# BIKANER TECHNICAL UNIVERSITY

# BIKANER

# SYLLABUS

**NOTE:** Adopted Syllabus and Scheme of Rajasthan Technical University, Kota Vide resolution of BOM agenda item No. BOM 1.6 in Meeting held on 07-09-2018

# SYLLABUS
## I Semester
## Common to all branches of UG Engineering & Technology

### 1FY2-01: Engineering Mathematics-I

**Credit: 4** **Max. Marks: 200 (IA:40, ETE:160)**

**3L+1T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Calculus:** Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. | 8 |
| 2 | **Sequences and Series:** Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions. | 6 |
| 3 | **Fourier Series:** Periodic functions, Fourier series, Euler's formula, Change of intervals,Half range sine and cosine series, Parseval's theorem. | 6 |
| 4 | **Multivariable Calculus (Differentiation):** Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence. | 10 |
| 5 | **Multivariable Calculus (Integration):** Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes. | 10 |
| | **TOTAL** | 40 |

## I & II Semester

## Common to all branches of UG Engineering & Technology

### 1FY2-02/ 2FY2-02: Engineering Physics

**Credit: 4** **Max. Marks: 200 (IA:40, ETE:160)**

**3L+1T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Wave Optics:** Newton's Rings, Michelson's Interferometer, Fraunhofer Diffraction from a Single Slit. Diffraction grating: Construction, theory and spectrum, Resolving power and Rayleigh criterion for limit of resolution, Resolving power of diffraction grating, X-Ray diffraction and Bragg's Law. | 9 |
| 2 | **Quantum Mechanics:** Introduction to quantum Mechanics, Wave-particle duality, Matter waves, Wave function and basic postulates, Time dependent and time independent Schrodinger's Wave Equation, Physical interpretation of wave function and its properties, Applications of the Schrodinger's Equation: Particle in one dimensional and three dimensional boxes. | 6 |
| 3 | **Coherence and Optical Fibers:** Spatial and temporal coherence: Coherence length; Coherence time and 'Q' factor for light, Visibility as a measure of Coherence and spectral purity, Optical fiber as optical wave guide, Numerical aperture; Maximum angle of acceptance and applications of optical fiber. | 4 |
| 4 | **Laser:** Einstein's Theory of laser action; Einstein's coefficients; Properties of Laser beam, Amplification of light by population inversion, Components of laser, Construction and working of He-Ne and semiconductor lasers, Applications of Lasers in Science, engineering and medicine. | 6 |
| 5 | **Material Science & Semiconductor Physics:** Bonding in solids: covalent and metallic bonding, Energy bands in solids: Classification of solids as Insulators, Semiconductors and Conductors, Intrinsic and extrinsic semiconductors, Fermi dirac distribution function and Fermi energy, Conductivity in semiconductors, Hall Effect: Theory, Hall Coefficient and applications. | 7 |
| 6 | **Introduction to Electromagnetism:** Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential, Bio-Savart law, Divergence and curl of static magnetic field, Faraday's law, Displacement current and magnetic field arising from time dependent electric field, Maxwell's equations, Flow of energy and Poynting vector. | 8 |
| | **TOTAL** | 40 |

## I & II Semester

## Common to all branches of UG Engineering & Technology

### 1FY2-03/ 2FY2-03: Engineering Chemistry

**Credit: 4** **Max. Marks: 200 (IA:40, ETE:160)**
**3L+1T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Water:**<br>Common impurities, hardness, determination of hardness by complexometric (EDTA method), Degree of hardness, Units of hardness<br>Municipal water supply: Requisite of drinking water, Purification of water; sedimentation, filtration, disinfection, breakpoint chlorination.<br>Boiler troubles: Scale and Sludge formation, Internal treatment methods, Priming and Foaming, Boiler corrosion and Caustic embrittlement<br>Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process.<br>Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process. | 10 |
| 2 | **Organic Fuels:**<br>Solid fuels: Coal, Classification of Coal, Proximate and Ultimate analyses of coal and its significance, Gross and Net Calorific value, Determination of Calorific value of coal by Bomb Calorimeter. Metallurgical coke, Carbonization processes; Otto-Hoffmann by-product oven method.<br>Liquid fuels : Advantages of liquid fuels, Mining, Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number<br>Gaseous fuels; Advantages, manufacturing, composition and Calorific value of coal gas and oil gas, Determination of calorific value of gaseous fuels by Junker's calorimeter<br>Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulongs formula, proximate analysis & ultimate and combustion of fuel. | 10 |
| 3 | **Corrosion and its control:**<br>Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion.<br>Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design. | 3 |
| 4 | **Engineering Materials:**<br>Portland Cement; Definition, Manufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum.<br>Glass: Definition, Manufacturing by tank furnace, significance of annealing, Types and properties of soft glass, hard glass, borosilicate glass, glass wool, safety glass<br>Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. | 10 |

| | | |
|---|---|---|
| | Emulsification and steam emulsion number. | |
| **5** | **Organic reaction mechanism and introduction of drugs:**<br>Organic reaction mechanism: Substitution; SN1, SN2, Elecrophilic aromatic substitution in benzene, free radical halogenations of alkanes, Elimination; elimination in alkyl halides, dehydration of alcohols, Addition: electrophilic and free radical addition in alkenes, nucleophilic addition in aldehyde and ketones, Rearrangement; Carbocation and free radical rearrangements<br>Drugs : Introduction, Synthesis, properties and uses of Aspirin, Paracetamol | **7** |
| | **TOTAL** | **40** |

## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY1-04/ 2FY1-04: Communication Skills

