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# MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABAD

**An Autonomous Institute Affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra (India)**

# First Year B. Tech. Syllabus (Group-A) 2021-22

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Basic Sciences and Humanities
MIT, Aurangabad (An Autonomous Institute)

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**F. Y. B. Tech. Syllabus Structure w.e.f. 2021-22 (with amendments)**

**Group A - (Agricultural Engineering, Civil Engineering, Mechanical Engineering, Plastic and Polymer Engineering)**

| Sr. No | Course Category | Course Code | Course Title | L | T | P | Contact Hr /Wk | Credits | MSE-I | MSE-II | CIE | TA | ESE/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Foundation Program/SIP: 3 Week Duration | | | | | | | | | | | | |
| 1.1 | BSC | BSC101 | Calculus and Differential Equations | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.2 | HSM | HSM101-A | Engineering Exploration-I | 1 | - | 2 | 3 | 2 | - | - | 20 | 10 | 20 | 50 |
| 1.3 | ESC | ESC101 | C-Programming | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.4 | ESC | ESC102/ ESC103 | BME/BCE | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.5 | BSC | BSC102 - BSC104 | Open Elective-I | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 1.6 | ESC | ESC201 | Lab-I: C-Programming | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 1.7 | ESC | ESC202- ESC203 | Lab-II: BME/BCE | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 1.8 | BSC | BSC201 – BSC203 | Lab-III: Open Elective-I | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 1.9 | ESC | ESC204 | Lab-IV: Workshop | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 1.10 | ESC | ESC205 | Lab-V: Engineering Graphics | - | - | 2 | 2 | 1 | - | - | - | 25 | 25 | 50 |
| 1.11 | HSM | HSM201 | Lab-VI: Communication Skills | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 1.12 | HSM | HSM251 | Lab-VII: Cognitive Aptitude | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 1.13 | ESC | ESC206 | Environmental Studies | 2 | - | - | 2 | Mandatory Non-Credit Course | | | | | | |
| S1 | | | | 15 | 0 | 16 | 31 | 21 | 60 | 60 | 60 | 175 | 295 | 650 |

| Sr. No | Course Category | Course Code | Course Title | L | T | P | Contact Hr /Wk | Credits | MSE-I | MSE-II | CIE | TA | ESE/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.1 | BSC | BSC151 | Statistics and Integral Calculus | 3 | 1 | - | 4 | 4 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.2 | ESC | ESC151 | Python Programming | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.3 | ESC | ESC152 | Engineering Mechanics | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.4 | ESC | ESC153 | Electrical and Electronics Engineering | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.5 | BSC | BSC102 - BSC104 | Open Elective-II | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 10 | 50 | 100 |
| 2.6 | ESC | ESC251 | Lab-I: Python Programming | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 2.7 | ESC | ESC252 | Lab-II: Engineering Mechanics | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 2.8 | ESC | ESC253 | Lab-III: Electrical and Electronics Engineering | - | - | 2 | 2 | 1 | - | - | - | - | 25 | 25 |
| 2.9 | BSC | BSC201 – BSC203 | Lab-IV: Open Elective-II | - | - | 2 | 2 | 1 | - | - | - | 25 | - | 25 |
| 2.10 | HSM | HSM101-B | Engineering Exploration-II | - | - | 2 | 2 | 1 | - | - | 20 | 10 | 20 | 50 |
| 2.11 | HSM | HSM252/ HSM253 | Language Proficiency- German Language/ Japanese | 2 | - | - | 2 | Mandatory Non-Credit Course | | | | | | |
| S2 | | | | 17 | 1 | 10 | 28 | 21 | 75 | 75 | 70 | 110 | 320 | 650 |

**L-Lecture, P- Practical, T- Tutorial, MSE- Mid Semester Exam, CIE-Continuous Internal Evaluation, TA-Teacher Assessment, ESE- End Semester Examination**





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**Open Elective-I/II**

| | | | |
|---|---|---|---|
| BSC102 | Engineering Physics | ESC102 | Basics of Mechanical Engineering (Compulsory for ME, PPE and AE) |
| BSC103 | Engineering Chemistry | ESC103 | Basics of Civil Engineering (Compulsory for CE) |
| BSC104 | Biology for Engineers | | |
| BSC201 | Lab-III/IV: Engineering Physics | ESC202 | Lab-II: Basics of Mechanical Engineering |
| BSC202 | Lab-III/IV: Engineering Chemistry | ESC203 | Lab-II: Basics of Civil Engineering |
| BSC203 | Lab-III/IV: Biology for Engineers | | |

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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC101<br>Course: Calculus and Differential Equations<br>Teaching Scheme:<br>Theory: 03Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs |

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|---|---|
| **Prerequisite** | Students required the knowledge of all basic concepts related to calculus and differential equations. |
| **Objectives** | 1. To develop skills and create interest to use mathematics in Engineering & technology<br>2. To know how the real word problems governed by the first order differential equations and calculus.<br>3. To understand the importance of differential calculus and differential equations in Engineering & technology.<br>4. To learn formation and solving various types of differential equations. |
| **Unit-I** | **Differential Calculus**: $n^{th}$ Derivative of Standard functions, Leibnitz's Theorem, Taylor's Series, Maclaurin's Series, Indeterminate Forms: L' Hospital's Rule (Without Proof), Evaluation of Limits. (6 Hrs) |
| **Unit-II** | **Infinite Series**: Sequences, Introduction to Infinite Series, Convergence and Divergence of Infinite Series: p-Series Test, Comparison Test, D' Alembert's Ratio Test, Cauchy's $N^{th}$ Root Test. (6 Hrs) |
| **Unit-III** | **Differential Equations**: Solution of First Order and First Degree Differential Equation: Exact, Linear and Bernoulli's Equation (Reducible to Linear) (6 Hrs) |
| **Unit-IV** | **Application Of Differential Equations**: Application of First Order and First-Degree Differential Equations: Electrical Circuit, Mechanics and Orthogonal Trajectories. (6 Hrs) |
| **Unit-V** | **Partial Differentiation**: Partial Derivatives - Introduction, Homogeneous Functions of Two Variables - Euler's Theorem, Implicit Functions, Total |





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|---|---|---|---|---|---|
| | Derivative, Change of Variables. (7 Hrs) | | | | |
| **Unit-VI** | **Applications of Partial Differentiation**: Maxima and Minima of Functions of Two Variables, Jacobians and Its Properties. (5Hrs) | | | | |
| **Textbooks / Reference Books** | **Sr. No.** | **Title** | **Author** | **Publication** | **Edition** |
| | 1. | Advanced Engineering Mathematics | Louis C. Barrett, Ray Wylie C | McGraw-Hill Publishing Company Ltd, New Delhi, 2003. | 6th Edition |
| | 2. | Engineering Mathematics-Volume I | Venkatraman. M.K | National publishing company, Chennai, 2008. | 4th edition |
| | 3. | Higher Engineering Mathematics | Dr. Grewal. B.S. | Khanna Publications, New Delhi, 2007. | 40th Edition |
| | 4. | Advanced Engineering Mathematics | H. K. Dass. | S. Chand And Co. Ltd | 18th Edition |
| | 5. | Advanced Engineering Mathematics | Erwin Kreyszig | Willey Eastern Ltd. Mumbai | 10th Edition |
| | 6. | Advanced Engineering Mathematics | M. D. Greenberg | Pearson Publication | 2nd Edition |
| | 7. | A Textbook of Engineering Mathematics | Peter O'Neil | Thomson Asia Pvt. Ltd., Singapore | 7th Edition |







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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: HSM101-A<br>Course: Engineering Exploration-I<br>Teaching Scheme:<br>Theory: 01 Hr/week<br>Practical: 02Hrs/week | Credits: 1-0-1<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 20 Marks<br>ESE: 20 Marks |
| **Objectives** | • To make student understand the role of an Engineer as a problem solver.<br>• To enable students to build simple systems using engineering design process.<br>• To introduce ethical perspectives.<br>• To make students explore different aspects of engineering. |
| **Unit-I** | **Introduction to Engineering**<br>Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes. (3 Hrs) |
| **Unit-II** | **Engineering Ethics**<br>Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas. (4 Hrs) |
| **Unit-III** | **Engineering Design**<br>Engineering Design Process, Multidisciplinary facet of design, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solution, Pugh Chart, Motor and battery sizing concepts. (22 Hrs) |
| **Unit-IV** | **Mechanisms**<br>Basic Components of a Mechanism, Difference between speed and torque, concept of velocity ratio, Degrees of Freedom or Mobility of a Mechanism, Various mechanisms like 4 Bar Chain, Crank Rocker Mechanism, Slider |



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|---|---|---|---|---|---|
| | Crank Mechanism. (7 Hrs) | | | | |
| **Textbooks/ Reference Books** | **Sr. No.** | **Title** | **Author** | **Publication** | **Edition** |
| | 1. | Engineering Design: A Project Based Introduction | C.L. Dym, P. Little | Wiley Publication | 4th Edition |
| | 2. | Project Design & Development | Karl Ulrich | McGraw Hill Publication | 5th Edition |
| | 3. | Theory of Machines | S. S. Rattan | McGraw Hill Publication | 4th Edition |
| | 4. | Manuals and datasheets of respective software and hardware tools | | | |







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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: ESC101<br>Course: C-Programming<br>Teaching Scheme:<br>Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2Hrs |

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| **Objectives** | **Course Objectives:**<br>1. To introduce students to the basic knowledge of programming fundamentals of C language.<br>2. To impart writing skill of C programming to the students and solving problems.<br>3. To impart the concepts like decision control structures, looping, array, functions, pointers, structure. |
| **Unit-I** | **Programming Languages:** Introduction to programming language, Types of programming language- Machine language, Assembly Language, High Level Language, compiler, assembler, interpreter, loader, linker, editor.<br>**Introduction to C:** C Character set, Constants, Variables, Keywords and Operators, Basic data types, Type conversion, Instructions, Algorithm, Flow Chart, C program structure, Simple C program. (6 Hrs) |
| **Unit-II** | **The Decision control structures:** If, if-else, nested if statements, Logical operators, conditional operator, relational operator. (6 Hrs) |
| **Unit-III** | **Looping Control Structures:** While, for and do-while, Break and continue statements, Switch -case statement.(6 Hrs) |
| **Unit-IV** | **Arrays**: Array declaration, Initialization, One dimensional and Two dimensional arrays, Matrix operations.<br>**Strings**: Introduction, Standard Library Functions - strlen(), strcpy(), strcat(), strcmp(), strrev(), etc. (6 Hrs) |



