CURRICULUM
Revised Scheme
for the Academic year 2018 – 2019

COMMON TO ALL BRANCHES

I & II SEMESTER

RAMAIAH INSTITUTE OF TECHNOLOGY
(Autonomous Institute, Affiliated to VTU)
Bangalore – 560054.
Ramaiah Institute of Technology (RIT) (formerly known as M. S. Ramaiah Institute of Technology) is a self-financing institution established in Bangalore in the year 1962 by the industrialist and philanthropist, Late Dr. M S Ramaiah. All engineering departments offering bachelor degree programmes have been accredited by NBA. RIT is one of the few institutes with faculty student ratio of 1:15 and achieves excellent academic results. The institute is a participant of the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. All the departments are full with competent faculty, with 100% of them being postgraduates or doctorates. Some of the distinguished features of RIT are: State of the art laboratories, individual computing facility to all faculty members. All research departments are active with sponsored projects and more than 150 scholars are pursuing Ph.D. The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up on campus. RIT has a strong Placement and Training department with a committed team, a fully equipped Sports department, large air-conditioned library with over 1,35,000 books with subscription to more than 300 International and National Journals. The Digital Library subscribes to several online e-journals like IEEE, JET etc. RIT is a member of DELNET, and AICTE INDEST Consortium. RIT has a modern auditorium, several hi-tech conference halls, all air-conditioned with video conferencing facilities. It has excellent hostel facilities for boys and girls. RIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association. RIT obtained Academic Autonomy for all its UG and PG programs in the year 2007. As per the National Institutional Ranking Framework (NIRF), MHRD, Government of India, Ramaiah Institute of Technology has achieved 60th rank in 2018 among the top 100 engineering colleges across India.
VISION OF THE INSTITUTE

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio-economic needs.

MISSION OF THE INSTITUTE

RIT shall meet the global socio-economic needs through

- Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization.

- Establishing research clusters in emerging areas in collaboration with globally reputed organizations.

- Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs.

QUALITY POLICY

We at M.S. Ramaiah Institute of Technology, strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stakeholders concerned.

VISION AND MISSION OF THE DEPARTMENTS:

DEPARTMENT OF MATHEMATICS

VISION

To mould the students to have strong Mathematical and analytical skills to meet the challenges open to them.

MISSION

To provide the students with a strong Mathematical foundation through course which cater to the needs of Industry, research and higher education.
DEPARTMENT OF CHEMISTRY

VISION
Department strives for development of curriculum viewing emerging trends in technology with a balanced approach towards Institute Industry interaction and academic excellence along with research in basic sciences.

MISSION
Providing outstanding teaching and quality training in chemistry to all students at all levels and in all disciplines and also develop and maintain research programs of national and international relevance and serve the society through unique expertise and talent found in the department.

DEPARTMENT OF PHYSICS

VISION
To develop undergraduate courses of best academic standards comparable to universities of international repute and be a catalytic agent to help students to manifest their latent potential.

MISSION
To provide the best training through teaching and research to enable the students to master the concepts in physics and apply successfully to real time problems and kindle their interest in cutting edge research areas.

DEPARTMENT OF HUMANITIES

VISION
The department of Humanities, MSRIT aspires to achieve excellence in teaching and training the young engineering students in the areas of humanities and social sciences through outcomes based quality education and nurture them to emerge as professional leaders, lifelong learners and responsible citizens of global community.

MISSION
The mission of the department is to offer courses that aim to strengthen the student’s creative and critical thinking, problem solving abilities, communication skills and broaden intellectual perspectives, to understand and deal with social realities through continuous learning experiences.
PROGRAM OUTCOMES (POs):

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
## Faculty List:

**Department of Mathematics**

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<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>Qualification</th>
<th>Designation</th>
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<tr>
<td>1</td>
<td>Dr. N. L. Ramesh</td>
<td>M.Sc., Ph.D</td>
<td>Professor &amp; HOD</td>
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<tr>
<td>2</td>
<td>Dr. V. Ramachandramurthy</td>
<td>M.Sc., Ph.D</td>
<td>Professor &amp; I Year Coordinator</td>
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<tr>
<td>3</td>
<td>Dr. S. H. C. V. Subba Bhatta</td>
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<td>Dr. Monica Anand</td>
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<td>6</td>
<td>Dr. Dinesh. P. A</td>
<td>M.Sc., M.Sc (IT)., M.Phil., Ph.D</td>
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<tr>
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<td>Dr. M. V. Govindaraju</td>
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<td>8</td>
<td>Mr. Vijaya Kumar</td>
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<tr>
<td>9</td>
<td>Dr. A. Sreevallabha Reddy</td>
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<td>10</td>
<td>Mr. R. Suresh Babu</td>
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<td>Dr. M. S. Basavaraj</td>
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<td>Mr. Azghar Pasha. B</td>
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<td>Dr. Girinath Reddy. M</td>
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<td>Assistant Professor</td>
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<td>15</td>
<td>Mrs. Uma. M</td>
<td>M.Sc., (Ph.D)</td>
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<td>16</td>
<td>Mr. S Ram Prasad</td>
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<td>Ms. Kavitha. N</td>
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<td>Mrs. Sushma. S</td>
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<td>Dr. Nancy Samuel</td>
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<td>20</td>
<td>Dr. Kalyan Chakravarthy</td>
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### Department of Physics

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<td>Dr. A. Jagannatha Reddy</td>
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<td>Professor &amp; HOD</td>
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<td>2</td>
<td>Dr. Seema Agarwal</td>
<td>M.Sc., M.Phil., Ph.D</td>
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<td>3</td>
<td>Dr. Ravindra M Melavanki</td>
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<td>4</td>
<td>Dr. Sandhya. K. L</td>
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<td>Dr. Nagesh. B. V</td>
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<td>Dr. Siddlingeshwar</td>
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<td>Dr. Kalpana Sharma</td>
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<td>Ms. Gopika C</td>
<td>M.Sc.</td>
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### Department of Chemistry

