



**UNIVERSITY DEPARTMENTS**  
**RAJASTHAN TECHNICAL UNIVERSITY, KOTA**

**FIRST YEAR CURRICULUM**  
**for**  
**UNDERGRADUATE DEGREE COURSES**  
**(Engineering & Technology)**  
**Scheme and Syllabus**



**(Effective for 2018-19)**

**University Departments**  
**Rajasthan Technical University, Kota**



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### Scheme for I Semester (First year)

Common to all branches of UG Engineering & Technology

| Sr. No. | Category | Course Code         | Course Title   | Hours |   |   | Marks |     |                      | Cr          |
|---------|----------|---------------------|--|-------|---|---|-------|-----|----------------------|-------------|
|         |          |                     |  | L     | T | P | IA    | ETE | Total                |             |
| 1       | BSC      | 1FY2-01             | Engineering Mathematics-I  | 3     | 1 | - | 50    | 100 | 150                  | 4           |
| 2       | BSC      | 1FY2-02/<br>1FY2-03 | Engineering Physics/<br>Engineering Chemistry                          | 3     | 1 | - | 50    | 100 | 150                  | 4           |
| 3       | HSMC     | 1FY1-04/<br>1FY1-05 | Communication Skills/<br>Human Values                                  | 2     | - | - | 50    | 100 | 150                  | 2           |
| 4       | ESC      | 1FY3-06/<br>1FY3-07 | Programming for Problem Solving/<br>Basic Mechanical Engineering       | 2     | - | - | 50    | 100 | 150                  | 2           |
| 5       | ESC      | 1FY3-08/<br>1FY3-09 | Basic Electrical Engineering/<br>Basic Civil Engineering               | 2     | - | - | 50    | 100 | 150                  | 2           |
| 6       | BSC      | 1FY2-20/<br>1FY2-21 | Engineering Physics Lab/<br>Engineering Chemistry Lab                  | -     | - | 2 | 50    | 25  | 75                   | 1           |
| 7       | HSMC     | 1FY1-22/<br>1FY1-23 | Language Lab/<br>Human Values Activities                               | -     | - | 2 | 50    | 25  | 75                   | 1           |
| 8       | ESC      | 1FY3-24/<br>1FY3-25 | Computer Programming Lab/<br>Manufacturing Practices Workshop          | -     | - | 3 | 50    | 25  | 75                   | 1.5         |
| 9       | ESC      | 1FY3-26/<br>1FY3-27 | Basic Electrical Engineering Lab/<br>Basic Civil Engineering Lab       | -     | - | 2 | 50    | 25  | 75                   | 1           |
| 10      | ESC      | 1FY3-28/<br>1FY3-29 | Computer Aided Engineering Graphics/<br>Computer Aided Machine Drawing | -     | - | 3 | 50    | 25  | 75                   | 1.5         |
| 11      | SODECA   | 1FY8-00             |  |       |   |   |       |     | 50                   | 0.5         |
|         |          |                     |  |       |   |   |       |     | <b>Total Credits</b> | <b>20.5</b> |

L = Lecture, T = Tutorial,

P = Practical, IA=Internal Assessment,

ETE=End Term Exam, Cr=Credits



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### Scheme for II Semester (First year)