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| **Unit-V** | **Functions**<br>Introduction to function, Uses of functions, Function declaration and definition, Scope rule of functions, Call by value, Recursion.**Pointers:** Introduction to pointers, Pointer notation, Call by Reference, Passing an array and array elements to a function. (6 Hrs) |
| **Unit-VI** | **Structures:**<br>Introduction to Structure, Uses of Structures, Declaring a Structure, Accessing structure elements, Array of structures. (6 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Introduction to computers | Peter Norton | Tata McGraw Hill | 4th Edition |
| 2. | Let us C | Yeshwanth Kanetkar | BPB | 8th Edition |
| 3. | The C Programming language | Kernighan B.W and Ritchie D.M | Pearson Education | 2nd Edition |
| 4. | Programming with C | Byron S Gottfried | Tata McGraw-Hill, Schaum's Outlines | 2nd Edition |
| 5. | Programming in C | E. Balagurusamy | Tata McGraw Hill | 4th Edition |







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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester I) | |
|---|---|
| Course Code: ESC102<br>Course: Basics of Mechanical Engineering<br>Teaching Scheme:<br>Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs |
| **Prerequisite** | 1. To understand fundamental concepts of thermal engineering<br>2. To study engineering applications of thermal engineering<br>3. To understand working principle of machine tools<br>4. To understand the functions of various power transmitting elements |
| **Objectives** | 1. To study the fundamental principles and laws of heat transfer and to explore the implications of these principles for system behavior.<br>2. To study, analyse and design heat transfer systems through the application of these principles.<br>3. To develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications. |
| **Unit I** | Scope & applications of thermodynamics, Macroscopic and microscopic description of matter, Pure and working substance, Thermodynamic system and its types, Thermodynamic state of the system, Thermodynamic properties, Thermodynamic processes and its types, Thermodynamic equilibrium, Zeroth law of thermodynamics Temperature and its measurement , Pressure and its measurement, Numerical on pressure measurement and temperature measurement. (4 Hrs) |
| **Unit II** | Introduction to forms of energy and non-conventional energy sources, Thermodynamic definition of work, types of work, quasi static process, P.dV work for different processes, Definition of heat, specific heat, Modes of heat transfer, Laws governing the modes of heat transfer, Comparison between heat & work, Statement of First law of thermodynamics for open and closed |







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| | systems, Numerical on types of work and modes of heat transfer (8 Hrs) |
| **Unit III** | Classification of boiler, Boiler mountings and accessories (location, and applications only), Construction and Working and of 2 stroke and 4 stroke engines, Refrigerator, Air conditioner and air cooler, Basic working principle of Steam Turbine and Compressor (6 Hrs) |
| **Unit IV** | Engineering Materials (Introduction, Classification, Properties, Selection, and application only), Basic heat treatment Processes (Introduction to Annealing, Normalizing and Hardening only), Metal Forming and Metal Joining Processes (Introduction and Brief description of types only) (6 Hrs) |
| **Unit V** | Machine Tools: - Lathe Machine Milling Machine, Drilling Machine, Shaper Machine, Grinding Machine (All machine tools to be studied with respect to Working principle, Block diagram, Specification and Different operations performed), Introduction to NC/CNC machines) (6 Hrs) |
| **Unit VI** | Power Transmission Elements: - Belt, Pulleys, Gears, Bearings, Keys and Coupling: Clutches (All power transmission elements to be studied with respect to brief description of their types only) (6 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Fundamentals of Classical Thermodynamics | P.K. Nag | Tata Mc Graw Hill | 8th Edition |
| 2. | Thermodynamics An Engineering Approach | Y. Cengel& M Boles | McGraw Hill | 5th Edition |
| 3. | Thermal Engineering | R.K. Rajput | Laxmi Publications | 10th Edition |
| 4. | Engineering Thermodynamics (Principle and Practices) | D.S. Kumar | Katsons Publications | 2nd Edition |







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|---|---|---|---|---|---|
| | 5. | Workshop Technology | Hajra Choudhary | Media Promotors | 4th Edition |
| | 6. | Manufacturing Science | Amitabha Ghosh & Malik | East West Press | 2nd Edition |
| | 7. | Manufacturing Technology | P.N. Rao | Tata Mc Graw Hill | 4th Edition |
| | 8. | Comprehensive Workshop Technology | S.K. Garg | Laxmi Publications | 3rd Edition |







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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester I) | |
|---|---|
| Course Code: ESC103<br>Course : Basics of Civil Engineering<br>Teaching Scheme:<br>Theory: 03 Hrs/week | Credits:3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination:50Marks<br>End Semester Examination(Duration):2Hrs |

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| **Prerequisite** | Introduction to basic terminologies involved in general science. |
| **Objectives** | 1. To get knowledge of various building materials and structural members.<br>2. To create awareness and knowledge in students about basic civil engineering terminologies and techniques which will be helpful in their day to day life<br>3. To understand concept of surveying and leveling. |
| **Unit-I** | **Civil Engineering Materials:** Study of properties and use of civil engineering materials namely bricks, rubble, cement, sand, coarse aggregate, etc. (6 Hrs) |
| **Unit-II** | **Foundation:** Introduction to foundation and types, isolated footing, combined footing, cantilever footing, Pile foundation - types. (6 Hrs) |
| **Unit-III** | **Masonry:** Introduction to brick masonry and bonds in brick, header bond, stretcher bond, English and Flemish bond. (6 Hrs) |
| **Unit-IV** | **Lintels, Doors and Window:** Types of lintels, definition of technical terms of doors and windows, study of battened, ledged and braced doors casement windows, glazed window, and metal windows. (6 Hrs) |
| **Unit-V** | **Roofs and Floors:** Trussed roofs, king post roof truss and queen post roof truss, flat RCC roof, components of floor, material for construction of floor. (6 Hrs) |







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| **Unit-VI** | **Surveying and Leveling:**<br>i) Surveying: Length measurement, use of metallic tape and chain (20m & 30m).<br>ii) Angular Measurements: Use of prismatic compass, simple problems.<br>iii) Level measurements: Use of dumpy level, simple problems on calculation of reduced levels. (6 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Building Materials | S.K. Duggal | New Age International Publishers | 5th Edition |
| 2. | Building Construction | B.C. Punmia | Laxmi Publication | 11th Edition |
| 3. | Surveying And Levelling | N.N. Basak | McGraw Hill Education India | 16th Edition |
| 4. | A Text Book of Surveying & Levelling | R. Agor | Khanna Publishers | 5th Edition |







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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC102<br>Course: Open Elective-I: Engineering Physics<br>Teaching Scheme: Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration):2Hrs |

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| **Objectives** | 1. To let the engineering undergraduates study physical properties, concepts and physical quantities required for the solution of complex engineering problems<br>2. To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems<br>3. To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives.<br>4. To engage engineering undergraduatesextensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities. |
| **Unit-I** | **Optics**<br>The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference<br>Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices.<br>Polarization, Nicol prism, Laurent's half shade polarimeter, applications of polarization. (6 Hrs) |
| **Unit-II** | **Acoustics**<br>Acoustic terminology and definitions, Acoustic Wave Equation and its Basic |







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| | Physical Measures, Sabine's formula (derivation not necessary) acoustics factor in architectural design.<br>**Ultrasonics**<br>Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves.<br>(6 Hrs) |
| **Unit-III** | **Crystal Structure**<br>Crystalline and amorphous material, lattice and unit cell, Miller indices, SC, BCC, FCC, diamond structure, NaCl structure, imperfections and defects in solids<br>**X-Rays**<br>Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination (6 Hrs) |
| **Unit-IV** | **Nuclear Physics**<br>Nuclear force, liquid drop model, shell model, Nuclear fission and fusion, Q-value of nuclear reaction, nuclear reactor, P-P cycle, C-N cycle, cyclotron, GM counter, applications of nuclear physics in various fields.<br>**Modern Physics**<br>Black body radiation, Planck' s law, Photoelectric effect, Wave particle duality, De- Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing.<br>(6 Hrs) |
| **Unit-V** | **Introduction to solids**<br>Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications.<br>Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic |





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<table>
<tr><td></td><td>potential, Kronig-Penney model and origin of energy bands<br>Magnetic Materials: Magnetic susceptibility and diamagnetic materials, paramagnetic, ferromagnetic, and, BH characteristics, applications.<br>Nanomaterials and Nanotechnology: Properties of nanomaterials, 0 D, 1 D, 2 D and 3 D nanoparticle, various carbon allotropes, historical instances and day to day examples, Introduction to nanotechnology and applications in various engineering fields.<br>(6 Hrs)</td></tr>
<tr><td>Unit-VI</td><td>Laser<br>Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, $CO_2$ laser and semiconductor Laser, applications of lasers in science, engineering and medicine.<br>Fiber Technology<br>Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors.<br>(6 Hrs)</td></tr>
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<table>
<tr><td rowspan="4">Textbooks/ Reference Books</td><td>Sr. No.</td><td>Title</td><td>Author</td><td>Publication</td><td>Edition</td></tr>
<tr><td>1.</td><td>A Text book of Engineering Physics</td><td>M. N. Avadhanulu P. G. Kshirsagar</td><td>S. Chand & Co.</td><td>7th Edition</td></tr>
<tr><td>2.</td><td>A Text book of Engineering Physics</td><td>R. K. Gaur S. L. Gupta</td><td>Dhanpat Rai</td><td>3rd Edition</td></tr>
<tr><td>3.</td><td>Fundamentals of Physics</td><td>David Halliday, Jearl Walker, and Robert Resnick</td><td>Wiley</td><td>6th Edition</td></tr>
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|---|---|---|---|---|---|
| | 4. | Elements of X-ray Diffraction | B. D. Cullity | Addison-Wesley Metallurgy Series | 1st Edition |
| | 5. | Nuclear Physics | Irving Kaplan | Narosa Publishing house | 2nd Edition |
| | 6. | Introduction to Solid State Physics | C. Kittel | John Wiley & Sons, Inc | 8th Edition |
| | 7. | Lasers and Non-Linear Optics | B.B. Laud | New Age International | 3rd Edition |
| **Websites and online courses** | 1. | http://science.howstuffworks.com/laser1.htm | | | |
| | 2. | http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html | | | |
| | 3. | http://nptel.ac.in/courses/122107035/ | | | |
| | 4. | http://nptel.ac.in/courses/122104016/ | | | |
| | 5. | https://www.coursera.org/learn/intro-to-acoustics | | | |
| | 6. | https://nptel.ac.in/courses/112/106/112106227/ | | | |
| | 7. | https://nptel.ac.in/courses/113/104/113104081/ | | | |
| | 8. | https://nptel.ac.in/courses/115/102/115102017/ | | | |