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**
**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Communication:** Meaning, Importance and Cycle of Communication. Media and Types of Communication. Verbal and Non-Verbal Communication. Barriers to communication. Formal and Informal Channels of Communication (Corporate Communication). Divisions of Human Communication and Methods to improve Interpersonal Communication. Qualities of good communication. | 5 |
| 2 | **Grammar:** Passive Voice. Reported Speech. Conditional Sentences. Modal Verbs. Linking Words (Conjunctions) | 5 |
| 3 | **Composition:** Job Application and Curriculum-Vitae Writing. Business Letter Writing. Paragraph Writing. Report Writing. | 5 |
| 4 | **Short Stories:** "Luncheon" by Somerset Maugham."How Much Land Does a Man Need?" by Count Leo Tolstoy. "The Night Train at Deoli" by Ruskin Bond. | 5 |
| 5 | **Poems:** "No Men are Foreign" by James Kirkup. "If" by Rudyard Kipling. "Where the Mind is without Fear" by Rabindranath Tagore. | 5 |
| | **TOTAL** | 25 |

## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY1-05/ 2FY1-05: Human Values

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**
**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**<br>Understanding the need, basic guidelines, Self Exploration - its content and process; 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facilities,Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.<br>Method to fulfill the above human aspirations: understanding and living in harmony at various levels | 5 |
| 2 | **Understanding Harmony in the Human Being - Harmony in Myself**<br>Understanding human being as a co-existence of the sentient 'I' and the material 'Body'<br>Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha<br>Understanding the Body as an instrument of 'I',Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya. | 5 |
| 3 | **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**<br>Understanding harmony in the Family, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) , meaning of Vishwas; Difference between intention and competence, meaning of Samman, Difference between respect and differentiation;<br>the other salient values in relationship, harmony in the society , Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals ,Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha )- from family to world family. | 5 |
| 4 | **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**<br>Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence | 5 |

| | | |
|---|---|---|
| | (Sah-astitva) of mutually interacting units in allpervasive Space. Holistic perception of harmony at all levels of existence | |
| **5** | **Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values** Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers. Case studies related to values in professional life and individual life. | **5** |
| | **TOTAL** | **25** |

### 1FY3-06/ 2FY3-06: Programming for Problem Solving

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**
**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Fundamentals of Computer:** Stored program architecture of computers, Storage device- Primary memory, and Secondary storage, Random, Direct, Sequential access methods, Concepts of High-level, Assembly and Low-level languages, Representing algorithms through flowchart and pseudo code. | **8** |
| 2 | **Number system:** Data representations, Concepts of radix and representation of numbers in radix r with special cases of r=2, 8, 10 and 16 with conversion from radix r1 to r2, r's and (r-1)'s complement, Binary addition, Binary subtraction, Representation of alphabets. | **8** |
| 3 | **C Programming:** Problem specification, flow chart, data types, assignment statements, input output statements, developing simple C programs, If statement, for loops, while loops, do-while loops, switch statement, break statement, continue statement, development of C programs using above statements, Arrays, functions, parameter passing, recursion, Programming in C using these statements, Structures, files, pointers and multi file handling. | **12** |
| | **TOTAL** | **28** |

## I & II Semester

## Common to all branches of UG Engineering & Technology

### 1FY3-07/ 2FY3-07: Basic Mechanical Engineering

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**
**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants. | |
| 2 | **Pumps and IC Engines:** Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components. | |
| 3 | **Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning. | |
| 4 | **Transmission of Power:** Introduction and types of Belt and Rope Drives, Gears. | |
| 5 | **Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering. | |
| 6 | **Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties. | |
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## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY3-08/ 2FY3-08: Basic Electrical Engineering

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**
**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **DC Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Series-Parallel circuits, Node voltage method, Mesh current method, Superposition, Thevenin's, Norton's and Maximum power transfer theorems. | 5 |
| 2 | **AC Circuits:** Representation of sinusoidal waveforms, peak and r.m.s values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections. | 4 |
| 3 | **Transformers:** Ideal and practical transformer, EMF equation, equivalent circuit, losses in transformers, regulation and efficiency. | 4 |
| 4 | **Electrical Machines:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor, single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators. | 7 |
| 5 | **Power Converters:** Semiconductor PN junction diode and transistor (BJT). Characteristics of SCR, power transistor and IGBT. Basic circuits of single phase rectifier with R load, Single phase Inverter, DC-DC converter. | 4 |
| 6 | **Electrical Installations:** Layout of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing. Power measurement, elementary calculations for energy consumption. | 4 |
| | **TOTAL** | **28** |

## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY3-09/ 2FY3-09: Basic Civil Engineering

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**
**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction to objective, scope and outcome the subject** | 1 |
| 2 | **Introduction:**<br>Scope and Specialization of Civil Engineering, Role of civil Engineer in Society, Impact of infrastructural development on economy of country. | 2 |
| 3 | **Surveying:**<br>Object, Principles & Types of Surveying; Site Plans, Plans& Maps; Scales & Unit of different Measurements.<br>Linear Measurements: Instruments used. Linear Measurement by Tape, Ranging out Survey Lines and overcoming Obstructions; Measurements on sloping ground; Tape corrections, conventional symbols.<br>Angular Measurements: Instruments used; Introduction to Compass Surveying,Bearings and Longitude & Latitude of a Line, Introduction to total station.<br>Levelling: Instrument used, Object of levelling, Methods of levelling in brief, Contour maps. | 8 |
| 4 | **Buildings:**<br>Selection of site for Buildings, Layout of Building Plan, Types of buildings, Plinth area, carpet area, floor space index, Introduction to building byelaws, concept of sun light and ventilation. Components of Buildings & their functions, Basic concept of R.C.C., Introduction to types of foundation. | 3 |
| 5 | **Transportation:**<br>Introduction to Transportation Engineering; Traffic and Road Safety: Types and Characteristics of Various Modes of Transportation; Various Road Traffic Signs, Causes of Accidents and Road Safety Measures. | 2 |
| 6 | **Environmental Engineering:**<br>Environmental Pollution, Environmental Acts and Regulations, Functional Concepts of Ecology, Basics of Species, Biodiversity, Ecosystem, Hydrological Cycle;Chemical Cycles: Carbon, Nitrogen& Phosphorus; Energy Flow in Eco-systems.<br>Water Pollution: Water Quality standards, Introduction to Treatment & Disposal of Waste Water. Reuse and Saving of Water, Rain Water Harvesting. | 4<br>3<br>2 |