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<td>Dr. B. M. Nagabhushana</td>
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<td>Prof. B. S. Durgakeri</td>
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<td>Dr. P. Muralikrishna</td>
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<td>Dr. Sharath. D</td>
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### Department of Humanities

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<td>Asst. Professor &amp; I/C HOD</td>
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<td>Mrs. Kanya Kumari. S</td>
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<td>Mr. Uday Kumar. H. M</td>
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<td>Mrs. Sukanya,N</td>
<td>M.A</td>
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<td>Mrs. Nimmy.V.S</td>
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L – Lecture (One Hour)  T – Tutorial (Two Hours)  P – Practical (Two Hours)  * Non Credit Mandatory Course
## RAMAIAH INSTITUTE OF TECHNOLOGY, BANGALORE – 560 054
(Autonomous Institute, Affiliated to VTU)

REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR 2018 – 2019

### II SEMESTER  B.E.

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L – Lecture (One Hour)  T – Tutorial (Two Hours)  P – Practical (Two Hours)  * Non Credit Mandatory Course
RAMAIAH INSTITUTE OF TECHNOLOGY, BANGALORE – 560 054  
(Autonomous Institute, Affiliated to VTU)  
REVISED SCHEME OF TEACHING FOR THE ACADEMIC YEAR  2018 – 2019

Branches: ME, IM, TC, CV, EE and BT

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| Total   |              |                                              |                                          | 14      | 4  | 4  | 20    | 30                   |

L – Lecture (One Hour)    T – Tutorial (Two Hours)    P – Practical (Two Hours)  * Non Credit Mandatory Course
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<td>Physics</td>
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<td>MEL29</td>
<td>Workshop Practice</td>
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L – Lecture (One Hour)       T – Tutorial (Two Hours)       P – Practical (Two Hours)       * Non Credit Mandatory Course
ENGINEERING MATHEMATICS - I

Course code: MA11
Prerequisite: Nil
Course Coordinator: Dr. S.H.C.V. Subba Bhatta

UNIT I

Differential Calculus - I: Polar curves, angle between the radius vector and the tangent, angle between the curves, length of perpendicular from pole to the tangent, pedal equations.

Partial Differentiation: Partial derivatives, Euler's theorem. Total differential coefficient, differentiation of composite and implicit functions, Jacobians and properties.

UNIT II

Integral Calculus - I: Reduction formulae \( \sin^n x, \cos^n x, \sin^m x \cos^n x \), sevaluation of these integrals with standard limits, Tracing of curves (both Cartesian and polar). Application of integration – length of arc of a curve, plane areas, volumes and surface area of revolution.

UNIT III

Integral Calculus - II: Multiple integrals- evaluation of double and triple integrals, change of order of integration, change of variables. Applications of double and triple integrals to find areas and volumes.

UNIT IV


UNIT V

Vector integration: Line integrals, surface integrals and volume integrals. Green's theorem (with proof) and its applications, Stokes' theorem (without proof), and its applications Gauss divergence theorem (without proof) and its applications.

Text Books:

Reference Books:

Course Outcomes:
At the end of the course, students will be able to:
1. Apply the knowledge of calculus and multivariate calculus to solve problems related to polar curves, composite functions and Jacobians.(PO1, PO2)
2. Analyze guiding properties of the curve to trace the curve and use integration to find the application of those plane curves.(PO1, PO2)
3. Apply the concept of change of variables and change of order of integration to evaluate multiple integrals. Use multiple integrals to find areas and volumes.(PO1, PO2)
4. Apply the knowledge of vector differentiation to identify solenoidal and irrotational vectors and solve problems using vector identities.(PO1, PO2)
5. Exhibit the interdependence of line, surface and volume integrals using integral theorems.(PO1, PO2)
ENGINEERING PHYSICS

Course code: PY12/22

Prerequisite: Nil

Course Coordinator: Dr. K.L. Sandhya

Course Credits: 3:1:0

Contact Hours: 42L+14T

UNIT-I

Crystal structure:
Forces between atoms — Cohesion of atoms and equilibrium atomic spacing— Expression for cohesive energy.
Crystal structure—Space lattice --unit cell, primitive cell, Bravais lattice and crystal systems-- Determination of Miller indices of Crystal planes—Inter planar spacing - Bragg's law and applications –Powder and single crystal X-ray diffraction methods for cubic unit cells – Crystal structure of NaCl and Diamond.

UNIT –II

Elasticity and Vibrations:
Elasticity—Introduction --Hooke's law — Poisson's ratio— Derivations for Y, K, n in terms of linear and lateral strains-- Relationship between Y, k, n and $\sigma$ – Torsion of a cylinder and determination of couple per unit twist—Torsion pendulum—Determination of rigidity modulus using torsion pendulum --Bending moment of a beam (qualitative) – Cantilever loaded at free end.

Vibrations -- Introduction to vibrations—Analysis of Free and damped vibrations –under, over and critical damping—logarithmic decrement and quality factor—Forced vibrations and Resonance —LCR circuits and electrical resonance.

UNIT –III

Concepts of Modern Physics and Quantum Mechanics:
Particle nature of electromagnetic radiation—Discussion of Blackbody spectrum—Wien's law, Rayleigh Jeans law , Stefan -Boltzman law and Planck's law (qualitative)—Deduction of Wien's law and Rayleigh Jeans law from Planck's law -- Compton effect .

Wave nature of particles—de-Broglie waves—Phase and group velocities—Expression for group velocity from superposition principle—Equivalence of group velocity to velocity of particle--Relationships between phase velocity and group velocity in dispersive and non dispersive media—Heisenberg's uncertainty relationships--
Applications (intrinsic line width of spectral lines and non confinement of electrons in atomic nucleus)—characteristics of a well behaved wave function—Born approximation and normalization of the wave function—Setting up of one dimensional time independent Schrodinger's wave equation from classical wave equation—Particle in an infinite one dimensional potential well.