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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC103<br>Course: Open Elective-I: Engineering Chemistry<br>Teaching Scheme: Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs |

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| **Objectives** | 1. To relate the concepts of Chemistry in all Engineering Disciplines.<br>2. To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry.<br>3. To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials.<br>4. To develop the awareness about powering the future using advanced energy Storage Systems. |
| **Unit-I** | **Advanced Engineering Materials**<br>**Industrial Polymers**: Thermoplastics (PVC) & Thermosetting polymers (Bakelite), Biodegradable polymers (PVa), Properties, Applications<br>**Nanomaterials**: Preparation of nano materials by Laser method, properties and applications of CNTs.<br>**Composite Materials**: Ceramic matrix composites, carbon- carbon composites<br>**Reinforcements**: Silicon carbide, Fiber glass. (6Hrs) |
| **Unit-II** | **Water Technology:**<br>Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration (6 Hrs) |
| **Unit-III** | **Fuels and Energy Storage Systems:**<br>Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal & |





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| | importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG.<br>Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) (6 Hrs) |
| **Unit-IV** | **Lubricants and Coolants**<br>Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index. Coolants: Introduction, properties and uses of water and ethylene glycol as coolant. (6 Hrs) |
| **Unit-V** | **Corrosion and its prevention**<br>Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed &digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating (6 Hrs) |
| **Unit-VI** | **Metallurgical processes**<br>Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing (6 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Engineering Chemistry | B. Siva Shankar | Mc Graw Hills Publications | 3rd Edition |
| 2. | Engineering Chemistry | Shelly, Oberi and Malik | Cingage Publication | 1st Edition |
| 3. | Principles of Polymerization | Odian, G.G | John Wiley & Sons, Inc | 4th Edition |
| 4. | Engineering Chemistry | Jain & Jain | Dhanpat Rai Publishing | 16th Edition |
| 5. | Polymer Chemistry | Malcolm P. Stevens | Oxford University Press | 3rd Edition |

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|---|---|---|---|---|---|
| | 6. | A Textbook of Engineering Chemistry | Shashi Chawla | Dhanpat Rai & CO | 10th Edition |
| | 7. | Material Science & Engineering | William Callister and V. Raghavan | Wiley | 9th Edition |
| **Websites and online courses** | 1. | Unit- I – https://onlinecourses.nptel.ac.in/noc21_ch49/preview https://www.explainthatstuff.com/composites.html | | | |
| | 2. | Unit- II – https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf | | | |
| | 3. | Unit- III – https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf https://www.sciencedirect.com/topics/engineering/proximate-analysis | | | |
| | 4. | Unit- IV – https://nptel.ac.in/courses/112/102/112102014/ https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf | | | |
| | 5. | Unit- V - https://nptel.ac.in/courses/113/108/113108051/ | | | |
| | 6. | Unit- VI -https://nptel.ac.in/courses/112/107/112107144/ | | | |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC104<br>Course: Open Elective-I: Biology for Engineers<br>Teaching Scheme: Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration):2Hrs |

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| **Objectives** | To introduce students to modem biology with an emphasis on evolution of biology as a multi-disciplinary field, to make them aware of application of engineering principles in biology, and engineering robust solutions inspired by biological examples. |
| **Unit-I** | Introduction to Molecular Biology, Central Dogma of life, DNA replication, Translation and transcription, Introduction to Genetics, Phylogenetic analysis, Introduction to developmental biology, structure and functions of cell. (8 Hrs) |
| **Unit-II** | Introduction to immunology, components of the immune system, antigens and antibodies, B-cells and T- cells development, proliferation and differentiation, MHC Restriction, Complement system. (6 Hrs) |
| **Unit-III** | Infectious diseases, TB, HIV, Flue, COVID-19, response of host to infectious diseases. Vaccines, cancer biology. (4 Hrs) |
| **Unit-IV** | Introduction to bioinformatics, tools of bioinformatics, primary and secondary data bases, sequence alignments, methods of structure prediction of proteins, homology modeling (6 Hrs) |
| **Unit-V** | Introduction to Analytical Instrumentation, Electrophoresis techniques, Chromatography types and techniques, Isoelectric focusing, PCR and ELISA (6 Hrs) |
| **Unit-VI** | Environmental biosafety, bioresources, biodiversity, bioreactors, ethical aspects of plant and animal biotechnology, Engineering designs inspired by examples in biology, Engineering aspects of some Nobel Prizes in Physiology and Medicine & Chemistry / recent advances in Biology (6 Hrs) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| Textbooks/ Reference Books | 1. | Essentials of Genetics. | Miko, I. & Lejeune, L., eds. | Cambridge, MA: NPG Education | 2009 |
| | 2. | Essentials of Cell Biology | O'Connor, C. M. & Adams, J. U. | Cambridge, MA: NPG Education | 2010 |
| | 3. | Molecular Biology of the Gene | Warson JD, Baker, TA, Bell SP, Gann A, Levin M, Losick R, | Pearson Education | 2004 |
| | 4. | The Greatest Show on Earth: The Evidence For Evolution | Dawkins, R | Bantam Press, Transworld Publishers | 2009 |
| | 5. | The Blind Watchmaker | Dawkins, R | W. W. Norton & Co | 1996 |
| | 6. | The Double Helix: A Personal Account of the Discovery of the Structure of DNA | Watson, J. D. | Simon & Schuster Inc. | 2011 |







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**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester I)**

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|---|---|
| Course Code: ESC201<br>Course: Lab-I: C-Programming<br>Teaching Scheme: Practical:02Hrs/week | Credits: 0-0-1<br>End Semester Examination/Oral:25Marks |

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|---|---|
| **Objectives** | 1. Understand the syntax and construction of C code.<br>2. Know the steps involved in compiling, linking and debugging C code.<br>3. Understand how to use header files, library functions, user defined functions.<br>4. To impart the use of different data-structures like arrays, pointers, structures and files. |
| **List of Practical** | 1. If the marks obtained by a student in five different subjects are input through the keyboard, find out the aggregate marks and percentage marks obtained by the student. Assume that the maximum marks that can be obtained by a student in each subject is 100.<br>2. If the ages of Ram, Shyam and Ajay are input through the keyboard, write a program to determine the youngest of the three.<br>3. Any year is entered through the keyboard. Write a program to determine whether the year is leap or not using the logical operators.<br>4. Write a program to print the multiplication table of the number entered by the user. The table should get displayed in the following form.<br>5* 1 =5<br>5 *2 = 10<br>....<br>5. Write a menu driven program which has the following options:<br>i) Addition of two integers<br>ii) Subtraction<br>iii) Multiplication<br>iv) Exit<br>Make use of switch statement.<br>6. Write a function power (a, b), to calculate the value of a raised to b. |

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| | 7. Twenty-five numbers are entered from the keyboard into an array. The number to be searched is entered through the keyboard by the user. Write a program to find if the number to be searched is present in the array and if it is present, display the number of times it appears in the array.<br>8. Write a program to demonstrate the following string handling functions strlen(), strcpy(), strcmp(), strcat(), strrev().<br>9. Write a program to swap two numbers using call by reference method.<br>10. Create a structure to specify data of customers in a bank.<br>The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank. Write a function to print the Account number and name of each customer with balance below Rs. 100. |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

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| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester I) | |
|---|---|
| Course Code: ESC202<br>Course: Lab-II: Basics of Mechanical Engineering<br>Teaching Scheme: Practical:02Hrs/week | Credits: 0-0-1<br>End Semester Examination/Oral: 25Marks |