| | | |
|---|---|---|
| | Solid Waste Management: Classification of Solid Waste, Collection, Transportation and Disposal of Solid. Recycling of Solid Waste: Energy Recovery,Sanitary Land fill, On-Site Sanitation.<br>Air& Noise Pollution: Primary and Secondary air pollutants, Harmful effects of Air Pollution, Control of Air Pollution. . Noise Pollution, Harmful Effects of noise pollution, control of noise pollution, Global warming& Climate Change, Ozone depletion, Green House effect | **3** |
| | **TOTAL** | **28** |

**1FY2-20/ 2FY2-20: Engineering Physics Lab**

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**
**0L+0T+2P**

1. To determine the wave length of monochromatic light with the help of Michelson's interferometer.
2. To determine the wave length of sodium light by Newton's Ring.
3. To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
4. Determination of band gap using a P-N junction diode.
5. To determine the height of given object with the help of sextant.
6. To determine the dispersive power of material of a prism with the help of spectrometer.
7. To study the charge and discharge of a condenser and hence determine the same constant (both current and voltage graphs are to be plotted.
8. To determine the coherence length and coherence time of laser using He – Ne laser.
9. To measure the numerical aperture of an optical fibre.
10. To study the Hall Effect and determine the Hall Voltage and Hall coefficients.

## I & II Semester
## Common to all branches of UG Engineering & Technology

**1FY2-21/ 2FY2-21: Engineering Chemistry Lab**

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**

**0L+0T+2P**

1. Determination the hardness of water by EDTA method
2. Determination of residual chlorine in water
3. Determination of dissolved oxygen in water
4. Determination of the strength of Ferrous Ammonium sulphate solution with the help of $K_2Cr_2O_7$ solution by using diphenyl amine indicator
5. Determination of the strength of $CuSO_4$ solution iodometrically by using hypo solution
6. Determination of the strength of NaOH and $Na_2CO_3$ in a given alkali mixture
7. Proximate analysis of Coal
8. Determination of the flash & fire point and cloud & pour point of lubricating oil
9. Determination of the kinematic viscosity of lubricating oil by Redwood viscometer no. 1 at different temperature
10. Synthesis of Aspirin/ Paracetamol

## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY2-22/ 2FY2-22: Language Lab

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**
**0L+0T+2P**

1. Phonetic Symbols and Transcriptions.
2. Extempore.
3. Group Discussion.
4. Dialogue Writing.
5. Listening comprehension.

## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY2-23/ 2FY2-23: Human Values Activities

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**
**0L+0T+2P**

**PS 1:**
Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your salient achievements and shortcomings in your life? Observe and analyze them.

**PS 2:**
Now-a-days, there is a lot of talk about many technogenic maladies such as energy and material resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be manmade problems, threatening the survival of life Earth - What is the root cause of these maladies & what is the way out in opinion?
On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression & suicidal attempts etc. - what do you think, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

**PS 3:**
1. Observe that each of us has the faculty of 'Natural Acceptance', based on which one can verify what is right or not right for him. (As such we are not properly trained to listen to our 'Natural Acceptance' and may a time it is also clouded by our strong per-conditioning and sensory attractions).

Explore the following:
(i) What is Naturally Acceptable' to you in relationship the feeling of respect or disrespect for yourself and for others?
(ii) What is 'naturally Acceptable' to you - to nurture or to exploit others?

Is your living in accordance with your natural acceptance or different from it?
2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities - observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

**PS 4:**
list down all your important desires. Observe whether the desire is related to Self (I) or the Body. If it appears to be related to both, visualize which part of it is related to Self (I) and which part is related to Body.

**PS 5:**
1. a. Observe that any physical facility you use, follows the given sequence with time:

Necessary and tasteful - unnecessary but still tasteful - unnecessary and tasteless - intolerable

b. In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If not acceptable, you want it continuously and if not acceptable, you do not want it any moment!

2. List down all your important activities. Observe whether the activity is of 'I' or of

Body or with the participation of both or with the participation of both 'I' and Body.
3. Observe the activities within 'i'. Identify the object of your attention for different moments (over a period of sy 5 to 10 minutes) and draw a line diagram connecting these points. Try observe the link between any two nodes.

**PS 6:**

1. Chalk out some programs towards ensuring your harmony with the body - in terms of nurturing, protection and right utilization of the body.
2. Find out the plants and shrubs growing in and around your campus, which can be useful in curing common diseases.

**PS 7:**

Form small groups in the class and make them carry out a dialogue focusing on the following eight questions related to 'TRUST';
1a. Do I want to make myself happy?
2a. Do I want to make the other happy?
3a. Does the other want to make himself/herself happy?
4a. Does the other want to make me happy?
What is the answer?
Intention (Natural Acceptance)
1b. Am I able to always make myself happy?
2b. Am I able to always make the other happy?
3b. Is the other able to always make himself/herself happy?
What is the answer?
Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate yourself and others on the basis of intention/competence.