UNIT—IV

Electrical conduction in solids:
Metals—Classical free electron theory of metals—Expression for electrical conductivity - Drawbacks of classical free electron theory--Quantum free electron theory—Density of energy states in a metal --- Fermi energy at 0 K—Effect of temperature on Fermi-Dirac Distribution function- Effect of temperature on f(E), n(E) vs E and g(E) vs E graphs. Merits of quantum free electron theory.
Semiconductors: Formation of energy bands in solids (qualitative)—Density of energy states in conduction and valence bands of a semiconductor—Thermal equilibrium concentration of electrons in conduction band—Intrinsic carrier concentration—Hall effect.

UNIT –V

Lasers and Optical fibers:
Lasers—Interaction of radiation with matter—Absorption—spontaneous emission and stimulated emission--Expression for energy density of radiation in terms of Einstein coefficients at thermal equilibrium—Requisites of a laser system-- Three and four level lasers--Principle and operation of He-Ne and semiconductor Lasers– Holography.
Optical Fibers—Propagation mechanisms in optical fibers, Angle of acceptance and Numerical aperture –Types of optical fibers—Step index and graded index fibers--Intermodal dispersion—Attenuation in optical fibers—Optical fiber communication system (Block diagram)

Text Books:
Reference Books:

Course Outcomes:
At the end of the course, students will be able to:
1. Apply the concepts to designate crystal planes and use Bragg's law to identify different types of cubic crystals.(PO1)
2. Analyze elastic modulii in different cases and enumerate free, damped and forced vibrations.(PO1)
3. Apply the quantum theory to understand the electrical conductivity of metals and calculate carrier concentration in metals and semiconductors.(PO1)
4. Enumerate the construction and working of simple laser systems, holography, distinguish between different types of optical fibers and apply the concepts to optical communication system.(PO1)
5. Distinguish between phase and group velocities; solve Schrödinger's time independent wave equation for the case of infinite potential well.(PO1)
ELEMENTS OF MECHANICAL ENGINEERING

Course code: ME13/23
Prerequisite: Nil
Course Coordinator: Dr. T Anil Kumar

Course Credits: 3:0:0
Contact Hours: 42L

UNIT I

Steam boilers: Formation of steam at constant pressure, Conditions of steam, Properties of steam with simple numerical problems. Boilers, Boiler mountings, Accessories and applications;

Steam turbine: Prime movers, Impulse and Reaction turbine, Definitions of compounding, methods of compounding,

Gas turbine: Classification, Working principles and operations, Open and closed cycle gas turbines;

Water turbine: Classification, Working principle of Pelton, Francis and Kaplan turbines, Demonstration of boilers and prime movers.

UNIT II

Internal combustion engines: Classification, Parts of an I.C. engine, 2 stroke, 4 stroke, petrol and diesel engines, Simple numerical problems on indicated power, Indicated thermal efficiency, Brake power, Brake thermal efficiency, Mechanical efficiency, Specific fuel consumption, Demonstration of I.C. engine.

Refrigeration and air conditioning: Classification of refrigeration, working principles of vapor compression and vapor absorption refrigerator, Properties of refrigerant, Working principle of window air conditioner.

UNIT III

Metal removal processes: Machine tools, specifications of lathe, parts of engine lathe, Working principle, Lathe operations; Plain turning, Facing, Parting, Grooving, Knurling, Taper turning and Thread cutting. Drilling machine: Working principles of bench and radial drilling machines, Drilling operations; Drilling, Reamers, Boring, Counter sinking, Counter boring, Spot facing. Milling machines: Methods of cutting, Milling machines; Horizontal and Vertical Milling operations; Plain, Angular, Slot, Form, Straddle, Gang, Face and End milling. Demonstration of the above machine tools.

UNIT IV

Computer numerical control machines: Numerical Control, Computer Numerical Control and Direct Numerical Control.

Introduction to Composites: Role of matrix and reinforcements, MMCs, PMCs and CMCs, Advantages, limitations and applications.

UNIT V

Power transmission: Belt drives; Types, Velocity ratio, Slip, Length of belts for open belt and cross belt drive, Angle of lap, ratio of belt tensions, Power transmitted, Creep in belt drive. Pulleys; Stepped, Tight and loose, Idler, Simple numerical problems. V-belt drive, Gear drives: Classification of gears, Spur gear nomenclature, Velocity ratio, Pinion and rake, Helical gears, Bevel gears and Worm gears. Gear train: Train values, Classification of gear trains and their uses, Simple numerical problems on Simple, Compound and Reversed gear trains.

Text Books

Reference Books
Course Outcomes:
At the end of the course, students will be able to:

1. Recognize various conditions of steam, its formation using boilers, prime movers for various power plants and other applications. (PO1, PO2, PO7)
2. Illustrate the construction and working of I.C. engines, refrigeration and air conditioning systems required for transportation, domestic and industrial purpose. (PO1, PO2, PO7)
3. Identify various machining process, joining and other manufacturing techniques used for the production of various components. (PO1, PO2)
4. Differentiate the power transmission systems used in various applications. (PO1, PO2)
5. Identify the significance of mechanical engineering concepts in various fields of engineering applications. (PO1, PO2, PO4, PO12)
BASICS OF CIVIL ENGINEERING AND MECHANICS

Course code: CV14/24
Prerequisite: Nil
Course Coordinator: B. Suguna Rao

Course Credits: 3:0:0
Contact Hours: 42L

UNIT I

Introduction to Civil Engineering-
Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural development, Effect of the infrastructural facilities on socio-economic development of a country.
Roads: Types of Roads and their functions, Dams: Different types of Dams based on Material, Structural behaviour and functionality with simple sketches.
Materials of Construction: Properties & applications of PCC, RCC, PSC and steel.

UNIT II


UNIT III

Equilibrium of concurrent force system: Equilibrium of coplanar concurrent system of forces, free body diagram, Conditions of equilibrium. Definition of Equilibrant, Numerical problems on equilibrium of coplanar concurrent force systems.