Common to all branches of UG Engineering & Technology

| Sr. No               | Category | Course Code         | Course Title   | Hours |   |   | Marks |     |             | Cr  |
|----------------------|----------|---------------------|--|-------|---|---|-------|-----|-------------|-----|
|                      |          |                     |  | L     | T | P | IA    | ETE | Total       |     |
| 1                    | BSC      | 2FY2-01             | Engineering Mathematics-II   | 3     | 1 | - | 50    | 100 | 150         | 4   |
| 2                    | BSC      | 2FY2-03/<br>2FY2-02 | Engineering Chemistry/<br>Engineering Physics                          | 3     | 1 | - | 50    | 100 | 150         | 4   |
| 3                    | HSMC     | 2FY1-05/<br>2FY1-04 | Human Values/<br>Communication Skills                                  | 2     | - | - | 50    | 100 | 150         | 2   |
| 4                    | ESC      | 2FY3-07/<br>2FY3-06 | Basic Mechanical Engineering/<br>Programming for Problem Solving       | 2     | - | - | 50    | 100 | 150         | 2   |
| 5                    | ESC      | 2FY3-09/<br>2FY3-08 | Basic Civil Engineering/<br>Basic Electrical Engineering               | 2     | - | - | 50    | 100 | 150         | 2   |
| 6                    | BSC      | 2FY2-21/<br>2FY2-20 | Engineering Chemistry Lab/<br>Engineering Physics Lab                  | -     | - | 2 | 50    | 25  | 75          | 1   |
| 7                    | HSMC     | 2FY1-23/<br>2FY1-22 | Human Values Activities/<br>Language Lab                               | -     | - | 2 | 50    | 25  | 75          | 1   |
| 8                    | ESC      | 2FY3-25/<br>2FY3-24 | Manufacturing Practices Workshop/<br>Computer Programming Lab          | -     | - | 3 | 50    | 25  | 75          | 1.5 |
| 9                    | ESC      | 2FY3-27/<br>2FY3-26 | Basic Civil Engineering Lab/<br>Basic Electrical Engineering Lab       | -     | - | 2 | 50    | 25  | 75          | 1   |
| 10                   | ESC      | 2FY3-29/<br>2FY3-28 | Computer Aided Machine Drawing/<br>Computer Aided Engineering Graphics | -     | - | 3 | 50    | 25  | 75          | 1.5 |
| 11                   | SODECA   | 1FY8-00             |  |       |   |   |       |     | 50          | 0.5 |
| <b>Total Credits</b> |          |                     |  |       |   |   |       |     | <b>20.5</b> |     |

L = Lecture, T = Tutorial,

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# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### SYLLABUS

#### I Semester

#### Common to all branches of UG Engineering & Technology

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

**Credit: 4**

**3L+1T+0P**

| SN           | CONTENTS   | Hours     |
|--------------|--|-----------|
| 1            | <b>Calculus:</b><br>Improper integrals (Beta and Gamma functions) and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.   | 8         |
| 2            | <b>Sequences and Series:</b><br>Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.   | 6         |
| 3            | <b>Fourier Series:</b><br>Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series, Parseval's theorem.   | 6         |
| 4            | <b>Multivariable Calculus (Differentiation):</b><br>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            | <b>Multivariable Calculus (Integration):</b><br>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        |
| <b>TOTAL</b> |  | <b>40</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

Credit: 4

3L+1T+0P

| SN           | CONTENTS   | Hours     |
|--------------|--|-----------|
| 1            | <b>Wave Optics:</b><br>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            | <b>Quantum Mechanics:</b><br>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            | <b>Coherence and Optical Fibers:</b><br>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            | <b>Laser:</b><br>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            | <b>Material Science &amp; Semiconductor Physics:</b><br>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            | <b>Introduction to Electromagnetism:</b><br>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         |
| <b>TOTAL</b> |  | <b>40</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

Credit: 4

3L+1T+0P

| SN | CONTENTS   | Hours |
|----|--|-------|
| 1  | <p><b>Water:</b><br/>Common impurities, hardness, determination of hardness by complexometric (EDTA method), Degree of hardness, Units of hardness</p> <p>Municipal water supply: Requisite of drinking water, Purification of water; sedimentation, filtration, disinfection, breakpoint chlorination.</p> <p>Boiler troubles: Scale and Sludge formation, Internal treatment methods, Priming and Foaming, Boiler corrosion and Caustic embrittlement</p> <p>Water softening; Lime-Soda process, Zeolite (Permutit) process, Demineralization process.<br/>Numerical problems based on Hardness, EDTA, Lime-Soda and Zeolite process.</p>  | 10    |
| 2  | <p><b>Organic Fuels:</b><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.</p> <p>Liquid fuels : Advantages of liquid fuels, Mining, Refining and Composition of petroleum, Cracking, Synthetic petrol, Reforming, Knocking, Octane number, Anti-knocking agents, Cetane number</p> <p>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</p> <p>Numerical problems based on determination of calorific value (bomb calorimeter/Junkers calorimeter/Dulong's formula, proximate analysis &amp; ultimate and combustion of fuel.</p> | 10    |