**PS 8:**

1. Observe, on how many occasions, you are able to respect your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
2. Also, observe whether your feeling of respect is based on treating the other as you would treat yourself or on differentiations based on body, physical facilities or belieds.

**PS 9:**

1. Write a narration in the form of a story, poem, skit or essay to clarify a salient Human Value to the children.
2. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to balues in a difficult situation.

**PS 10:**

List down some common units (things) of Nature which you come across in your daily life and classify them in the four orders of Nature. Analysis and explain the aspect of mutual fulfillment of each unit with other orders.

**PS 11:**

Make a chart to show the whole existence as co-existence. With the help of this chart try to identify the role and the scope of some of the courses of your study. Also indicate the areas which are being either over-emphasized or ignored in the present context.

**PS 12:**

Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basic of natural acceptance of human values. If so, how should one proceed in this direction from

the present situation?

**PS 13:**

1. Suggest ways in which you can use your knowledge of Science/Technology/Management etc. for moving towards a universal human order.
2. Propose a broad outline for humanistic Constitution at the level of Nation.

**PS 14:**

The course is going to be over now. It is time to evaluate what difference in your thinking it has made. Summarize the core massage of this course grasped by you. How has this affected you in terms of;

a. Thought
b. Behavior
c. Work and
d. Relization

What practical steps are you able to visualize for the transition of the society from its present state.

**Project:**

**Every student required to take-up a social project e.g. educating children in needy/weaker section, services in hospitals, NGO's and other such work i.e. social work at villages adopted by respective institute/ college.**

## I & II Semester
## Common to all branches of UG Engineering & Technology

### 1FY3-24/ 2FY3-24: Computer Programming Lab

**Credit: 1.5** **Max. Marks: 75 (IA:45, ETE:30)**
**0L+0T+3P**

1. To learn about the C Library, Preprocessor directive, Input-output statement.
2. Programs to learn data type, variables, If-else statement
3. Programs to understand nested if-else statement and switch statement
4. Programs to learn iterative statements like while and do-while loops
5. Programs to understand for loops for iterative statements
6. Programs to learn about array and string operations
7. Programs to understand sorting and searching using array
8. Programs to learn functions and recursive functions
9. Programs to understand Structure and Union operation
10. Programs to learn Pointer operations
11. Programs to understand File handling operations
12. Programs to input data through Command line argument

## I & II Semester

## Common to all branches of UG Engineering & Technology

### 1FY3-25/ 2FY3-25: Manufacturing Practices Workshop

**Credit: 1.5** **Max. Marks: 75 (IA:45, ETE:30)**
**0L+0T+3P**

**Carpentry Shop**

1. T – Lap joint
2. Bridle joint

**Foundry Shop**

3. Mould of any pattern
4. Casting of any simple pattern

**Welding Shop**

5. Lap joint by gas welding
6. Butt joint by arc welding
7. Lap joint by arc welding
8. Demonstration of brazing, soldering & gas cutting

**Machine Shop Practice**

9. Job on lathe with one step turning and chamfering operations

**Fitting and Sheet Metal Shop**

10. Finishing of two sides of a square piece by filing
11. Making mechanical joint and soldering of joint on sheet metal
12. To cut a square notch using hacksaw and to drill a hole and tapping

### 1FY3-26/ 2FY3-26: Basic Electrical Engineering Lab

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**
**0L+0T+2P**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Transformers: Observation of the no-load current waveform on an oscilloscope. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
3. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).Phase-shifts between the primary and secondary side.
4. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
5. Torque Speed Characteristic of separately excited dc motor.
6. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

### 1FY3-27/ 2FY3-27: Basic Civil Engineering Lab

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**
**0L+0T+2P**

1. Linear Measurement by Tape:
   a) Ranging and Fixing of Survey Station along straight line and across obstacles.
   b) Laying perpendicular offset along the survey line
2. Compass Survey: Measurement of bearing of linesusing Surveyor's and Prismatic compass
3. Levelling: Using Tilting/ Dumpy/ Automatic Level
   a) To determine the reduced levels in closed circuit.
   b) To carry out profile levelling and plot longitudinal and cross sections for road by Height of Instrument and Rise & Fall Method.
4. To study and take measurements using various electronic surveying instruments like EDM, Total Station etc.
5. To determine pH, hardness and turbidity of the given sample of water.
6. To study various water supply Fittings.
7. To determine the pH and total solids of the given sample of sewage.
8. To study various Sanitary Fittings.

### 1FY3-28/ 2FY3-28: Computer Aided Engineering Graphics

**Credit: 1.5** **Max. Marks: 75 (IA:45, ETE:30)**
**0L+0T+3P**

**Introduction:** Principles of drawing, lines, type of lines, usage of Drawing instruments, lettering, Conic sections including parabola, hyperbola, Rectangular Hyperbola (General method only); Scales-Plain, Diagonal and Vernier Scales.

**Projections of Point & Lines:** Position of Point, Notation System, Systematic Approach for projections of points, front view & Top view of point, Position of straight lines, line parallel to Both the RPs, Line perpendicular to either of the RPs, Line inclined to one RP and parallel to the other, Line inclined to Both the RPs, Traces of a line (One drawing sheet, one assignment in sketch book).

**Projection of Planes:** Positions of planes, Terms used in projections of planes, plane parallel to RP, plane inclined to one RP and perpendicular to the other RP, plane perpendicular to Both the RPs, plane Inclined to Both the RPs, True shape of the plane, Distance of a point from plane, Angle between two planes.

