R19 SYLLABUS

I Semester	L	T	P	C
	3	1	0	4
19MA1T01 - **Calculus and Linear Algebra**				

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, Normal form - solving system of homogeneous and non-homogeneous linear equations- Gauss Elimination, Jacobi and Gauss Seidel methods - Eigen values and Eigen vectors and their properties (without proof).

Learning Outcomes:

At the end of this unit, the student will be able to

solve systems of linear equations, determine the rank, Eigen values and eigenvectors(K2).

Unit II: Cayley-Hamilton theorem and Quadratic forms

Cayley-Hamilton theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton theorem - Reduction to diagonal form - Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- reduce to diagonal form and identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (K3)

Unit III: Multivariable calculus

Expansions of functions: Taylor's and Maclaurin's series - Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Expand the given function as series of Taylor's and Maclaurin's (K3)
- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (K3)
- Acquire the Knowledge in maxima and minima of functions of several variables (K1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (K3)

Unit IV: Multiple Integrals

Double Integrals: change of order of integration, double integrals in polar coordinates, areas enclosed by plane curves.

Triple Integral: Evaluation of triple integrals, change of variables

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates (K3)
- apply double integration techniques in evaluating areas bounded by a region (K4)

Unit V: Special Functions
Beta and Gamma functions and their properties, relation between beta and gamma functions.

Learning Outcomes:
At the end of this unit, the student will be able to
- Conclude the use of special functions in multiple integrals (K3)

Textbooks:
1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42/e, 2012.

References:
1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9/e, 2013.
2. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

Course Outcomes:
At the end of the course, the student will be able to
1. develop the use of matrix algebra techniques that is needed by engineers for practical applications (K3)
2. familiarize with functions of several variables which is useful in optimization (K3)
3. learn important tools of calculus in higher dimensions. Students will become familiar with double integral(K3)
4. familiarize with triple integral and also learn the utilization of special functions

I Semester	L	T	P	C
	3	0	0	3
19BS1T01 – **Engineering Physics**				

COURSE OUTCOMES

After completion of course student able to:

1. Describe Basic crystal systems and determination of crystal structures
2. Explain Magnetic and Dielectric Materials properties
3. Describe Concept of Magnetic Induction and Super Conducting properties
4. Explain Pure & Doped Semiconductor materials for better utility
5. Describe Optical fibers and Optical properties of materials and their applications

SYLLABUS

UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION

CRYSTAL STRUCTURE:
Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

X-RAY DIFFRACTION:
Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg's law-Bragg's Spectrometer.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the seven crystal systems
- **Interpret** the crystal structure based on Bragg's law

UNIT – II: MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Introduction-Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis- soft and Hard Magnetic materials.

DIELECTRIC PROPERTIES: Introduction-Dielectric constant- Relation between three electric vectors-Electronic and ionic polarizations (Quantitative) - orientation polarizations (Qualitative) - Internal fields in solids- Clausius - Mossotti equation.

Learning Outcomes: At the end of this unit, the students will be able to

- **Classify** the magnetic materials into dia, para, ferro, anti ferro and ferri
- **Explain** the importance of hysteresis
- **Explain** the concept of polarization in dielectric materials.
- **Summarize** various types of polarization of dielectrics .
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.

UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY

ELECTROMAGNETIC WAVES: Introduction-Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere's law - Biot-Savart's law-Magnetic Induction due to current carrying circular loop- Faraday's law - Maxwell's equations.

SUPERCONDUCTIVITY: General and Thermal properties –Meissner effect – Type-I and Type-II superconductors – Flux quantization – BCS Theory of Superconductivity - Josephson effects – Applications of Superconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Illustrate** the concept of electro magnetism based on fundamental laws of electro magnetism
- **Explain** Maxwell's equations
- **Summarize** various properties and applications of superconductors

UNIT-IV: PHYSICS OF SEMICONDUCTORS:

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers- Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers- Drift and diffusion – Einstein's equation – Hall Effect- Hall coefficient – Applications of Hall effect– direct & indirect band gap semiconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Summarize** various types of solids based on band theory.
- **Outline** the properties of n-type and p-type semiconductors.
- **Identify** the type of semiconductor using Hall effect

UNIT-V: LASERS AND OPTICAL FIBERS

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

FIBER OPTICS: Introduction to Optical fibers- Critical angle of propagation- Total internal reflection- Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Applications of optical fibers.

Learning Outcomes: At the end of this unit, the students will be able to

- **Design** various types of lasers
- **Explain** the principle and propagation of light through Optical fibers
- **Discuss** the application of lasers and Optical fibers

TEXT BOOK:

M. N. Avadhanulu, P.G. Kshirasagar & TVS Arun Murthy , A text book of "Engineering Physics", S Chand publications, 11th Edition 2019.

REFERENCE BOOKS:

1. Shatendra Sharma and Jyotsna Sharma , Engineering Physics, Pearson Education, 2018.

I Semester	L	T	P	C
	3	0	0	3
19EE1T01 – **Basic Electrical Engineering**				

COURSE OUTCOMES: after successful completion of this course, students should be able to:

CO1 : Solve simple DC circuit using KVL, KCL and Network Theorems.