Equilibrium of non-concurrent force system: Equilibrium of non-concurrent system of forces, Types of loads, supports for beam, statically determinate and indeterminate beams, Numerical problems on statically determinate beams subjected to concentrated load,
Uniformly distributed load, Uniformly Varying Load and their combinations Problems on equilibrium of different force systems.

UNIT IV

**Centroid:** Definition of Centroid & Centre of Gravity, Axes of Symmetry, Location of Centroid of Rectangle, Triangle, Semicircle, Quadrant and sector of a circle by method of integration. Numerical problems on Centroid of Composite sections.

**Moment Of Inertia:** Concept of Moment of inertia, perpendicular axis theorem, parallel axis theorem, and moment of inertia of Rectangular, Circular, Semicircular, Quadrant of a circle Triangular sections by method of integration. Numerical Problems on moment of inertia of composite section.

UNIT V

**Friction:** Definition of Friction and its applications, angle of friction, angle of repose, coefficient of friction. Types of Friction, laws of static friction, Description and application of friction on blocks on horizontal and inclined planes.

**Kinematics**

**Text Books:**

**Reference Books:**

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

1. Describe various fields of Civil Engineering and summarize the construction materials. (PO1, PO10)
2. Analyze coplanar force systems. (PO1, PO2, PO3)
3. Determine the equilibrium of coplanar force systems and statically determinate beams. (PO1, PO2, PO3)
4. Locate the centroid and compute the moment of inertia of plane figures. (PO1, PO2, PO3)
5. Apply friction laws to analyze the problems on friction and apply the relationship between motions of bodies. (PO1, PO2, PO3)
BASIC ELECTRONICS

Course code : EC15/25  
Course Credits: 3:0:0
Prerequisite: Semiconductor Physics  
Contact Hours: 42L
Course Coordinator: Jayashree S

UNIT I

Semiconductor Diodes and Applications: P-N junction diode, DC equivalent circuits, Half-Wave Rectifier, Two Diode Full Wave Rectifier, Bridge Rectifier, Capacitor filter circuit, Zener diode voltage regulators (with no load and loaded regulator), 78xx based fixed IC voltage regulator

Bipolar Junction Transistors: BJT Operation, Common Emitter Characteristics, (Numerical examples as applicable)

UNIT II

BJT Biasing: DC load line and bias point, Voltage divider bias (Numerical examples as applicable)

AC analysis of BJT Circuits: Common emitter circuit analysis (Qualitative analysis only)

Signal Generators: Conditions for oscillations, BJT phase shift oscillator, BJT Colpitt's and Hartley oscillators (Qualitative analysis only)

UNIT III

Field Effect Transistors: Junction Field Effect Transistors (JFET), JFET characteristics and parameters, Metal Oxide Semiconductor Field Effect Transistors (MOSFETs): Depletion and Enhancement MOSFET, Complementary Metal Oxide Semiconductor (CMOS)

Op-Amps: Ideal Op-Amp, Basic Op-amp circuits: Inverting amplifier, Non-inverting amplifier, voltage follower, summer, subtractor, integrator, differentiator. (Numerical examples as applicable)

UNIT IV

Digital Electronics: Number Systems: Decimal, Binary and Hexadecimal number systems, converting from Decimal to Binary/Hexadecimal, converting Binary to Decimal/Hexadecimal, converting Hexadecimal to Binary/Decimal, Complement of Binary Numbers.

Flip Flops: Introduction to Flip-Flops, NAND gate latch/NOR gate latch, RS Flip-Flop.

UNIT V


Applications: Block diagram of analog and digital communication systems, block diagram of a digital TV system, block diagram of satellite communication, Principle of operations of a mobile phone.

Text Books:

Reference Books:

Course Outcomes:
At the end of the course, students will be able to:
1. Describe semiconductor devices and its applications.(PO1, PO2)
2. Analyze the various circuits of BJT.(PO1, PO2)
3. Employ op-amp in various circuits.(PO1, PO2)
4. Analyze digital circuits.(PO1, PO2)
5. Appreciate the importance of transducers and communication systems.(PO1, PO2)
ENVIRONMENTAL STUDIES

Course code: **HS 16/26**
Prerequisite: **Nil**
Course Coordinator: **B. Suguna Rao**

**Course Credits:** 0:0:0  
**Contact Hours:** 28L

**UNIT- I**

**Environment, Ecology and Biodiversity**
Definition, scope and importance of Environmental Studies. Multidisciplinary nature of Environmental Studies. The concept of an ecosystem, biotic and abiotic components of an ecosystem and their interaction. Food chain and food web. Energy flow and material cycling in ecosystem and balanced eco system. Biodiversity, ecological values of biodiversity and threats to biodiversity. Concept of sustainable development, objectives and applications of sustainable development.

**UNIT- II**

**Natural resources**
Forest resources-ecological importance of forests, deforestation, causes of deforestation and remedial measures. Water resources & global water resources distribution. Mineral resources and environmental impacts of mining. Food resources- effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity. Land resources- landslides, soil erosion and desertification.