**Projections of Regular Solids:** frustum and truncated solids, those inclined to both the Planes-Auxiliary Views.

**Section of Solids:** Theory of sectioning, section of prisms and cubes, section of pyramids and Tetrahedron section of Cylinders, section of cones, section of spheres (One drawing sheet, one assignment in sketch book)

**Overview of Computer Graphics :** Covering theory of CAD software [such as: The menu System, Toolbars (standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of lines, Planes, Simple and compound Solids.

### 1FY3-29/ 2FY3-29: Computer Aided Machine Drawing

**Credit: 1.5** **Max. Marks: 75 (IA:45, ETE:30)**
**0L+0T+3P**

**Introduction:** Principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, rules of dimensioning.

**Conversion of pictorial views into orthographic views:** (1 drawing sheet) Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing view problems covering Principles of Orthographic Projections.

**Sectional views of mechanical components:** (1 drawing sheet) Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web rib, shaft, pipes, different types of holes, conventions of section lines for different metals and materials.

**Fasteners and other mechanical components:** (Free hand sketch) Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints. Riveted joints, rivets and riveting, type of rivets, types of riveted joints etc. Bearing: Ball, roller, needle, foot step bearing. Coupling: Protected type, flange, and pin type flexible coupling. Other components: Welded joints, belts and pulleys, pipes and pipe joints, valves etc.

**Overview of Computer Graphics:** (2 drawing sheets) Covering theory of CAD software such as: The menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line (Where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.: Isometric Views of Lines, Planes, Simple and compound Solids.

## II Semester

## Common to all branches of UG Engineering & Technology

### 2FY2-01: Engineering Mathematics-II

**Credit: 4** **Max. Marks: 200 (IA:40, ETE:160)**

**3L+1T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Matrices:** Rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation. | 10 |
| 2 | **First order ordinary differential equations:** Linear and Bernoulli's equations, Exact equations, Equations not of first degree: equations solvable for $p$, equations solvable for $y$, equations solvable for $x$ and Clairaut's type. | 6 |
| 3 | **Ordinary differential equations of higher orders:** Linear Differential Equations of Higher order with constant coefficients, Simultaneous Linear Differential Equations, Second order linear differential equations with variable coefficients: Homogenous and Exact forms, one part of CF is known, Change of dependent and independent variables, method of variation of parameters, Cauchy-Euler equation; Power series solutions including Legendre differential equation and Bessel differential equations. | 12 |
| 4 | **Partial Differential Equations – First order:** Order and Degree, Formation; Linear Partial differential equations of First order, Lagrange's Form, Non Linear Partial Differential equations of first order, Charpit's method, Standard forms. | 6 |
| 5 | **Partial Differential Equations– Higher order:** Classification of Second order partial differential equations, Separation of variables method to simple problems in Cartesian coordinates including two dimensional Laplace, one dimensional Heat and one dimensional Wave equations. | 6 |
| | **TOTAL** | **40** |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

## 3EE2-01: Advance Mathematics

**Credit: 3** **Max. Marks: 150 (IA:30, ETE:120)**

**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Numerical Methods:**<br>Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Gauss's forward and backward interpolation formulae. Stirling's Formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange'sformulae.<br>Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.<br>Solution of polynomial and transcendental equations-Bisection method, Newton-Raphson method and Regula-Falsi method. | **14** |
| 2 | **Transform Calculus:**<br>Laplace Transform: Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem.<br>Fourier Transform: Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem.<br>Z-Transform: Definition, properties and formulae, Convolution theorem, inverse Z-transform, application of Z-transform to difference equation. | **20** |
| 3 | **Complex Variable:**<br>Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties. | **06** |
| | **TOTAL** | **40** |

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

**3EE1-02/4EE1-02: Technical Communication**

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication. | 4 |
| 2 | **Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media. | 6 |
| 3 | **Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings. | 8 |
| 4 | **Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles. | 8 |
| | **TOTAL** | 26 |

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

## 3EE1-03/4EE1-03: Managerial Economics and Financial Accounting

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1. | **Basic economic concepts** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement. | 4 |
| 2. | **Demand and Supply analysis** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply. | 5 |
| 3. | **Production and Cost analysis** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation. | 5 |
| 4. | **Market structure and pricing theory** Perfect competition, Monopoly, Monopolistic competition, Oligopoly. | 4 |
| 5. | **Financial statement analysis** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques. | 8 |
| | **TOTAL** | **26** |

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

**3EE3-04: Power Generation Processes**

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1. | **Conventional Energy Generation Methods**<br>Thermal Power plants: Basic schemes and working principle. (ii) Gas Power Plants: open cycle and closed cycle gas turbine plants, combined gas & steam plants-basic schemes.<br>Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. (iv) Nuclear Power Plants: Nuclear fission and nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants. | 6 |
| 3. | **New Energy Sources**<br>Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming).Renewable and nonrenewable energy sources.<br>Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal. | 6 |
| 4. | **Loads and Load Curves**<br>Types of load, chronological load curve, load duration curve, energy load curve and mass curve. Maximum demand, demand factor, load factor, diversity factor, capacity factor and utilization. | 2 |
| 5. | **Power Factor Improvement**<br>Causes and effects of low power factor and advantages of power factor improvement. Power factor improvement using shunt capacitors and synchronous condensers. | 3 |
| 6. | **Power Plant Economics**<br>Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics.<br>Calculation of most economic power factor when (a) kW demand is constant and (b) kVA demand is constant. (iii) Energy cost reduction: off peak energy utilization, co-generation, and energy conservation. | 5 |
| 7. | **Tariff**<br>Objectives of tariffs. General tariff form. Flat demand rate, straight meter rate, block meter rate. Two part tariff, power factor dependent tariffs, three part tariff. Spot (time differentiated) pricing. | 3 |

| | | |
|---|---|---|
| **8.** | **Selection of Power Plants**<br>Comparative study of thermal, hydro, nuclear and gas power plants. Base load and peak load plants. Size and types of generating units, types of reserve and size of plant. Selection and location of power plants. | **4** |
| | **Total** | **28** |