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|---|---|
| **List of Practical** | **Any 10 practical to be conducted**<br>1. Study and demonstration of low-pressure boiler (anyone)<br>2. Study and demonstration of high-pressure boiler (anyone)<br>3. Study and demonstration of 2 stroke and 4 stroke petrol engine<br>4. Study and demonstration of 2 stroke and 4 stroke diesel engine<br>5. Study and demonstration of domestic refrigerator<br>6. Study and demonstration of window type air conditioner<br>7. Study and demonstration of Lathe machine<br>8. Study and demonstration of Milling machine<br>9. Study and demonstration of Shaper machine<br>10. Study and demonstration of Radial Drilling machine<br>11. Assignment on Unit I, II, IV and VI (One assignment on each of these units comprising theoretical concepts and numerical. Application of Excel / MATLAB for numerical examples.) / Presentation on technical case studies<br>12. Two MCQ Tests of 15 marks each based on course contents related to GATE Examination.<br>**Assessment will be based on:-**<br>1. Attendance<br>2. Assignments<br>3. MCQ Test/Presentation on technical case studies<br>4. Viva-voce |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester I) | |
|---|---|
| Course Code: ESC203<br>Course: Lab-II: Basics of Civil Engineering<br>Teaching Scheme:Practical:02Hrs/week | Credits: 0-0-1<br>End Semester Examination/Oral:25Marks |
| **Objectives** | 1. To learn basics of civil engineering will help the engineers to deal with the facts and applications to the real-life problems. |
| **List of Practical** | 1. To observe civil engineering materials in lab such as bricks, rubble, cement, sand, coarse aggregate, etc.<br>2. To study and write about foundation and its types, isolated footing, combined footing, cantilever footing and pile foundation.<br>3. To observe and study brick masonry and bonds in brick such as header bond, stretcher bond, English and Flemish bond.<br>4. To observe structural components such as lintels, definition of technical terms of doors and windows, study of battened, ledged and braced doors casement windows, glazed window, and metal windows.<br>5. To observe and study trussed roof, king post roof truss and queen post roof truss, flat RCC roof, components of floor, material for construction of floor.<br>6. To observe and study various surveying instruments. |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC201<br>Course: Lab-III Open Elective-I: Engineering Physics<br>Teaching Scheme: Practical:02Hrs/week | Credits: 0-0-1<br>Teacher Assessment:25Marks |

| | |
|---|---|
| **List of Practical** | **Any 10 practical to be conducted**<br>1. Newton's ring: To determine wavelength of monochromatic light<br>2. G. M. Counter: dead time calculation<br>3. Grating: To determine wavelength of LASER light.<br>4. Polarimeter: To determine concentration of solution.<br>5. Reverberation time: To determine Reverberation time of a hall.<br>6. Characteristics of solar cell<br>7. Ultrasonic interferometer<br>8. Zener diode: To study characteristics of zener diode & to determine zener voltage.<br>9. Dielectric constant: to determine dielectric constant.<br>10. Forbidden gap: To determine forbidden gap of semiconductors.<br>11. Transistor Characteristics in CE Configuration.<br>12. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier.<br>13. Planck's Constant<br>14. To measure the divergence of the laser beam |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC202<br>Course: Lab-III Open Elective-I: Engineering Chemistry<br>Teaching Scheme: Practical: 02Hrs/week | Credits: 0-0-1<br>Teacher Assessment:25Marks |

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|---|---|
| **List of Practical** | **Any 10 practical to be conducted**<br>1. Lab safety experiment (Only as introduction)<br>2. Preparation and standardization of analytical reagents<br>3. Analysis of Chemical parameters of water<br>4. Analysis of physical parameters of water<br>5. Determination of percentage of moisture and ash in given coal sample.<br>6. Determination of Acid value/ saponification value of lubricating oil.<br>7. Determination of viscosity of chemical compound<br>8. Preparation of polymer<br>9. Electro gravimetric Estimation of Metals (Virtual experiment)<br>10. Determination of chloride content of water by Mohr's method (Virtual experiment)<br>11. Determination of melting or boiling point of organic compound. (Virtual experiment)<br>12. Determination of rate of corrosion in different pH media. (Virtual experiment)<br>13. Preparation of nano materials<br>14. Determination of molecular weight of polymer using Ostwald's viscometer |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: BSC203<br>Course: Lab-III Open Elective-I: Biology for Engineers<br>Teaching Scheme: Practical:02Hrs/week | Credits: 0-0-1<br>Teacher Assessment:25Marks |
| **List of Practical** | 1. Bio safety laboratory practices and biological waste disposal<br>2. Buffers in biology, buffering capacity and pKa<br>3. Observing cell surface and intracellular contents using light and/or fluorescence microscopy<br>4. Measuring mechanical strength of cells - osmolarity and elasticity of biological membranes<br>5. Protein and DNA isolation from plant cells, visualization of proteins and DNA<br>6. Microbial culture - growth curve and enumeration methods<br>7. Basic molecular biology techniques - including isolation of bacterial plasmids demos on Polymerase Chain Reaction and Restriction Fragment Length Polymorphism<br>8. Mammalian and plant cell culture methods |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester I)**

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|---|---|
| Course Code: ESC204<br>Course: Lab-IV: Workshop<br>Teaching Scheme: Practical: 02 Hrs /week | Credits: 0-0-1<br>Teachers Assessment: 25 Marks. |

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|---|---|---|
| **Objectives** | i) To have hands on practice and understanding of fitting process and tools.<br>ii) To have hands on practice and understanding of smithy process and tools.<br>iii) To have hands on practice and understanding of sheet metal process and | |
| | **Section** | **Contents** |
| | **Fitting** | **i) Study of different tools of fitting & processes involved in fitting.**<br>**Workshop Diary** – Draw sketches and description of fitting tools and sketches of the job.<br>**Practical -** One composite job involving simple fitting operation like sawing, marking, filling & tapping operation: minimum one job. (Male – female fitting) |
| | **Black Smithy** | ii) **Study of different smithy tools & processes.**<br>**Workshop diary –** Draw sketches and description of smithy tools and sketches of the job.<br>**Practical -** Preparation of one job making round cross section to square bar. |
| | **Sheet metal working** | **iii) Study of different sheet metal tools.**<br>**Workshop diary -** Sketches and description of sheet metal tools and sketches of the job.<br>**Practical -** One job involving development of surfaces, marking on sheet metal cutting, bending, joint preparation by folding. |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory

- Oral examination conducted on the syllabus and term work mentioned above

**Instruction to Students:**

Each student is required to maintain a workshop diary consisting of drawing / sketches of the job sand a brief description of tools, equipment and procedure used for doing the job.

**Reference/Textbooks:**

1. K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi,2010.
2. Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.

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**Syllabus of F. Y. B. Tech. All Branches (Semester I)**

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|---|---|
| Course Code: ESC205 | Credits: 0-0-1 |
| Course: Lab-V: Engineering Graphics | Teachers Assessment: 25 Marks |
| Teaching Scheme: Practical: 02Hrs/week | End Semester Examination/Oral: 25 Marks |

**Course Objectives**

Following are the objectives of the course

1. To develop vision and imagination skill required for drawing engineering components.
2. Enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient.
3. Develop the ability to communicate with others through the language of technical drawing and sketching.
4. Ability to read and interpret engineering drawings created by others.

**List of Practical**

1. **Introduction: -**

   Drawing Instruments and their uses. (Practice of drawing instruments)

2. **Drawing standard sand geometrical construction**:

   Types of lines, lettering, dimensioning, scaling conventions. Geometrical construction. Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side. (Use A2 sheet and sketch book)

3. **Projections of Planes**

   Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes. (Minimum 4 problems on A2-sheet)

4 **Projections of Solids**

   Types of solids, projections of solids like cube, Prism, Pyramid, Cone and Cylinder with its axis perpendicular to one reference plane and parallel to the other,

   Solids with axis inclined to one of the reference planes and parallel to the other.(Minimum 4 problems on A2 sheet)

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| | 5. **Orthographic Projections**<br>Introduction to orthographic projection, drawing of 2-D orthographic views of objects from isometric views. (Minimum 4 problems on A2 sheet)<br>6. **Isometric Projections**<br>Isometric projections: Isometric scale, drawing of isometric views and projections from given orthographic views. (Minimum 4 problems on A2 sheet) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Engineering Drawing | N.D. Bhatt | Charotar Publishing House | 46th Edition |
| 2. | A text book of Engineering Graphic | K.V.Natarajan | Dhana lakshmi Publishers | 31st Edition |
| 3. | Engineering Graphics | K.Venugopalan d V.PrabhuRaja | New Age International(P) Ltd | 1st Edition |
| 4. | Engineering Drawing with an Introduction to AUTOCAD | Dhananjay A. Jolhe | McGraw HillEducation | 1st Edition |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester I)**

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|---|---|
| Course Code: HSM201<br>Course: Lab-VI: Communication Skills<br>Teaching Scheme: Practical:02 Hrs/week | Credits: 0-0-1<br>Teacher Assessment: 25 Marks |

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| **Course Objectives** | 1. To apply English Grammar in day to day communication.<br>2. To pronounce and articulate English words and sentences accurately<br>3. To communicate in English effectively by using updated vocabulary.<br>4. To apply Soft Skills from campus to corporate.<br>5. To exhibit etiquettes through their behavior from campus to corporate. |

| Sr. No. | Section | Contents |
|---|---|---|
| **Unit-I** | **Grammar** | Parts of Speech |
| **Unit-II** | | Tenses and the Concept of Time |
| **Unit-III** | | Transformation of sentences and Conditional Clauses |
| **Unit-IV** | **Vocabulary Enhancement** | • Types of Vocabulary<br>• Basic techniques to Enhance Vocabulary<br>• Vocabulary Enhancing Activities |
| **Unit-V** | **Introduction to Phonetics** | Phonetics and problems in learning and using pronunciation,<br>• Vowel sounds & Consonant Sounds,<br>• Articulation of Sounds<br>• Word accent |
| **Unit-VI** | **Soft Skills** | • Importance of Soft Skills in general,<br>• Campus to Corporate Etiquettes: (Grooming, Mobile, Classroom) |

| Textbooks/ Reference Books | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| | 1. | The Essence of Effective Communication | Adrian Budday, Ron Ludlow and Fergus' Panton | Prentice Hall of India-Private Ltd. | 1992 |
| | 2. | Professional | A. K. Jain, Pravin, | S. Chand & | 2018 |

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|---|---|---|---|---|---|
| | | Communication Skills | S. R. Bhatia, A. M. Sheikh | Company Ltd. | |
| | 3. | Business Communication | Urmila Rai, S. M. Rai | Himalya Publishing House | 9th Edition |
| | 4. | Technical Communication-Principles and Practice | Meenakshi Raman & Sangeeta Sharma | Oxford University Press | 2nd Edition |
| | 5. | A course in Phonetics & Spoken English | J. Sethi, P.V. Dharmatma | PHI Publication | 2nd Edition |
| | 6. | Communication Skills for Engineers | Sunita Mishra, C. Murli Krishna | Pearson Education | 2nd Edition |
| | 7. | Grammar of Spoken and Written English | DauglasBiber, Geoffrey Leech | Longman | 1st Edition |
| | 8. | English Grammar and Composition | Wren and Martin, | S. Chand Publications | 1st Edition |
| **Mode of Conduct** | Use of audio video sessions, demonstrations, group activities and games, simulation activities | | | | |