# UNIVERSITY DEPARTMENTS

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|--------------|--|-----------|
|              |  |           |
| 3            | <p><b>Corrosion and its control:</b><br/>Definition and significance of corrosion, Mechanism of chemical (dry) and electrochemical (wet) corrosion, galvanic corrosion, concentration corrosion and pitting corrosion.</p> <p>Protection from corrosion; protective coatings-galvanization and tinning, cathodic protection, sacrificial anode and modifications in design.</p>  | 3         |
| 4            | <p><b>Engineering Materials:</b><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</p> <p>Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. Emulsification and steam emulsion number.</p>                     | 10        |
| 5            | <p><b>Organic reaction mechanism and introduction of drugs:</b><br/>Organic reaction mechanism: Substitution; SN1, SN2, Electrophilic 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</p> <p>Drugs : Introduction, Synthesis, properties and uses of Aspirin, Paracetamol</p> | 7         |
| <b>TOTAL</b> |  | <b>40</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

Credit: 2

2L+0T+0P

| SN           | CONTENTS  | Hours     |
|--------------|---|-----------|
| 1            | <b>Communication:</b><br>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            | <b>Grammar:</b><br>Passive Voice. Reported Speech. Conditional Sentences. Modal Verbs. Linking Words (Conjunctions)   | 5         |
| 3            | <b>Composition:</b><br>Job Application and Curriculum-Vitae Writing. Business Letter Writing. Paragraph Writing. Report Writing.  | 5         |
| 4            | <b>Short Stories:</b><br>“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            | <b>Poems:</b><br>“No Men are Foreign” by James Kirkup. “If” by Rudyard Kipling. “Where the Mind is without Fear” by Rabindranath Tagore.  | 5         |
| <b>TOTAL</b> |   | <b>25</b> |





# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### I & II Semester

#### Common to all branches of UG Engineering & Technology

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

Credit: 2

2L+0T+0P

| SN | CONTENTS  | Hours |
|----|---|-------|
| 1  | <p><b>Course Introduction - Need, Basic Guidelines, Content and Process for Value Education</b></p> <p>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.</p> <p>Method to fulfill the above human aspirations: understanding and living in harmony at various levels</p>   | 5     |
| 2  | <p><b>Understanding Harmony in the Human Being - Harmony in Myself</b></p> <p>Understanding human being as a co-existence of the sentient 'I' and the material 'Body'</p> <p>Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha</p> <p>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.</p>   | 5     |
| 3  | <p><b>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</b></p> <p>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;</p> <p>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.</p> | 5     |



## UNIVERSITY DEPARTMENTS RAJASTHAN TECHNICAL UNIVERSITY, KOTA

|              |  |           |
|--------------|--|-----------|
| <b>4</b>     | <p><b>Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</b></p> <p>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 (Sah-astitva) of mutually interacting units in allpervasive Space.<br/>Holistic perception of harmony at all levels of existence</p>  | <b>5</b>  |
| <b>5</b>     | <p><b>Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values</b></p> <p>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,<br/>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.</p> | <b>5</b>  |
| <b>TOTAL</b> |  | <b>25</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

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

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

Credit: 2  
2L+0T+0P

| SN           | CONTENTS  | Hours     |
|--------------|---|-----------|
| 1            | <b>Fundamentals of Computer:</b><br>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            | <b>Number system:</b><br>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            | <b>C Programming:</b><br>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        |
| <b>TOTAL</b> |   | <b>28</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

Credit: 2

2L+0T+0P

| SN           | CONTENTS   | Hours     |
|--------------|--|-----------|
| 1            | <b>Fundamentals:</b><br>Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology.<br>Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.       | 4         |
| 2            | <b>Pumps and IC Engines:</b><br>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.  | 6         |
| 3            | <b>Refrigeration and Air Conditioning:</b><br>Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.  | 5         |
| 4            | <b>Transmission of Power:</b><br>Introduction and types of Belt and Rope Drives, Gears.  | 4         |
| 5            | <b>Primary Manufacturing Processes:</b><br>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         |
| 6            | <b>Engineering Materials and Heat Treatment of Steel:</b><br>Introduction to various engineering materials and their properties.   | 3         |
| <b>TOTAL</b> |  | <b>28</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

