsberg, "Printed Circuit Design" , McGraw Hill, 1991

RKDF UNIVERSITY RANCHI

B. TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING COURSE SCHEME 2023-27

Choice Based Credit System Semester-VIII												
SL. No.	**Category**	**Subject Code**	**Subject Name**	**Periods**			**Credits**	**Marks Distribution**				
				L	**T**	**P**		**Internal**	**External**		**Total**	
								Max	**Max**	**Min**	**Max**	**Min**
2	**Project-II**	**PROJINT801**	**Project-II**			**16**	**8**	**30**	**70**	**21**	**100**	**35**

SOP Project-II

This course is aimed to provide more weightage for project work. The project work could be done in the form of a summer project or internship in the industry or even a minor practical project in the college. Participation in any technical event/ competition to fabricate and demonstrate an innovative machine or product could be encouraged under this course.