**Classroom Activities:**

1. Self- Introduction Use of Audio, video sessions, demonstrations, group activities and games, scene enactments.
2. Review a film clipping
3. Guess the word, Telephonic Conversations
4. Dumb Charades
5. Dialogues, Situational conversation, Relay conversation.
6. Analyse a newspaper article
7. Spot the error, clues.
8. Newspaper articles, Reports, Editorials.
9. Picture Composition
10. Paragraph Writing

11. Group Activity-follow instructions, enacting.
12. Crossword Puzzles, Scramble
13. Memory Games.
14. Chinese Whispers, Follow Instructions

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Online Examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | | | | | |
|---|---|---|---|---|---|
| Course Code: HSM251<br>Course: Lab-VII: Cognitive Aptitude<br>Teaching Scheme: Practical:02 Hrs/week | | | Credits: 0-0-1<br>Teacher Assessment: 25 Marks | | |
| **Objectives** | 1. To improve cognitive aptitude skills.<br>2. To improve thinking ability of students | | | | |
| **Unit-I** | Introduction to aptitude assessment, Classification, Numbers, Applications of HCF and LCM Variation, Linear Equations, Number Systems, Ages, Averages, Percentage, Ratio and Proportion, Simple Interest, Compound Interest, Mensuration. (4 Hrs) | | | | |
| **Unit-II** | Divisibility Rules, Time & Work, Pipes and Cisterns, Boats and Streams, Partnerships, Problems on Trains, Working with different efficiencies, Work equivalence, Division of wages. (4 Hrs) | | | | |
| **Unit-III** | Relative Speed, Problems based on Races, Percentages as Fractions.and Decimals, Fundamental Counting principle, Basics of Permutation and Combination, Probability. (4 Hrs) | | | | |
| **Unit-IV** | Coding Decoding, Direction Sense, Blood Relations, Analogy (word, letter, number, mixed), Ranking and Ordering, Eligibility Testing, Syllogism, Inequaliies. (4 Hrs) | | | | |
| **Unit-V** | Sitting Arrangements, Clock and Calendar, Statements & Arguments, Statements & Course of Action, Cause and Effect, Cubes and Dice, Image Analysis (mirror & water images) (4Hrs) | | | | |
| **Unit-VI** | Cubes and Cuboid, Error Detection, Grammar, Cloze Test, Comprehension, Double Fillers, Para jumbled sentences, One-word substitution (4 Hrs) | | | | |
| **Textbooks/ Reference Books** | **Sr. No.** | **Title** | **Author** | **Publication** | **Edition** |
| | 1. | Quantitative Aptitude for Competitive | Dr. R. S. Aggarwal | S. Chand Publications | 2017 |



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| | | Examinations | | | |
| | 2. | A Modern Approach to Logical Reasoning | Dr. R. S. Aggarwal | S. Chand Publications | 2018 |
| | 3. | The Hands-on Guide to Analytical Reasoning and Logical Reasoning | Peeyush Bhardwaj | Arihant Publication | 2015 |
| | 4. | Quantitative Aptitude for Campus Interview Vol I | Dinesh Khattar | Pearson | 4th Edition |
| | 5. | How to Prepare for Logical Reasoning | Arun Sharma | McGraw Hill Publication | 5th Edition |
| | 6. | Logical Reasoning and DI | Nishit Sinha | Pearson Publication | 7th Edition |
| | 7. | Critical Thinking | Moore, Parker | McGraw Hill Publication | 13th Edition |
| | 8. | How to Prepare for Quantitative Aptitude | Arun Sharma | Tata McGraw Hill | 5th Edition |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Examination conducted on the syllabus.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester I) | |
|---|---|
| Course Code: ESC206<br>Course: Mandatory Non-Credit course (Environmental Studies)<br>Teaching Scheme: 02 Hrs/week | |
| **Objectives** | 1. To raise the awareness, about the emerging environmental issues.<br>2. To study the implementation of environmental policies and practices.<br>3. To study environment as a whole with all the basic concepts related to it. |
| **Unit-I** | **Multidisciplinary nature of Environment:**<br>Components of Environment, Structure of Atmosphere, Environmental Degradation, Sustainable development, Environmental ethics (4 Hrs) |
| **Unit-II** | **Natural Resources:**<br>Conventional (Exhaustive) Resources - Forest, Water resources, Alternative (In exhaustive) Resources i.e., Solar energy, Wind energy, Tidal energy etc. Role of individual in conservation of natural resources. (4 Hrs) |
| **Unit-III** | **Environment & Human health:**<br>Water quality & health, Air quality & health, Industry and health, Energy & Health. Government organizations in the field of Environment, Institutions working in Environment and conservation, Environmentalists in Environment, and conservation. (4 Hrs) |
| **Unit-IV** | **Biodiversity and its conservation:**<br>A. Conservation of wildlife, Forest conservation, Soil, Water and Energy Conservation.<br>B. Solid waste management, Plastic waste management, E- waste management.<br>(4 Hrs) |
| **Unit-V** | **Environmental Audit and legislations:**<br>A. EIA in India, MoEF, ISO environmental standards, Environmental Management System (EMS),<br>B. Power/ Functions of State Pollution Control Board and Central Pollution Control Board. (4 Hrs) |

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| **Unit-VI** | **Social Issues and Environmental laws:** Environmental Protection Act (1986), Air Act(1981), Water Act(1974), Forest Act(1980), Wildlife Protection Act. (4 Hrs) | | | | |
| **Textbooks/ Reference Books** | **Sr. No.** | **Title** | **Author** | **Publication** | **Edition** |
| | 1. | Handbook of Environmental Laws, Rules guidelines, compliances and standards Volume I and II | Dr. R. K. Trivedy | Enviro Media | 3rd Edition |
| | 2. | Textbook of environmental | Erach Bharucha | University Press | 1st Edition |
| | 3. | Environmental chemistry and pollution control | Dr. S. S Dara & Dr. D. D. Mishra | S. Chand | 7th Edition |
| | 4. | Environmental Biotechnology | S. N. Jogdand | Himalaya Publishing | 1st Edition |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches(Semester II) | |
|---|---|
| Course Code: BSC151<br>Course: Statistics and Integral Calculus<br>Teaching Scheme:<br>Theory: 03 Hrs/week<br>Tutorial: 01Hr/week | Credits: 3-1-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2Hrs |
| **Prerequisite** | Students requires sufficient amount of knowledge of certain topics related to Statistics and Integral Calculus. |
| **Objectives** | 1. To provide basic ideas of statistics including measures of central tendency and dispersion.<br>2. To develop mathematical skills and logical understanding of the subject.<br>3. To analyze and find solutions of problems in engineering.<br>4. To apply knowledge of mathematics in engineering and technology. |
| **Unit-I** | **Statistics-I**<br>Introduction to Statistics, Measures of central tendency: Mean, Median and Mode. (5 Hrs) |
| **Unit-II** | **Statistics-II**<br>Measures of dispersion: Quartiles, Quartile deviation, Coefficient of Quartile deviation, Mean deviation, Coefficient of Mean deviation, Standard deviation, Variance, Coefficient of variation, Skewness, Measures of Skewness: Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness.(7 Hrs) |
| **Unit-III** | **Curve Tracing and Rectification**<br>Tracing of curves in Cartesian form, Tracing of curves in Polar form, Rectification of plane curves (Cartesian and Polar)(6 Hrs) |
| **Unit-IV** | **Integral Calculus**<br>Reduction Formulae, Beta Function, Gamma Function, Relation between Beta and Gamma Function (without proofs)(6 Hrs) |
| **Unit-V** | **Multiple Integrals**<br>Double Integration in Cartesian and Polar co-ordinates, Change of order of Integration, Change to polar co-ordinates, Triple integral. (6 Hrs) |

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| **Unit-VI** | **Applications of Multiple Integrals**<br>Application to areas, volumes, surfaces areas and volume of revolutions (6Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | A Text Book of Applied Mathematics Volume-I | P. N. Wartikar J. N. Wartikar | Pune Vidyarthi Griha Prakashan, Pune | 9th Edition |
| 2. | Advanced Engineering Mathematics | H. K. Dass. | S.Chand and Co.Ltd | 18th Edition |
| 3. | Higher Engineering Mathematics | Dr. B. S. Grewal | Khanna Publishers | 46th Edition |
| 4. | Higher Engineering Mathematics | B.V. Ramana | Tata McGraw-Hill Publishing Co.Ltd. | 1st Edition |
| 5. | Advanced Engineering Mathematics | Erwin Kreyszig | Wiley eastern Ltd. Mumbai | 10th Edition |
| 6. | A Text Book of Engineering Mathematics | Peter O'Neil | Thomson Asia Pvt. Ltd., Singapore | 7thEdition |
| 7. | Advanced Engineering Mathematics | C. R. Wylie & Barrett | Mc Graw Hill Publishing Company Ltd | 6th Edition |
| 8. | Advanced Engineering Mathematics | M.D. Greenberg | Pearson Education | 2nd Edition |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester II) | |
|---|---|
| Course Code: ESC151<br>Course: Python Programming<br>Teaching Scheme: Theory:03 Hrs / week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2Hrs |

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| **Prerequisite** | Basic Mathematics |
| **Objectives** | 1. To introduce basic constructs of python programming language.<br>2. To make Engineering graduates learn python data types and their operations. |
| **Unit-I** | **Introduction to Python Programming**<br>Python Language- history, features, advantages, Applications of Python , Comparison with other programming languages<br>Installing python, installing Pycharm IDE. Getting python help online. Structure of Python Program, data types, simple arithmetic operations, Comments, Type Conversions, Flowchart, Algorithm (6 Hrs) |
| **Unit-II** | **Flow Control and Loops**<br>Decision Making : if statement, if…else statement, if..elif ..else statement, Nested if statement, The Get construct (6 Hrs) |
| **Unit-III** | **Loops**<br>While loop , for loop, nested loops, range() function, continue and break statement (6 Hrs) |
| **Unit-IV** | **Functions**<br>Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement (6 Hrs) |
| **Unit-V** | **Lists & Sets**<br>Python List- syntax: add-remove item, access, modify, slice, loop through list; predefined list methods with example, application |