**UNIT- III**

**Energy sources**

**UNIT- IV**

**Environmental pollution**
Definition, causes, effects and control measures of water pollution, air pollution and soil/land pollution. Management of municipal solid waste & treatment methods for municipal solid waste. Dams:benefits and problems. Effects of housing and infrastructure development on environment.
Environmental protection

Text Books:

Reference Books:

Course Outcomes
At the end of the course, students will be able to:
1. Describe the importance of environmental studies, sustainable development and biodiversity.(PO1, PO7)
2. Discuss the importance of natural resources, environmental impacts on these resources and suggest remedial measures.(PO1, PO7)
3. Distinguish different types of energy sources and identify alternative energy for sustainable development.(PO1, PO7)
4. Identify the causes, effects and control measures of environmental pollution.(PO1, PO7)
5. Outline the current environmental issues and the role of agencies for environmental protection.(PO1, PO7)
KANNADA MANASU

Course code: HS17/27 (M)
Course Coordinator: Mrs. Kanya Kumari. S

Course Credits: 0:0:0
Contact Hours: 28L

9.  ಬಾಲಮೆ – ೧
   ಬಾಲಮೆ ತಾಳೆಗಳು: ಕಾಲಿ, ಜಗತ್ತಿ ಸಾಮಾಜಿಕ ವಿಧಾನದ, ವಸ್ತುವಿದ್ಯೆಗಳ
   ಉದ್ದೇಶಕ್ಕೆ ಮೂಲಕ

10. ಬಾಲಮೆ – ೨
   ಗುರುವಿನ ಗುರುವಿನ ವೈವಿಧ್ಯಾಧಾರಗಳು (ತುಂಬಾಗುಡು)

11. ಬಾಲ ಬಹುಪದ್ಧಾರ ಬಾಲವಳಕ್ಕೆ ಮೂಲಕ – ೨. ನ.ಪ. ಅಮೀ (ಕಾಲಿಯ ನಿಜಿತ, ಸಾಮಾಜಿಕ)

12. ತಂತ್ರಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ಪ್ರಕಾಶ್ಯ – ೩. ಹ.ಪ. (ಕಾಲಿಯ ವೈವಿಧ್ಯಾಧಾರ, ಸಾಮಾಜಿಕ)

13. ತಂತ್ರಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ಪ್ರಕಾಶ್ಯ – ೪. ಹ.ಪ. (ಕಾಲಿಯ ವೈವಿಧ್ಯಾಧಾರ, ಸಾಮಾಜಿಕ)

14. ತಂತ್ರಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ಪ್ರಕಾಶ್ಯ – ೫. ಹ.ಪ. (ಕಾಲಿಯ ವೈವಿಧ್ಯಾಧಾರ, ಸಾಮಾಜಿಕ)

15. ತಂತ್ರಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ಪ್ರಕಾಶ್ಯ – ೬. ಹ.ಪ. (ಕಾಲಿಯ ವೈವಿಧ್ಯಾಧಾರ, ಸಾಮಾಜಿಕ)

16. ತಂತ್ರಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ಪ್ರಕಾಶ್ಯ – ೭. ಹ.ಪ. (ಕಾಲಿಯ ವೈವಿಧ್ಯಾಧಾರ, ಸಾಮಾಜಿಕ)

17. ತಂತ್ರಜ್ಞಾನ ತಂತ್ರಜ್ಞಾನ ಪ್ರಕಾಶ್ಯ – ೮. ಹ.ಪ. (ಕಾಲಿಯ ವೈವಿಧ್ಯಾಧಾರ, ಸಾಮಾಜಿಕ)

ನಂದಿಸುವ ಮುಖ್ಯ ಅಧ್ಯಯನೆಗಳು: ಸಂಕ್ಷರಗಳು, ಕಾಲಿಯ ಮಾರ್ಗೀಯ – ಕಾಲಿಯ ಸಾಮಾಜಿಕತೆಯ ಸಂಕ್ಷರಗಳು ಮಾರ್ಗೀಯ 2015.

ಇನ್ನೆರಡು ವಿಷಯಗಳು:

೧. ಅಗಾಧಕ್ಕೆ 'ಕಾಲಿಯ ಮಾರ್ಗೀಯ ವಿಷಯ'
೨. ಸಾಮಾಜಿಕ ಮಾರ್ಗೀಯ ವಿಷಯ 'ಕಾಲಿಯ ಮಾರ್ಗೀಯ, ರಾಜಶಾಹಿ'.
(Course Outcomes):

(1) PO12

(2) PO6, PO12

(3) PO6, PO12
KANNADA KALI

Course code: **HS17/27 (K)**

Course Coordinator/s: Smt. Premila Swamy D & Smt. Kanya Kumari. S

Course Credits: **0:0:0**

Contact Hours: **28L**

UNIT -I

Lesson 1: Introducing each other- personal pronouns, interrogative words.
Lesson 2: Introducing each other - possessive forms, Noun and verb.

UNIT -II

Lesson 3: About Ramayana. Adjectives, usage of tenses, formation of words and sentences.
Lesson 4: Enquiring about college. Qualitative and quantitative adjectives.

UNIT -III

Lesson 5: Enquiring about room. Preposition.
Lesson 6: Vegetable Market- Dative case, Kannada alphabets and basic numerals.

UNIT -IV

Lesson 7: About medical college - Ordinal numerals, plural markers.
Lesson 8: In a cloth shop - Color adjectives, vocabulary, Translation.

UNIT -V

Lesson 9: Plan to go for picnic- Imperative and permissive, Names of the days, Kannada script writing.
Lesson 10: Enquiring about friends and family- verb, Corresponding negation, dialogue and paragraph writing.

Text Book:


Reference Book:

Course Outcomes:
At the end of the course, students will be able to:
1. Develop vocabulary. (PO10)
2. Enrich language skills for various purposes. (PO6, PO12)
ENGINEERING PHYSICS LABORATORY

Course code: PYL18/28
Prerequisite: Nil
Course Coordinator: Dr. S. Vaijayanthimala

Course Credits: 0:0:1
Contact Hours: 14P

Engineering Physics Lab experiments

1. General Instructions and Introduction to Error Analysis.
2. Plotting of forward and reverse bias characteristics of a Zener Diode and determination of breakdown voltage.
3. Determination of input, output and mutual characteristics of a transistor and calculation of $\alpha$ and $\beta$ values.
4. Measurement of capacitance and dielectric constant of a capacitor by charging and discharging it through a resistor.
5. Calculation of Planck's constant using LEDs.
6. Verification of Stefan's law
7. Identification of different components (L, C or R) of a Black Box and calculation of their values through frequency response curves.
8. Determination of Moment of inertia of an irregular body and calculation of rigidity modulus of the material of the suspension wire using torsional oscillations.
12. Determination of Fermi energy of a metal.
15. Calculation of thickness of given paper strip by the method of interference fringes (Air wedge).
17. Determination of Hall coefficient and concentration of charge carriers of the semiconductor.
18. Analysis of X-ray powder photograph and determination of lattice constant by Debye-Scherrer method.
19. Simulation of electrical experiments using Pspice

- Students are required to perform 12 prescribed experiments (from 2 to 18) in the above list. Cyclic order will be followed.
- Experiment 19 is compulsory for all students.