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## 3EE4-05 Electrical Circuit Analysis

**Credit: 3** **Max. Marks: 150 (IA:30, ETE:120)**
**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1. | **Network Theorems**<br>Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks. | 10 |
| 2. | **Solution of First and Second order networks**<br>Solution of first and second order differential equations for Series and parallel R-L, R-C, RL- C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response. | 8 |
| 3. | **Sinusoidal steady state analysis**<br>Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer. | 8 |
| 4. | **Electrical Circuit Analysis Using Laplace Transforms**<br>Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances | 8 |
| 5. | **Two Port Network and Network Functions**<br>Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks. | 6 |
| | **TOTAL** | **40** |

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

**3EE4-06: Analog Electronics**

**Credit: 3** **Max. Marks: 150 (IA:30, ETE:120)**

**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | | Hours |
|---|---|---|
| 1. | **Diode circuits**<br>P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits. | 4 |
| 2. | **BJT circuits**<br>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. | 8 |
| 3. | **MOSFET circuits**<br>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, transconductance, high frequency equivalent circuit. | 8 |
| 4. | **Differential, multi-stage and operational amplifiers**<br>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) | 8 |
| 5. | **Linear applications of op-amp**<br>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).<br>Analog to Digital Conversion. | 8 |
| 6. | **Nonlinear applications of op-amp**<br>Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators, Precision rectifier, peak detector. Monoshot | 6 |
| | **TOTAL** | 42 |

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

**3EE4-07: Electrical Machine-I**

**Credit: 3** **Max. Marks: 150 (IA:30, ETE:120)**

**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1. | **Magnetic fields and magnetic circuits**<br>Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines. | 6 |
| 2. | **Electromagnetic force and torque**<br>B-H curve of magnetic materials; flux-linkage v/s current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency | 9 |
| 3. | **DC machines**<br>Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction. | 8 |
| 4. | **DC machine - motoring and generation**<br>Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines. | 7 |

| | | |
|---|---|---|
| **5.** | **Transformers**<br>Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phase. transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current,Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers. | **12** |
| | **TOTAL** | **42** |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - III Semester: B.Tech. (Electrical Engineering)**

**3EE4-08: Electromagnetic Fields**

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1. | **Review of Vector Calculus**<br>Vector algebra- addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation, partial differentiation, integration, vector operatordel, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another. | 4 |
| 2. | **Static Electric Field**<br>Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density. | 4 |
| 3. | **Conductors, Dielectrics and Capacitance**<br>Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations. | 4 |
| 4. | **Static Magnetic Fields**<br>Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. | 4 |
| 5. | **Magnetic Forces, Materials and Inductance**<br>Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances. | 4 |
| 6. | **Time Varying Fields and Maxwell's Equations**<br>Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces. Boundary Conditions. | 4 |
| 7. | **Electromagnetic Waves**<br>Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect. Poynting theorem. | 4 |
| | **TOTAL** | **28** |

## 3EE4-21: Analog Electronics Lab

**Credit: 1** **Max. Marks: 50 (IA:30, ETE:20)**
**0L+0T+2P**

1) Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1 kHz with and without negative feedback.
2) Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3) Plot and study the characteristics of small signal amplifier using FET.
4) Study of push pull amplifier. Measure variation of output power & distortion with load.
5) Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency.
6) Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7) Study the following oscillators and observe the effect of variation of C on oscillator frequency:
   (a) Hartley (b) Colpitts.
8) To plot the characteristics of UJT and UJT as relaxation.

## 3EE4-22: Electrical Machines-I Lab

**Credit: 2** **Max. Marks: 100 (IA:60, ETE:40)**
**0L+0T+4P**

1) To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.
2) To perform sumpner's test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.
3) To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.
4) To perform the heat run test on a delta/delta connected 3-phase transformer and determine the parameters for its equivalent circuit.
5) To perform the parallel operation of the transformer to obtain data to study the load sharing.
6) Separation of no load losses in single phase transformer.
7) To study conversion of three-phase supply to two-phase supply using Scott-Connection.
8) Speed control of D.C. shunt motor by field current control method & plot the curve for speed verses field current.
9) Speed control of D.C. shunt motor by armature voltage control method & plot the curve for speed verses armature voltage.
10) To determine the efficiency at full load of a D.C shunt machine considering it as a motor by performing Swinburne's test.
11) To perform Hopkinson's test on two similar DC shunt machines and hence obtain their efficiencies at various loads.