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| | Python Set- syntax: add-remove, item access, modify, predefined list methods, Compare list and set (6 Hrs) |
| **Unit-VI** | **Tuples & Dictionary**<br>Python Tuple- syntax: add-remove, access, change value, loop through tuple, predefined tuple methods<br>Python Dictionary- syntax: add-remove, access, change value, loop through values, levels of dictionary, predefined dictionary methods, applications of dictionary (6 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Think Python | Allen B. Downey | O'Really | 2nd Edition |
| 2. | Dive into Python 3 | Mark Pilgrim | Apress | 2nd Edition |
| 3. | Learning with Python | Allen B. Downey | Dreamtech | 1st Edition |
| 4. | The Complete Reference Python | Martin C. Brown | Mc Graw Hill | 4th Edition |
| 5. | Head First Python | Paul Barry | O'Really | 2nd Edition |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester II) | |
|---|---|
| Course Code: ESC152<br>Course: Engineering Mechanics<br>Teaching Scheme:<br>Theory:03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2Hrs |

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| **Prerequisite** | Introduction to basic terminologies involved in physics. |
| **Objectives** | 1. To study the forces and their effects on the bodies in motion or at rest.<br>2. To study the mechanics of rigid bodies and deformed bodies.<br>3. To study the properties of plane surfaces, analysis of simple trusses and concept of friction. |
| **Unit-I** | **Force System:** Introduction, Fundamental concept, principle of superposition, fundamental laws of mechanics, coplanar force system, components, resultant, moment of a force, Varignon's Theorem, couple, Equivalent force couple system.<br>**Equilibrium of forces:** Introduction, free body diagram, beam, Equilibrium of force system, Lami's Theorem. (10 Hrs) |
| **Unit-II** | **Friction:** Introduction, advantages and limitations of friction, characteristics of frictional force, Theory of friction, Types of friction, Laws of friction, Important definitions.<br>**Plane Trusses:** Introduction, classification of trusses, assumption made in the analysis of truss, Analysis of statically determinate truss by method of joint and method of section. (8 Hrs) |
| **Unit-III** | **Properties of Plane Surfaces:** Introduction, Centroid, Centre of gravity, Important definitions, Determination of centroid, Positions of centroid, Moment of Inertia, Polar moment of inertia, Radius of gyration, Theorems of moment of inertia. (6 Hrs) |

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| **Unit-IV** | **Kinematics of Particles:** Introduction, basic terms and definitions, Rectilinear motion of the particles, Motion curves under uniform acceleration, linear motion under gravity, linear motion under variable acceleration, motion curves under variable acceleration, Motion of projectiles, Relative motion. (6 Hrs) |
| **Unit-V** | **Kinetics of Particles:** Introduction, important terms and definitions, linear motion of a particle by Newton's second law of motion and D'Alembert's principle. (3 Hrs) |
| **Unit-VI** | **Impulse, Momentum and Impact:** Introduction of Impulse and Momentum, important terminologies, principle of impulse and momentum, law of conservation of linear momentum, Recoil of gun, Impact, types of central impact, loss of kinetic energy during impact. (3 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Engineering Mechanics | S.S. Bhavikatti | New Age International Publication | 8th Edition |
| 2. | Engineering Mechanics | R.K.Bansal | Laxmi Publication | 4th Edition |
| 3. | Engineering Mechanics | A.R.Basu | Dhanpat Rai | 2nd Edition |
| 4. | Engineering Mechanics | Nelsonand Mclean | McGraw Hill Book,Inc | 2nd Edition |
| 5. | Engineering Mechanics | B.Prasad | Khanna Publications | 9th Edition |
| 6. | Engineering Mechanics: Principles of Statics and Dynamics | R.C. Hibbler | Pearson Education | 14thEditi on |
| 7. | A Textbook Of Engineering Mechanics | R.S. Khurmi | S. Chand | 22ndEditi on |

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester II)**

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|---|---|
| Course Code-:ESC153<br>Course Title: Electrical and Electronics Engineering<br>Teaching Scheme:<br>Theory:03Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs |

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| **Objectives** | 1. To introduce fundamental concepts, various laws-principles, and Basic knowledge of Electrical quantities<br>2. To impart knowledge related to electromagnetism for understanding basics of electrical machines.<br>3. To provide knowledge of some electronic devices and rectifier circuits.<br>4. To expose the students to working of digital circuits, transducers and their application |
| **Unit-I** | **AC and DC Fundamentals**<br>Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. Laws of resistance, resistivity, Concept of AC and DC, Ohms law Series and parallel combination of resistance, Kirchhoff's laws, Definition of Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, and Power Factor. Advantages of three phases over single-phase<br>(6 Hrs) |
| **Unit-II** | **Magnetism & Electromagnetic Induction**<br>Flux, flux density, magnetic field strength, mmf, reluctance, permeability. Comparison between electric and magnetic circuits. Faraday's laws of electromagnetic induction, Lenz's law, Flemings's right-hand rule for Generators, Fleming's left-hand rule for motors. (6 Hrs) |
| **Unit-III** | **Electrical Machines**<br>Construction, working and classification of the transformer, Significance of Emf |

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| | equation (no derivation) Voltage ratio, three-phase induction motor Construction, types of Alternator: - construction and working principle and application. Single-phase Induction motors: Construction, applications of a) Split phase induction motor b) Capacitor start capacitor run induction motor, Universal motor (6 Hrs) |
| **Unit-IV** | **Semiconductor devices and its applications** Semiconductor and its types, PN Junction Diode, Zener Diode, LED,BJT, JFET **Rectifiers** Types Half wave, Full wave, Bridge rectifiers, Ripple factor, Efficiency and PIV, Comparison, Uses of filters in rectifier circuit, Basic blocks of Regulated Power Supply (6 Hrs) |
| **Unit-V** | **Digital Circuit** Basic logic gates, universal logic gates, Boolean algebra, Introduction to logic Families, Half Adder, Full Adder, Multiplexer, De-multiplexer, SR-Flip-Flop. (6Hrs) |
| **Unit-VI** | **Transducers** Definition, Classification of Transducers, Operation of Transducers-Temperature Measurement -RTD, Thermocouple, Thermistor, Pressure Measurement-Strain Gauge, Displacement measurement- LVDT (6 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | ABC of Electrical Engineering | B.L.Thereja A.K.Thereja | S.Chand Publishing | 1st Edition |
| 2. | Basic Electrical Engineering | J.B. Gupta | S.K. Kataria& Sons | 14th Edition |
| 3. | Basic Electrical Engineering | V.K.Mehta | S.Chand Publishing | 2nd Edition |
| 4. | Principles of Electronics | V.K. Mehta | S.Chand Publishing | 12th Edition |
| 5. | Modern Digital Electronics | R.P.Jain | TataMc-Graw Hill | 3rd Edition |
| 6. | Electronics Instrumentation | H. S. Kalasi | TataMc-Graw Hill | 2nd Edition |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester II) | |
|---|---|
| Course Code: BSC102<br>Course: Open Elective-II: Engineering Physics<br>Teaching Scheme:<br>Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs |

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| **Objectives** | 1. To let the engineering undergraduates study physical properties, concepts and physical quantities required for the solution of complex engineering problems<br>2. To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems<br>3. To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives.<br>4. To engage engineering undergraduatesextensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities. |
| **Unit-I** | **Optics**<br>The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference<br>Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices.<br>Polarization, Nicol prism, Laurent's half shade polar meter, applications of polarization. (6 Hrs) |

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| **Unit-II** | **Acoustics**<br>Acoustic terminology and definitions, Acoustic Wave Equation and its Basic Physical Measures, Sabine's formula (derivation not necessary) acoustics factor in architectural design.<br>**Ultrasonics**<br>Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves.<br>(6 Hrs) |
| **Unit-III** | **Crystal Structure**<br>Crystalline and amorphous material, lattice and unit cell, Miller indices, SC, BCC, FCC, diamond structure, NaCl structure, imperfections and defects in solids<br>**X-Rays**<br>Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination (6 Hrs) |
| **Unit-IV** | **Nuclear Physics**<br>Nuclear force, liquid drop model, shell model, Nuclear fission and fusion, Q-value of nuclear reaction, nuclear reactor, P-P cycle, C-N cycle, cyclotron, GM counter, applications of nuclear physics in various fields.<br>**Modern Physics**<br>Black body radiation, Planck' s law, Photoelectric effect, Wave particle duality, De- Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing.<br>(6 Hrs) |
| **Unit-V** | **Introduction to solids**<br>Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications. |

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| | Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands<br>Magnetic Materials: Magnetic susceptibility and diamagnetic materials, paramagnetic, ferromagnetic, and, BH characteristics, applications.<br>Nanomaterials and Nanotechnology: Properties of nanomaterials, 0 D, 1 D, 2 D and 3 D nanoparticle, various carbon allotropes, historical instances and day to day examples, Introduction to nanotechnology and applications in various engineering fields.<br>(6 Hrs) |
| **Unit-VI** | **Laser**<br>Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, $CO_2$ laser and semiconductor Laser, applications of lasers in science, engineering and medicine.<br>**Fiber Technology**<br>Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors.<br>(6 Hrs) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **Textbooks/ Reference Books** | 1. | A Text book of Engineering Physics | M. N. Avadhanulu<br>P. G. Kshirsagar | S. Chand & Co. | 7th Edition |
| | 2. | A Text book of Engineering Physics | R. K. Gaur<br>S. L. Gupta | Dhanpat Rai | 3rd Edition |
| | 3. | Fundamentals of Physics | David Halliday, Jearl Walker, and Robert Resnick | Wiley | 6th Edition |