**Reference Book:**
1. Laboratory manual prepared by the Physics department, RIT, Bangalore.

**Course Outcomes**
At the end of the course, students will be able to:
1. Determine elastic constants of material using torsion pendulum and cantilever. (PO1, PO 4)
2. Apply the concepts of interference and diffraction of light to determine thickness of thin films and wavelength of light. (PO1, PO 4)
3. Construct and analyze simple AC and DC circuits to determine electrical parameters, familiarity with the concepts of modern Physics. (PO1, PO4, PO5)
WORKSHOP PRACTICE

Course code: MEL19/29  
Prerequisite: Nil  
Course Coordinator: Mr. Arun Kumar P C

Course Credits: 0:1:1  
Contact Hours: 14T+14P

1. **Fitting Shop:** Fitting of any three common joints. (3 classes)
2. **Welding Shop:** Welding of any three common joints. (3 classes including sl. No.4)
3. **Sheet Metal Work** Sheet-metal models – Rectangular Prism closed at one end, Rectangular 90° tray & Funnel.
4. **Machine Shop:** Two lathe models involving step turning, taper turning and knurling operations. (2 classes)
5. Demonstration of Radial drilling machine operations and typical milling operations.
6. Practice of drilling using lathe and drilling machine.
7. Practice of use of Power Tools for common machining operations. (2 classes including 5 & 6)
8. Disassembling and Assembling of Mechanical Assemblies. (2 classes)

Test: 1 class

**Text book:**

**Reference Books:**

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

1. Remember the role of basic workshop practices in the functioning of various daily life appliances. (PO1, PO2, PO3, PO5, PO12)
2. Understand the significant details of workshop tools, machines and simple fabrication processes. (PO1, PO2, PO3, PO12)
3. Apply the knowledge of workshop practice methods to demonstrate utilitarian skills. (PO1, PO3, PO5, PO12)
ENGINEERING MATHEMATICS-II

Course code: MAT21  
Course Credits: 3:1:0

Prerequisite: Engineering Mathematics –I (MA11)  
Contact Hours: 42L+14T

Course Coordinator: Dr. S.H.C.V. Subba Bhatta

UNIT I

Differential Calculus - II: Derivatives of arc length, curvature, radius of curvature. Taylor's series and Maclaurin's series (without proof), Taylor's and Maclaurin's series for functions of two variables (without proof), maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT II

Applications of first order and first degree differential equations: Applications of first order and first degree ODEs to solve LCR circuits, Newton's law of cooling and orthogonal trajectories.

Linear differential equations of higher order-I: Linear differential equations of higher order with constant coefficients.

UNIT III

Linear differential equations of higher order-II: Cauchy's and Legendre's linear differential equations, method of variation of parameters – Engineering applications.


UNIT IV

Beta and Gamma Function: Definition, Relation between Beta and Gamma Function, Problems.

Laplace transforms I: Definition, transforms of elementary functions, properties of Laplace transforms, existence conditions, transform of derivatives, integrals, multiplication by tn, division by t, evaluation of integrals by Laplace transforms, unit–step function, unit–impulse function.

UNIT V

Text Books:

Reference Books:

Course Outcomes:
At the end of the course, students will be able to :
1. Apply the knowledge of calculus, multivariate calculus to find arc length, radius of curvature, extreme values, and power Series expansion.(PO1, PO2)
2. Solve analytically first ODE's and higher order linear differential equations with constant coefficients.(PO1, PO2)
3. Solve analytically higher order linear differential equations with variable coefficients and also find the solution of partial differential equations.(PO1, PO2)
4. Analyze the importance of transformation of functions through Laplace transforms. (PO1, PO2)
5. Illustrate the concept of Laplace Transform to solve initial and boundary value problems.(PO1, PO2)
ENGINEERING CHEMISTRY

Course code : CY 12/22
Prerequisite: Nil
Course Coordinators: Dr. B. M. Nagabhushana & Dr. Nagaraju Kottam

Course Credits: 3:0:0  Contact Hours: 42L

UNIT-I


**Batteries (BT):** Basic concepts. Mechanism of battery operation, battery characteristics. Classification of batteries – Primary, secondary and reserve batteries. Modern batteries-construction, working and applications of Al-air, Nickel-metal hydride, Li-MnO$_2$ (Lithium batteries).

UNIT-II


UNIT-III


**Chemistry of nanomaterials (NM):** Introduction to nanomaterials. Synthesis: top-down and bottom-up approaches. Chemical methods of synthesis- solution combustion and
hydrothermal methods. Characterization techniques like PXRD, SEM, and TEM (Introduction & only mention). Applications of nonomaterials.

**UNIT-IV**


**UNIT-V**


**Text Books:**


**Reference Books:**

Course outcomes:

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

1. Apply the knowledge of electrochemistry to improve the efficiency of batteries. (PO1, PO2, PO7)
2. Interpret the reasons of corrosion, monitor and control by using the proper techniques. (PO1, PO2, PO7)
3. Apply different conventional & renewable sources of energy to generate power. Have concept on rearing high octane quality fuels. Apply the knowledge nanomaterials synthesis and their applications. (PO1, PO2, PO7)
4. Analyze the water samples and will have the knowledge to obtained potable water using different techniques. (PO1, PO2, PO7)
5. Apply the knowledge in synthesis of advanced polymers, composites and conducting polymers for different applications. (PO1, PO2, PO7)
CONSTITUTION OF INDIA

Course code: HS13/23
Course Credits: 0:0:0
Prerequisite: Nil
Contact Hours: 28L
Course Coordinator/s: Smt. Premila Swamy D & Mrs. KanyaKumari.S

UNIT - I

UNIT - II

UNIT - III
The Union Executive- President & Vice President, Prime Minister & Council of Ministers, Union Legislature (Parliament) -composition & functions. The Union Judiciary- Supreme Court of India.
State executive-Governor, Chief Minister & council of ministers. State legislature and State judiciary.