Credit: 2

2L+0T+0P

| SN           | CONTENTS  | Hours     |
|--------------|---|-----------|
| 1            | <b>DC Circuits:</b><br>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            | <b>AC Circuits:</b><br>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            | <b>Transformers:</b><br>Ideal and practical transformer, EMF equation, equivalent circuit, losses in transformers, regulation and efficiency.   | 4         |
| 4            | <b>Electrical Machines:</b><br>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            | <b>Power Converters:</b><br>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            | <b>Electrical Installations:</b><br>Layout of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing. Power measurement, elementary calculations for energy consumption.  | 4         |
| <b>TOTAL</b> |   | <b>28</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### I & II Semester

#### Common to all branches of UG Engineering & Technology

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

Credit: 2

2L+0T+0P

| SN | CONTENTS   | Hours |
|----|--|-------|
| 1  | <b>Introduction to objective, scope and outcome the subject</b>  | 1     |
| 2  | <b>Introduction:</b><br>Scope and Specialization of Civil Engineering, Role of civil Engineer in Society, Impact of infrastructural development on economy of country.   | 2     |
| 3  | <b>Surveying:</b><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  | <b>Buildings:</b><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  | <b>Transportation:</b><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  | <b>Environmental Engineering:</b><br>Environmental Pollution, Environmental Acts and Regulations, Functional Concepts of Ecology, Basics of Species, Biodiversity,   | 4     |



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## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

|  |           |
|--|-----------|
| Ecosystem, Hydrological Cycle; Chemical Cycles: Carbon, Nitrogen & Phosphorus; Energy Flow in Eco-systems.   | <b>3</b>  |
| Water Pollution: Water Quality standards, Introduction to Treatment & Disposal of Waste Water. Reuse and Saving of Water, Rain Water Harvesting.   | <b>2</b>  |
| 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.  | <b>3</b>  |
| 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 |           |
| <b>TOTAL</b>   | <b>28</b> |



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

**Credit: 1**  
**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.





# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### I & II Semester

### Common to all branches of UG Engineering & Technology

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

**Credit: 1**

**OL+OT+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



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### I & II Semester

#### Common to all branches of UG Engineering & Technology

1FY1-22/ 2FY1-22 : Language Lab

**Credit: 1**  
**OL+OT+2P**

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



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

1FY1-23/ 2FY1-23 : Human Values Activities

**Credit: 1**  
**OL+OT+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:



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## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

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 beliefs.

### 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 values in a difficult situation.

### PS 10:



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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 basis 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 message of this course grasped by you. How has this affected you in terms of;

- a. Thought
- b. Behavior
- c. Work and
- d. Realization

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.**



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

**Credit: 1.5**  
**OL+OT+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



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

**Credit: 1.5**

**OL+OT+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



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### I & II Semester

### Common to all branches of UG Engineering & Technology

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

**Credit: 1**  
**OL+OT+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 winding - 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.





# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

**Credit: 1**  
**OL+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 lines using 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.



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## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### I & II Semester

#### Common to all branches of UG Engineering & Technology

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

**Credit: 1.5**  
**OL+OT+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.



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

I & II Semester

Common to all branches of UG Engineering & Technology

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

**Credit: 1.5**  
**OL+OT+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.



# UNIVERSITY DEPARTMENTS

## RAJASTHAN TECHNICAL UNIVERSITY, KOTA

### II Semester

### Common to all branches of UG Engineering & Technology

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

Credit: 4

3L+1T+0P

| SN           | CONTENTS   | Hours     |
|--------------|--|-----------|
| 1            | <b>Matrices:</b><br>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            | <b>First order ordinary differential equations:</b><br>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            | <b>Ordinary differential equations of higher orders:</b><br>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;<br>Power series solutions including Legendre differential equation and Bessel differential equations. | 12        |
| 4            | <b>Partial Differential Equations – First order:</b><br>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            | <b>Partial Differential Equations– Higher order:</b><br>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         |
| <b>TOTAL</b> |  | <b>40</b> |