## 3EE4-23: Electrical Circuit Design Lab

**Credit: 2** **Max. Marks: 100 (IA:60, ETE:40)**
**0L+0T+4P**

1) Introduction to Datasheet Reading.
2) Introduction to Soldering - Desoldering process and tools.
3) Simulate characteristic of BJT and UJT. Validate on Bread Board or PCB.
4) Simulate Bridge Rectifier Circuit and validate on Bread Board or PCB.
   a) Half Bridge.
   b) Full Bridge.
5) Simulate Regulated Power Supply and validate on Bread Board or PCB.
   a) Positive Regulation (03 Volt to 15 Volt).
   b) Negative Regulation (03 Volt to 15 Volt).
   c) 25 Volt, 1–10 A Power Supply.
6) Simulate Multivibrator circuit using IC 555 and BJT separately. Validate on Bread Board or PCB.
   a) Astable Mode.
   b) Bistable Mode.
   c) Monostable Mode.
7) Introduction to Sensors to measure real time quantities and their implementation in different processes.
   (Proximity, Accelerometer, Pressure, Photo-detector, Ultrasonic Transducer, Smoke, Temperature, IR, Color, Humidity, etc.).
8) Hardware implementation of temperature control circuit using Thermistor.
9) Simulate Frequency divider circuit and validate it on Bread Board or PCB.
10) Hardware implementation of 6/12 V DC Motor Speed Control (Bidirectional)
11) Simulate Buck, Boost, Buck-Boost circuit and validate on Bread Board or PCB.
12) Simulate Battery Voltage Level Indicator Circuit and validate on Bread Board or PCB.

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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

**4EE2-01: Biology**

**Credit: 2** **Max. Marks: 100(IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Introduction:** Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry. | 1 |
| 3 | **Classification:** Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructureprokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion- aminotelic, uricotelic, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus | 3 |
| 4 | **Genetics:** Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences". Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics. | 3 |
| 5 | **Biomolecules:** Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine. Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids. | 3 |

| | | |
|---|---|---|
| **6** | **Enzymes:** Purpose: To convey that without catalysis life would not have existed on earth. Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic | **3** |
| **7** | **Information Transfer:** Purpose: The molecular basis of coding and decoding genetic information is universal. Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination. | **3** |
| **8** | **Macromolecular analysis:** Purpose: To analyse biological processes at the reductionistic level. Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements. | **4** |
| **9** | **Metabolism:** Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge. | **4** |
| **10** | **Microbiology:** Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics. | **3** |
| | **Total** | **28** |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

## 4EE1-03/3EE1-03: Managerial Economics and Financial Accounting

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Basic economic concepts**<br>Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement. | 3 |
| 3 | **Demand and Supply analysis**<br>Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply. | 5 |
| 4 | **Production and Cost analysis**<br>Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation. | 5 |
| 5 | **Market structure and pricing theory**<br>Perfect competition, Monopoly, Monopolistic competition, Oligopoly. | 4 |
| 6 | **Financial statement analysis**<br>Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques. | 8 |
| | **TOTAL** | 26 |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

## 4EE1-02/3EE1-02: Technical Communication

**Credit: 2** **Max. Marks: 100 (IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication. | 3 |
| 3 | **Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media. | 6 |
| 4 | **Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings. | 8 |
| 5 | **Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles. | 8 |
| | **TOTAL** | 26 |

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Rajasthan Technical University, Kota

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

**4EE3-04: Electronic Measurement and Instrumentation**

**Credit: 2** **Max. Marks: 100(IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Measuring Instruments:** Moving coil, moving iron, electrodynamic and induction instruments-construction, operation, torque equation and errors. Applications of instruments for measurement of current, voltage, single-phase power and single-phase energy. Errors in wattmeter and energy meter and their compensation and adjustment. Testing and calibration of single-phase energy meter by phantom loading. | 4 |
| 3 | **Polyphase Metering:** Blondel's Theorem for n-phase, p-wire system. Measurement of power and reactive kVA in 3-phase balanced and unbalanced systems: One-wattmeter, two- wattmeter and three-wattmeter methods. 3-phase induction type energy meter. Instrument Transformers: Construction and operation of current and potential transformers.<br>Ratio and phase angle errors and their minimization. Effect of variation of power factor, secondary burden and frequency on errors. Testing of CTs and PTs. Applications of CTs and PTs for the measurement of current, voltage, power and energy. | 6 |
| 5 | **Potentiometers:** Construction, operation and standardization of DC potentiometers– slide wire and Crompton potentiometers. Use of potentiometer for measurement of resistance and voltmeter and ammeter calibrations. Volt ratio boxes. Construction, operation and standardization of AC potentiometer in-phase and quadrature potentiometers. Applications of AC potentiometers. | 5 |
| 6 | **Measurement of Resistances:** Classification of resistance. Measurement of medium resistances – ammeter and voltmeter method, substitution method, Wheatstone bridge method.<br>Measurement of low resistances – Potentiometer method and Kelvin's double bridge method. Measurement of high resistance: Price's Guard-wire method. Measurement of earth resistance. | 6 |
| 7 | **AC Bridges:** Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge and Anderson bridge for self-inductance measurement. Heaviside's bridge for mutual inductance measurement. De Sauty Bridge for capacitance measurement. Wien's bridge for capacitance and frequency measurements. Sources of error in bridge measurements and precautions. Screening of bridge components. Wagner earth device. | 6 |
| | **Total** | 28 |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

**4EE4-05: Electrical Machines – II**

**Credit: 3** **Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Fundamentals of AC machine windings**<br>Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor. | 7 |
| 3 | **Pulsating and revolving magnetic fields**<br>Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field. | 4 |
| 4 | **Induction Machines**<br>Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines. | 12 |
| 5 | **Single-phase induction motors**<br>Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications. | 6 |
| 6 | **Synchronous machines**<br>Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine – two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division. | 10 |
| | **Total** | 40 |

**4EE4-06: Power Electronics**

**Credit: 3** **Max. Marks: 150(IA:30, ETE:120)**
**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Power switching devices**<br>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. | 5 |
| 3 | **Thyristor rectifiers**<br>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. | 6 |
| 4 | **DC-DC buck converter**<br>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. | 5 |
| 5 | **DC-DC boost converter**<br>Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage. | 5 |
| 6 | **Single-phase voltage source inverter**<br>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<br>and output voltage. | 10 |
| 7 | **Three-phase voltage source inverter**<br>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. | 8 |
| | **Total** | 40 |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