UNIT - IV

UNIT - V

Text Books:
Reference Books:

Course outcomes:
At the end of the course, students will be able to:
1. Identify the fundamental principles of Indian Constitution. (PO12)
2. Examine various provisions of Directive Principles of state policies & fundamental duties. (PO6, PO12)
3. Understand the powers of executive, legislature and judicial system. (PO12)
4. Identify the role of election commission & local self government. (PO12)
5. Understand about basic Human rights in India. (PO6, PO12)
PROFESSIONAL COMMUNICATION

Course code: HS14/24

Prerequisite: Nil

Course Coordinator/s: Smt. Premila Swamy D

Course Credits: 2:0:0

Contact Hours: 28L

UNIT-I

Fundamentals of Communication

UNIT-II

Listening and Speaking skills
Definition of Listening, Listening Vs Hearing, Types of Listening, Barriers to listening, Significance of listening, Improvising Listening Skills, Effective speaking, Presentation Strategies.

UNIT-III

Grammar
Words commonly confused, Parts of speech, Usage of Tenses, Usage of Phrasal Verbs and Idioms, Identifying errors in sentences, Vocabulary.

UNIT-IV

Reading and Writing Skills
Reading techniques-Skimming, Scanning, Intensive Reading, Extensive Reading, Reading different kinds of Texts, Effective Writing Skills, Paragraph writing, Expansion of ideas.

UNIT-V

Professional Writing
Professional writing strategies, Letter writing, Drafting job Application letter and Resume's, Email writing, Report writing.

Text books:

**Reference books:**

**Course outcomes:**
At the end of the course, students will be able to:
1. Understand the basic concepts in Communication. (PO9, PO10, PO12)
2. Inculcate Listening & Speaking Skills accurately. (PO10, PO12)
3. Develop grammatical accuracy and Vocabulary. (PO10, PO12)
4. Apply Reading and Writing strategies. (PO10, PO12)
5. Apply Professional writing skills. (PO9, PO10, PO12)
BASIC ELECTRICAL ENGINEERING

Course code: EE15/25  
Course Credits: 2:1:0
Prerequisite: Nil  
Contact Hours: 28L+14T
Course Coordinator/s: Dr. Likith Kumar M V & Sri. Gurunayk Nayak

UNIT-I

Introduction to Electrical Power
Introduction to generation, transmission and distribution of electrical power. AC and DC power. Concept of grid and need for interconnection of grids. Conditions for grid connection. Integration of renewable energy sources to grid- conditions and benefits. Types of loads. Concept of power and energy. Definition of Power Factor. Tariff structure for electrical energy consumption.

UNIT-II

Analysis of DC and AC Circuits
Fundamentals of AC and DC waveforms, representation of AC and DC quantities, average and rms values, form factor, peak factor.

UNIT-III

Introduction to Electrical Machines-I
Faraday’s laws. Static and dynamically induced EMF. Construction and working principle of DC Machine. DC Generator EMF equation. DC Motor Characteristics and applications. Necessity of starter, Numericals.
Construction and working principle of single phase transformer. EMF equation and losses in transformer, Numericals.

UNIT-IV

Introduction to Electrical Machines-II
Advantages of three phase circuits. Relation between line and phase quantities in STAR and DELTA connected systems.
Construction and working principle of Synchronous Generator, EMF equation, Numericals.
Types of Induction motors and applications. Construction and working principle of three phase Induction Motor (Rotating magnetic field), slip, slip speed and frequency of rotor emf, Numericals.

UNIT-V

Special Electrical Machines and Its Applications:
Construction and working principle of BLDC Motor and Stepper Motor and their applications.

Protection and Safety of Electrical Systems:
Introduction to domestic wiring, Fuse, MCB, ELCB and Relay.
Necessity of earthing, difference between earthing and grounding and types of grounding.
Electric shocks, hazards and safety precautions.

Text Books:

Reference Books:
3. EPRI Handbook.

Course Outcomes:
At the end of the course, students will be able to:
1. Understand different types of energy sources and the concepts of generation, transmission and distribution of electrical power.(PO1, PO6)
2. Solve problems in DC and AC circuits.(PO1)
3. Understand the construction and working of DC Machines.(PO1)
4. Understand the construction and working of AC Machines.(PO1)
5. Recognize the importance of protection and safety of electrical systems.(PO6, PO8)
UNIT I

UNIT II

UNIT III
Arrays and Matrices: One-Dimensional Array, Sorting Algorithms, Search Algorithms, Two-Dimensional Arrays. Character Arrays and Strings: Declaring and Initializing string variables, Reading Strings from Terminal, Writing Strings to screen, Arithmetic Operations on characters, putting strings together, Comparison of two strings, String Handling functions

UNIT IV

UNIT V
Pointers: Understanding pointers, accessing the address of a variable, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a variable through its pointer.
File: Introduction to files, Using files in C, Read data from files, Writing data from files

An engineering Problem-Solving Methodology - Compute the straight-line distance between two points in a plane, Problem Solving Applied: Freezing Temperature of Seawater, Problem Solving Applied: Ozone Measurements, Problem Solving Applied: Tsunami Analysis

Text Books:

Reference Books:

Course Outcomes:
At the end of the course, students will be able to:
1. Identify basic elements of computing systems. (PO1)
2. Illustrate the use of control structures, decision making and looping statements and arrays. (PO1, PO2)
3. Illustrate the concepts of C as modular programming language which includes functions, pointers and structures. (PO1, PO2)
4. Implement the concepts of handling strings and files. (PO1, PO2)
5. Applying concepts of C for solving simple real world engineering problems. (PO2)