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| | 4. | Elements of X-ray Diffraction | B. D. Cullity | Addison-Wesley Metallurgy Series | 1st Edition |
| | 5. | Nuclear Physics | Irving Kaplan | Narosa Publishing house | 2nd Edition |
| | 6. | Introduction to Solid State Physics | C. Kittel | John Wiley & Sons, Inc | 8th Edition |
| | 7. | Lasers and Non-Linear Optics | B.B. Laud | New Age International | 3rd Edition |
| **Websites and online courses** | 1. | http://science.howstuffworks.com/laser1.htm | | | |
| | 2. | http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html | | | |
| | 3. | http://nptel.ac.in/courses/122107035/ | | | |
| | 4. | http://nptel.ac.in/courses/122104016/ | | | |
| | 5. | https://www.coursera.org/learn/intro-to-acoustics | | | |
| | 6. | https://nptel.ac.in/courses/112/106/112106227/ | | | |
| | 7. | https://nptel.ac.in/courses/113/104/113104081/ | | | |
| | 8. | https://nptel.ac.in/courses/115/102/115102017/ | | | |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches(Semester II) | |
|---|---|
| Course Code: BSC103<br>Course: Open Elective-II: Engineering Chemistry<br>Teaching Scheme:<br>Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration):2 Hrs |

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| **Objectives** | 1. To relate the concepts of Chemistry in all Engineering Disciplines.<br>2. To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry.<br>3. To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials.<br>4. To develop the awareness about powering the future using advanced energy Storage Systems. |
| **Unit-I** | **Advanced Engineering Materials**<br>**Industrial Polymers**: Thermoplastics (PVC) & Thermosetting polymers (Bakelite), Biodegradable polymers (PVa), Properties, Applications<br>**Nanomaterials**: Preparation of nano materials by Laser method, properties and applications of CNTs.<br>**Composite Materials**: Ceramic matrix composites, carbon- carbon composites<br>**Reinforcements**: Silicon carbide, Fiber glass. (6 Hrs) |
| **Unit-II** | **Water Technology:**<br>Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration (6 Hrs) |

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| **Unit-III** | **Fuels and Energy Storage Systems:**<br>Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal & importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG.<br>Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) (6 Hrs) |
| **Unit-IV** | **Lubricants and Coolants**<br>Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index.<br>**Coolants**: Introduction, properties and uses of water and ethylene glycol as coolant. (6 Hrs) |
| **Unit-V** | **Corrosion and its Prevention**<br>Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed& digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating (6 Hrs) |
| **Unit-VI** | **Metallurgical Processes**<br>Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing (6 Hrs) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **Textbooks/ Reference Books** | 1. | Engineering Chemistry | B. Siva Shankar | Mc Graw Hills Publications | 3rd Edition |
| | 2. | Engineering Chemistry | Shelly, Oberi and Malik | Cingage Publication | 1st Edition |
| | 3. | Principles of Polymerization | Odian, G.G | John Wiley & Sons, Inc | 4th Edition |

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|---|---|---|---|---|---|
| | 4. | Engineering Chemistry | Jain & Jain | Dhanpat Rai Publishing | 16th Edition |
| | 5. | Polymer Chemistry | Malcolm P. Stevens | Oxford University Press | 3rd Edition |
| | 6. | A Textbook of Engineering Chemistry | Shashi Chawla | Dhanpat Rai & CO | 10th Edition |
| | 7. | Material Science & Engineering | William Callister and V. Raghavan | Wiley | 9th Edition |
| **Websites and online courses** | 1. | Unit- I – https://onlinecourses.nptel.ac.in/noc21_ch49/preview https://www.explainthatstuff.com/composites.html | | | |
| | 2. | Unit- II – https://nptel.ac.in/content/storage2/courses/116104045/lecture8.pdf https://nptel.ac.in/content/storage2/courses/116104045/lecture6.pdf | | | |
| | 3. | Unit- III – https://nptel.ac.in/content/storage2/courses/121106014/Week12/lecture38.pdf https://www.sciencedirect.com/topics/engineering/proximate-analysis | | | |
| | 4. | Unit- IV – https://nptel.ac.in/courses/112/102/112102014/ https://nptel.ac.in/content/storage2/courses/112105127/pdf/LM-12.pdf | | | |
| | 5. | Unit- V - https://nptel.ac.in/courses/113/108/113108051/ | | | |
| | 6. | Unit- VI -https://nptel.ac.in/courses/112/107/112107144/ | | | |

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester II)**

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|---|---|
| Course Code: BSC104<br>Course: Open Elective-II: Biology for Engineers<br>Teaching Scheme:<br>Theory: 03 Hrs/week | Credits: 3-0-0<br>Mid Semester Examination-I: 15 Marks<br>Mid Semester Examination-II: 15 Marks<br>Continuous Internal Evaluation: 10 Marks<br>Teacher Assessment: 10 Marks<br>End Semester Examination: 50 Marks<br>End Semester Examination (Duration): 2 Hrs |

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| **Objectives** | To introduce students to modem biology with an emphasis on evolution of biology as a multi-disciplinary field, to make them aware of application of engineering principles in biology, and engineering robust solutions inspired by biological examples. |
| **Unit-I** | Introduction to Molecular Biology, Central Dogma of life, DNA replication, Translation and transcription, Introduction to Genetics, Phylogenetic analysis, Introduction to developmental biology, structure and functions of cell. (8 Hrs) |
| **Unit-II** | Introduction to immunology, components of the immune system, antigens and antibodies, B-cells and T- cells development, proliferation and differentiation, MHC Restriction, Complement system. (6 Hrs) |
| **Unit-III** | Infectious diseases, TB, HIV, Flue, COVID-19, response of host to infectious diseases. Vaccines, cancer biology. (4 Hrs) |
| **Unit-IV** | Introduction to bioinformatics, tools of bioinformatics, primary and secondary data bases, sequence alignments, methods of structure prediction of proteins, homology modeling (6 Hrs) |
| **Unit-V** | Introduction to Analytical Instrumentation, Electrophoresis techniques, Chromatography types and techniques, Isoelectric focusing, PCR and ELISA (6 Hrs) |
| **Unit-VI** | Environmental biosafety, bioresources, biodiversity, bioreactors, ethical aspects of plant and animal biotechnology, Engineering designs inspired by examples in biology, Engineering aspects of some Nobel Prizes in Physiology and Medicine & Chemistry / recent advances in Biology (6 Hrs) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **Textbooks/ Reference Books** | 1. | Essentials of Genetics. | Miko, I. & Lejeune, L., eds. | Cambridge, MA: NPG Education | 2009 |
| | 2. | Essentials of Cell Biology | O'Connor, C. M. & Adams, J. U. | Cambridge, MA: NPG Education | 2010 |
| | 3. | Molecular Biology of the Gene | Warson JD, Baker, TA, Bell SP, Gann A, Levin M, Losick R, | Pearson Education | 2004 |
| | 4. | The Greatest Show on Earth: The Evidence For Evolution | Dawkins, R | Bantam Press, Transworld Publishers | 2009 |
| | 5. | The Blind Watchmaker | Dawkins, R | W. W. Norton & Co | 1996 |
| | 6. | The Double Helix: A Personal Account of the Discovery of the Structure of DNA | Watson, J. D. | Simon & Schuster Inc. | 2011 |

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester II) | |
|---|---|
| Course Code: ESC251<br>Course: Lab-I: Python Programming<br>Teaching Scheme:<br>Practical: 02Hrs/week | Credits: 0-0-1<br>End Semester Examination/Oral: 25 Marks |
| **Objectives** | Course will enable students to develop programs in python programming language and identify use of various data structures available in python. |
| **List of Practical (Any 10 Practical)** | 1. Installation of Python and IDE for Python Programming – Pycharm<br>2. Using flowchart and algorithm for problem solving<br>3. Develop program using arithmetic operations in python<br>4. Develop program using conditional statements (if-else) and logical operators in python<br>5. Develop program using conditional statements (if-elif-else) and relational operators in python<br>6. Develop program using conditional statements (nested-if) in python<br>7. Develop program using loops in python<br>8. Develop program using nested loops in python<br>9. Develop program using function in python.<br>10. Develop program to demonstrate operations on python lists<br>11. Develop program to demonstrate operations on python sets<br>12. Develop program to demonstrate operations on python tuple<br>13. Develop program to demonstrate operations on python dictionary |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester II) | |
|---|---|
| Course Code: ESC252<br>Course: Lab-II: Engineering Mechanics<br>Teaching Scheme: Practical: 02 Hrs/week | Credits: 0-0-1<br>Teacher Assessment: 25 Marks |
| **Objectives** | A Knowledge of Engineering Mechanics help the engineers to deal with the facts, laws, principles and applications to the real life problems through which the creation of new systems by way of research, design and developments in engineering practices. |
| **List of Practical** | **Part I: Graphical Solutions: (Two problems each)**<br>1. Resultant of Concurrent and Non-Concurrent Coplanar Force System<br>2. Problems on Beam Reaction<br>3. Problems on Analysis of Pin-jointed Trusses<br>**Part II: Laboratory Experiments: (Any Six)**<br>1. Parallelogram Law of Forces<br>2. Lami's Theorem<br>3. Beam Reactions<br>4. Member Forces in Trusses<br>5. Jib Crane<br>6. Moment of Inertia of Fly Wheel<br>7. Simple Screw Jack<br>8. Differential Axle and Wheel<br>9. Belt Friction |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. Non-Circuit Branches (Semester II) | |
|---|---|
| Course code-ESC253<br>Course Title: Lab III: Electrical and Electronics Engineering<br>Teaching Scheme: Practical: 02Hrs/week | Credits: 0-0-1<br>End Semester Examination/Oral: 25 Marks |