**4EE4-07: Signals and Systems**

**Credit: 3** **Max. Marks: 150(IA:30, ETE:120)**

**3L+0T+0P** **End Term Exam: 3 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Introduction to Signals and Systems:** Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples. | 6 |
| 3 | **Behavior of continuous and discrete-time LTI systems:** Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations.<br>State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response. | 14 |
| 4 | **Fourier, Laplace and z- Transforms:** Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-<br>Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution<br>to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis. | 12 |
| 5 | **Sampling and Reconstruction:** The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems. | 8 |
| | **Total** | 41 |

# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

**SYLLABUS**

**2nd Year - IV Semester: B.Tech. (Electrical Engineering)**

**4EE4-08: Digital Electronics**

**Credit: 2** **Max. Marks: 100(IA:20, ETE:80)**

**2L+0T+0P** **End Term Exam: 2 Hours**

| SN | CONTENTS | Hours |
|---|---|---|
| 1 | **Introduction:** Objective, scope and outcome of the course. | 1 |
| 2 | **Fundamentals of Digital Systems and logicfamilies:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic. | 4 |
| 3 | **Combinational DigitalCircuits:** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization. | 6 |
| 4 | **Sequential circuits and systems:** A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters. | 6 |
| 5 | **A/D and D/A Converters:** Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs | 4 |
| 6 | **Semiconductor memories and Programmable logic devices** Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA). | 7 |
| | **Total** | 28 |

**4EE4-21: Electrical Machines - II Lab**

**Credit: 2** **Max. Marks: 100(IA:60, ETE:40)**

**0L+0T+4P**

1) To study various types of starters used for 3 phase induction motor.
2) To connect two 3-phase induction motor in cascade and study their speed control.
3) To perform load test on 3-phase induction motor and calculate torque, output power, input power, efficiency, input power factor and slip for various load settings.
4) To perform no load and blocked rotor test on a 3-phase induction motor and determine the parameters of its equivalent circuits.
5) Draw the circle diagram and compute the following (i) Max. Torque (ii) Current (iii) slips (iv) p. f. (v) Efficiency.
6) Speed control of 3- Φ Induction Motor
7) To plot the O.C.C. & S.C.C. of an alternator.
8) To determine Zs , Xd and Xq by slip test, Zero power factor (ZPF)/ Potier reactance method.
9) To determine the voltage regulation of a 3-phase alternator by direct loading.
10) To determine the voltage regulation of a 3-phase alternator by synchronous impedance method.
11) To study effect of variation of field current upon the stator current and power factor of synchronous motor andPlot V-Curve and inverted V-Curve of synchronous motor for different values of loads.
12) To synchronize an alternator across the infinite bus and control load sharing.

## 4EE4-22: Power Electronics Lab

**Credit: 2** **Max. Marks: 100(IA:60, ETE:40)**
**0L+0T+4P**

1) Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.
2) Determine V-I characteristics of SCR and measure forward breakdown voltage, latching and holding currents.
3) Find V-I characteristics of TRIAC and DIAC.
4) Find output characteristics of MOSFET and IGBT.
5) Find transfer characteristics of MOSFET and IGBT.
6) Find UJT static emitter characteristics and study the variation in peak point and valley point.
7) Study and test firing circuits for SCR-R, RC and UJT firing circuits.
8) Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.
9) Study and obtain waveforms of single-phase half wave controlled rectifier with and without filters. Study the variation of output voltage with respect to firing angle.
10) Study and obtain waveforms of single-phase half controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.
11) Study and obtain waveforms of single-phase full controlled bridge converter with R and RL loads. Study and show rectification and inversion operations with and without freewheeling diode.
12) Control the speed of a dc motor using single-phase half controlled bridge rectifier and full controlled bridge rectifier. Plot armature voltage versus speed characteristics.

**4EE4-23: Digital Electronics Lab**

**Credit: 1** **Max. Marks: 50(IA:30, ETE:20)**
**0L+0T+2P**

1) To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify the truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gates with 2, 3, & 4 inputs).
2) To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND & NOR gates.
3) To realize an SOP and POS expression.
4) To realize Half adder/ Subtractor & Full Adder/ Subtractor using NAND & NOR gates and to verify their truth tables.
5) To realize a 4-bit ripple adder/ Subtractor using basic half adder/ Subtractor & basic Full Adder/ Subtractor.
6) To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7) Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven segment display.
8) Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9) Construct a divide by 2,4& 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10) Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer.

**4EE4-24: Measurement Lab**

**Credit: 1** **Max. Marks: 50(IA:30, ETE:20)**
**0L+0T+2P**

1) Study working and applications of (i) C.R.O. (ii) Digital Storage C.R.O. & (ii) C.R.O. Probes.
2) Study working and applications of Meggar, Tong-tester, P.F. Meter and Phase Shifter.
3) Measure power and power factor in 3-phase load by (i) Two-wattmeter method and (ii) One-wattmeter method.
4) Calibrate an ammeter using DC slide wire potentiometer.
5) Calibrate a voltmeter using Crompton potentiometer.
6) Measure low resistance by Crompton potentiometer.
7) Measure Low resistance by Kelvin's double bridge.
8) Measure earth resistance using fall of potential method.
9) Calibrate a single-phase energy meter by phantom loading at different power factors.
10) Measure self-inductance using Anderson's bridge.