Note: The topics discussed in tutorials of the Course CSL18/28 Fundamentals of Computing and C Programming Laboratory will be a part of CIE and SEE assessment of this Course.
ENGINEERING CHEMISTRY LABORATORY

Course code: CYL17/27                                      Course Credits: 0:0:1
Prerequisite: Nil                                           Contact Hours: 14P
Course Coordinator: Dr. B. M. Nagabhushana & Dr. Nagaraju Kottam

1. Assessment of suitability of drinking and industrial water by estimation of total hardness.
2. Determination of COD of waste water sample.
3. Design and execute an experiment for finding out % iron content in rust solution.
4. Determination of % Cu in brass by iodometric method.
5. Determination of the amount of chloride present in water sample by Argentometric method.
6. Colorimetric estimation of metal ions (Copper) in test water sample.
7. Estimation of sodium present in water sample by Flamephotometry.
8. Determination of amount of HCl and CH₃COOH present in an acid mixture by conductometry.
9. Estimation of FAS present in the given FAS solution potentiometrically.
10. Determination of pKa value of the given weak acid.
11. Synthesis of nanomaterials by combustion method (Demo)
12. Determination of single electrode potential using secondary reference electrode – Verification of Nernst equation – (Demo)

Reference books:

Course outcomes:
At the end of the course, students will be able to:
1. Analyze handling apparatus in chemical laboratories for analysis of various materials.(PO1, PO2, PO7)
2. Analyze the suitability of water for domestic and industrial consumption. (PO1, PO2, PO7)

3. Evaluate the content and composition of new materials encountered in engineering applications. (PO1, PO2, PO7)

4. Enumerate various sophisticated instruments in professional and research activities. (PO1, PO2, PO7)

5. Apply the knowledge of electrochemistry to improve the efficiency of batteries. (PO1, PO2, PO7)
Course code: CSL18/28  
Prerequisite: Nil  
Course Coordinator: Mrs. Meeradevi K

Course Contents:
1. Basic LINUX Commands, Basic Programming on shell Script  
2. Libreoffice Writer, Spreadsheets(Calc),Databases(Base)  
3. Creation of Scientific Document: Using LaTex,  
4. C-Programming: Using Operators,  
5. C-Programming: Using Conditional Statements  
6. C-Programming: Using Switch Case and GOTO Statement  
7. C-Programming: Using Iterative Statements  
8. C- Programming: Using One Dimensional Arrays  
9. C- Programming: Using Two Dimensional Arrays  
10. C -Programming :Using Character array and Strings  
11. C- Programming: Using Functions Structures and Pointers and Files  
12. C-Programming: Application of C programming to solve simple engineering problems

• The exercises based on the above topics will be formulated and discussed in the Tutorial Class.
• Each student will be given two books, one for the tutorial class (the student will write the solutions for the tutorial exercises) and one for the Laboratory (the student will write the executed program in the Lab class).

Reference Books/Links:
5. https://www.libreoffice.org/get-help/documentation/
Course Outcomes:
At the end of the course, students will be able to:

1. Recall basic UNIX commands and Shell Scripting and prepare a Document, spreadsheet and Database using Libre Office.(PO1, PO5, PO10)

2. Construct a C-program using language constructs such as Operators, Conditional and Iterative Statements, concept such as arrays, functions, Strings, structures and pointers and Files.(PO2, PO5)

3. Develop a C-program to solve simple engineering problems.(PO2, PO5)
COMPUTER AIDED ENGINEERING DRAWING

Course code: ME 19/29
Prerequisite: Nil
Course Coordinator: Dr. Sridhar. B. S

Course Credits: 0:1:1
Contact Hours: 14T+14P

UNIT 1

CAD Software: Learning the drawing commands such as point, line, arc, circle, ellipse, rectangle, polygons etc. Modify commands such as copy, move, mirror, rotate, pattern, scale etc. Dimensions, linear, aligned, radial, angular, etc.

Orthographic projections: Projection of points (I and III Quadrant), projection of lines.

Projection of Planes: Projection of Planes such as triangle, square, rectangle, pentagon, hexagon and circle.

UNIT II

Projection of Solids: Projection of Solids such as cube, prism, pyramid, cylinder, Cone and tetrahedron (No problems on freely suspended from corner and drawing profile view when three positions involved).

UNIT III

Isometric Projection: Isometric scale, isometric projection of simple solids & their frustums, combination of two solids (Co axial).

Text Books:

Reference Books:
Course Outcomes:
At the end of the course, students will be able to:
1. Demonstrate the usage of a CAD software for creating engineering drawings: commands such as draw, copy, move, mirror, rotate, dimensioning. (PO1, PO5, PO9, PO10, PO12)
2. Sketch and draw using the CAD software, the orthographic projections of the following with various conditions of position and orientation: points, lines, Planes and Solids. (PO1, PO5, PO9, PO10)
3. Sketch and draw using the CAD software Isometric projection of a combination of two coaxial solids. (PO1, PO5, PO9, PO10)
course contents
This course will provide an introduction to engineering design process. Students will work in
a group of 4/5 to solve a problem of current concern requiring an engineering solution. They
are required to follow a systematic approach towards developing the solution by considering
technical and non-technical factors. The working model of the solution along with the design
documentation will be considered for final evaluation.

References:
   -Design-Process.pdf

Course Outcomes:
At the end of the course, the students will be able to:
1. Define the problem to be solved in a clear and unambiguous terms. (PO1)
2. Identify and establish the need to solve the problem by gathering relevant literature.
   (PO1)
3. Generate multiple solutions, analyse and select one solution. (PO3, PO4, PO5)
4. Test and implement the solution as a team. (PO9, PO10)
5. Document and present the solution to the peer group. (PO10, PO12)