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| **List of Practical (Any 5 practical from each section)** | **Electrical Engineering**<br>1. To study the accessories to be used in household wirings and awareness of electric safety<br>2. i) To understand the concept of Phase, Neutral & Earthling in Electrical Installation.<br>ii) Single Lamp controlled by single switch circuit.<br>3. To study & Demonstrate Staircase Wiring.<br>4. To study & understand the importance of Series Lamp.<br>5. To Verify Ohm's Law.<br>6. To verify the Voltage Ratio of Single-Phase Transformer.<br>**Electronics Engineering**<br>7. To study characteristics of Semiconductor diode.<br>8. To study Half Wave and Full Wave Rectifier.<br>9. To plot the characteristics of BJT in CE configuration.<br>10. To study logic gate application as a Half Adder<br>11. To study use of LVDT for displacement measurement<br>12. Implementation and testing of circuits like amplifier, Power supply on bread board. |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester II) | |
|---|---|
| Course Code: BSC201<br>Course: Lab-IV: Open Elective-II: Engineering Physics<br>Teaching Scheme: Practical:02Hrs/week | Credits: 0-0-1<br>Teacher Assessment: 25 Marks |

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|---|---|
| **List of Practical** | **Any 10 practical to be conducted**<br>1. Newton's ring: To determine wavelength of monochromatic light<br>2. G. M. Counter: dead time calculation<br>3. Grating: To determine wavelength of LASER light.<br>4. Polarimeter: To determine concentration of solution.<br>5. Reverberation time: To determine Reverberation time of a hall.<br>6. Characteristics of solar cell<br>7. Ultrasonic interferometer<br>8. Zener diode: To study characteristics of zener diode & to determine zener voltage.<br>9. Dielectric constant: to determine dielectric constant.<br>10. Forbidden gap: To determine forbidden gap of semiconductors.<br>11. Transistor Characteristics in CE Configuration.<br>12. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier.<br>13. Planck's Constant<br>14. To measure the divergence of the laser beam |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester II) | |
|---|---|
| Course Code: BSC202<br>Course Lab-IV Open Elective-II: Engineering Chemistry<br>Teaching Scheme: Practical: 02 Hrs/week | Credits: 0-0-1<br>Teacher Assessment: 25 Marks |

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| **List of Practical** | **Any 10 practical to be conducted**<br>1. Lab safety experiment (Only as introduction)<br>2. Preparation and standardization of analytical reagents<br>3. Analysis of Chemical parameters of water<br>4. Analysis of physical parameters of water<br>5. Determination of percentage of moisture and ash in given coal sample.<br>6. Determination of Acid value/ saponification value of lubricating oil.<br>7. Determination of viscosity of chemical compound<br>8. Preparation of polymer<br>9. Electro gravimetric Estimation of Metals (Virtual experiment)<br>10. Determination of chloride content of water by Mohr's method (Virtual experiment)<br>11. Determination of melting or boiling point of organic compound. (Virtual experiment)<br>12. Determination of rate of corrosion in different pH media. (Virtual experiment)<br>13. Preparation of nano materials<br>14. Determination of molecular weight of polymer using Ostwald's viscometer |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

| Faculty of Science & Technology<br>Syllabus of F. Y. B. Tech. All Branches (Semester II) | |
|---|---|
| Course Code: BSC203<br>Course: Lab-IV Open Elective-II: Biology for Engineers<br>Teaching Scheme: Practical: 02 Hrs/week | Credits: 0-0-1<br>Teacher Assessment: 25 Marks |

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|---|---|
| **List of Practical** | 1. Biosafety laboratory practices and biological waste disposal<br>2. Buffers in biology, buffering capacity and pKa<br>3. Observing cell surface and intracellular contents using light and/or fluorescence microscopy<br>4. Measuring mechanical strength of cells - osmolarity and elasticity of biological membranes<br>5. Protein and DNA isolation from plant cells, visualization of proteins and DNA<br>6. Microbial culture - growth curve and enumeration methods<br>7. Basic molecular biology techniques - including isolation of bacterial plasmids demos on Polymerase Chain Reaction and Restriction Fragment Length Polymorphism<br>8. Mammalian and plant cell culture methods |

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester II)**

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|---|---|
| Course Code: HSM101-B<br>Course: Engineering Exploration-II<br>Teaching Scheme:<br>Practical: 02Hrs/week | Credits: 0-0-1<br>Teacher Assessment: 10 Marks<br>Continuous Internal Evaluation: 20 Marks<br>Oral Examination (Project): 20 Marks |

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| **Objectives** | • To make student understand the role of an Engineer as a problem solver.<br>• To introduce sustainability perspectives.<br>• To get students familiar with engineering project management skills.<br>• To make students explore different aspects of platform-based development. |
| **Unit-I** | **Platform based development**<br>Introduction to various platforms, platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino microcontroller. (16 Hrs) |
| **Unit-II** | **Project Management**<br>Introduction to Agile practices, Significance of team work, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation. (3 Hrs) |
| **Unit-III** | **Data Acquisition and Analysis**<br>Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition (Temperature and humidity) using Sensors interfaced with Arduino, Exporting acquired data to Microsoft Excel and analysis using visual representation. (4 Hrs) |
| **Unit-IV** | **Sustainability in Engineering**<br>Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon foot print. (1 Hr) |

| | Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|---|
| **Textbooks/ Reference Books** | 1 | Engineering Design: A Project Based Introduction | C.L. Dym, P. Little | Wiley Publication | 4th Edition |
| | 2 | Project Design & Development | Karl Ulrich | McGraw Hill Publication | 5thEdition |
| | 3 | Theory of Machines | S. S. Rattan | McGraw Hill Publication | 4thEdition |
| | 4 | Getting Started with Arduino | Massimo Banzi | O'Reilly | 1stEdition |
| | 5 | Project Management Methodologies and Framework | - | Active.collab | 1stEdition |
| | 6 | Manuals and datasheets of respective software and hardware tools | | | |

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester II)**

Course Code: HSM252

Course: Mandatory Non-Credit Course (Language Proficiency-German Language)

Teaching Scheme: Practical: 02 Hrs./week

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| **Objectives** | | • Students will be able to apply communicative German Grammar in communication.<br>• Students will be able to enhance the level of German vocabulary.<br>• Students will be able to pronounce and articulate words as well as sentences accurately.<br>• Students will be able to understand and apply German language eventually.<br>• Students will be able to develop German language skills.<br>• Students will be able to manage situational communication in German. |
| **Unit-I** | : | **Introduction**<br>- Self –Introduction<br>- Nos. up to 10,000<br>- Weekdays, Months<br>- Date and Time<br>- Greetings (6 Hrs) |
| **Unit-II** | : | **Vocabulary**<br>- My house<br>- My family<br>- Daily routine<br>- Hobbies<br>- Food (6 Hrs) |
| **Unit-III** | : | **Grammar**<br>- Verb forms (Present Tense)<br>- Articles<br>- Possessive pronouns |

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| | | - Auxiliary verbs<br>- Wh-Questions / Yes-No Questions<br>- Past-Tense of haben and sein (12 Hrs) | | | |
| **Textbooks/ Reference Books** | **Sr. No.** | **Title** | **Author** | **Publication** | **Edition** |
| | 1. | German Made Simple: Learn to speak and understand German quickly and easily | Arnold Leitner | Crown | 2006 |
| | 2. | The Everything Learning German Book: Speak, write, and understand basic German in no time | Edward Swick | Adams Media | 2nd Edition |
| | 3. | Langenscheidt German in 30 Days | Von Angelika G. Beck | Langenscheidt | 2007 |
| | 4. | Complete German Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself | Heiner Schenke | The McGraw Hill | 1st Edition |
| | 5. | German: How to Speak and Write It (Beginners' Guides) | Joseph Rosenberg | BN Publishing | 2011 |
| | 6. | Collins Easy Learning – Collins Easy Learning German Grammar and Practice | Collins | Collins | 2016 |

**Faculty of Science & Technology**

**Syllabus of F. Y. B. Tech. All Branches (Semester II)**

Course Code: HSM253

Course: Mandatory Non-Credit Course(Language Proficiency-Japanese Language)

Teaching Scheme: Practical: 02 Hrs./week

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|---|---|
| **Objectives** | 1. Students will be able to apply communicative Japanese Grammar in communication.<br>2. Students will be able to enhance the level of Japanese vocabulary.<br>3. Students will be able to pronounce and articulate words as well as sentences accurately.<br>4. Students will be able to understand and apply Japanese language eventually.<br>5. Students will be able to develop Japanese language skills.<br>6. Students will be able to manage situational communication in Japanese. |

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| **Unit-I** | : | **Introduction**<br>- Introduction<br>- Numbers<br>- Days, Months, Dates | (8 Hrs) |
| **Unit-II** | : | **Grammar**<br>- Verb and verb forms<br>- Present and Past Tense | (8 Hrs) |
| **Unit-III** | : | **Communication**<br>- Introduction of Japanese script<br>- Dialogues (Shopping, in the restaurant)<br>- Themes: Family, my city, my country, my friend | (8 Hrs) |

**Textbooks/ Reference Books**

| Sr. No. | Title | Author | Publication | Edition |
|---|---|---|---|---|
| 1. | Japanese Kanji for Beginners | Timothy G. Stout and Kaori Hakone | Tuttle Publishing | 2017 |
| 2. | Essential Japanese Grammar: A | Masahiro Tanimori and Eriko | Tuttle Publishing | 2012 |

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|---|---|---|---|---|---|
| | | Comprehensive Guide to Contemporary Usage | Sato Ph.D. | | |
| | 3. | 15-Minute Japanese: Learn in Just 12 Weeks | D.K. Goel and Rajesh Goel | DK | 2019 |
| | 4. | Oxford Japanese Grammar and Verbs (Dictionary) | Bunt Jonathan | Oxford University Press | 2003 |
| | 5. | Read and write Japanese scripts: Teach yourself | Helen Gilhooly | Teach Yourself | 1st Edition |
| | 6. | Complete Japanese Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself | Helen Gilhooly | Teach Yourself | 3rd Edition |