CO2 : Understand the fundamental concepts of single-phase and three phase systems analysis for simple AC circuit.

CO3 : Demonstrate the construction, working principles and operating characteristics of DC machines, transformer and AC rotating machines.

CO4 : Understand the basic Concepts of Electrical installations.

SYLLABUS

UNIT-I : DC CIRCUIT ANALYSIS

Electrical Circuit Elements (R, L and C), Voltage and Current Sources, Ohms Laws, Kirchoff's Laws and Star/Delta Conversion, Network Reduction Techniques-Series-Parallel- Series and Parallel (Only Resistor), Problems in Simple Circuits with DC Excitation, Superposition, Thevenin's and Norton's Theorems.

UNIT-II : AC CIRCUIT ANALYSIS

Representation of Sinusoidal Waveforms, Peak and RMS Values, Phasor Representation, Real Power, Reactive Power, Apparent Power, Power Factor, Analysis of Single Phase AC Circuits Consisting of R, L, C, RL, RC and RLC Combinations (Series and Parallel), Resonance, Three Phase Circuits- Voltage and Current Relations in Star and Delta Connections.

UNIT-III : DC MACHINES & TRANFORMERS

DC MACHINES: Introduction-Construction Details - Principle of Operation - EMF Equation – Classification Based on Excitation - Torque Equation- Characteristics-OCC of Generator-Load Characteristics of DC Shunt Motor, Type of Starters – Speed Control Methods of DC Motors – Swinburne's Test - Applications -Simple Problems.

TRANFORMERS: Introduction-Constructional Details - Principle of Operation - EMF Equation – OC and SC Test – Equivalent Circuit, Load Test-Voltage Regulation, Losses and Efficiency, Auto Transformer and Three Phase Transformer Connections.

UNIT-IV : AC MACHINES

INDUCTION MOTOR: Introduction-Construction Details - Principle Operation of a Three Phase Induction Motor - Generation of Rotating Magnetic Fields, Torque-Slip Characteristic. Losses and Efficiency, Speed Control of Induction Motor

ALTERNATOR: Introduction-Construction Details - Principle of Operation - Winding Factors-E.M. F Equation - Determination of Voltage Regulation by E.M.F and M.M.F Methods.

SINGLE PHASE INDUCTION MOTOR: Introduction-Construction Details - Theory of Operation - Methods of Starting.

UNIT-V : ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Type of Batteries, Important Characteristics for Batteries. Elementary Calculations for Energy Consumption, Power Factor Improvement and Battery Backup.

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, 3rd edition, 2010.
2. P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, Basic Electrical Engineering, Cengage, 2019.

REFERENCE BOOKS:

1. D.C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 2009.
2. L.S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011
3. E. Hughes, Electrical and Electronics Technology, Pearson, 10th Edition, 2010.
4. Vincent Deltoro, Electrical Engineering Fundamentals, Prentice Hall India,Second Edition, 1989.
5. V K Mehta & Rohit Mehta, Principles of Electrical Engineering and Electronics", S Chand Publishers, 2019 edition.

I Semester	L	T	P	C
	2	0	2	3
19ME1T01- **Engineering Graphics**				

COURSE OBJECTIVE

Engineering drawing is the principle method of communication for engineers; the objective is to introduce the students, the techniques of constructing the various types of polygons, curves. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

COURSE OUTCOMES: Students are able to

CO1: Construct polygons, conics, cycloids, involutes. (K3)

CO2: Draw the orthographic projections of points, lines in different positions. (K2)

CO3: Draw the orthographic projections of plane surfaces in different positions. (K2)

CO4: Draw the orthographic projections of solids like prisms, cylinder, pyramids and cone. (K2)

CO5: Convert Isometric views to orthographic views and vice-versa and also visualize 2D & 3D objects using Auto CAD. (K3)

UNIT I

Polygons: Constructing regular polygons by general methods, describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by Eccentricity method, Cycloid, Epi-cycloid and Hypo-cycloid and Involutes.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes, determination of true lengths, and angle of inclination.

UNIT III

Projections of Planes: regular planes perpendicular and parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Projections of Solids: Prisms, Pyramids, Cone and Cylinder, Simple positions of solids and Axis of the Solid parallel to one plane and inclined to other plane.

UNIT V

Isometric Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

CAD: Fundamentals of AutoCAD - For Polygons, Creating 2d And 3d Drawings.

Using Auto CAD: Computer Aided Design, Drawing practice using Auto CAD simple figures like polygons, creating 2D&3D drawings of objects using Auto CAD.

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. N.D. Butt, Engineering Drawing, Chariot Publications 2016.
2. K. Venugopal, V. Prabhu Raja , Engineering Drawing + AutoCAD, New Age 2010.

REFERENCE BOOKS:

1. K. L. Narayana & P. Kannaiah, Engineering Drawing, Scitech Publishers 2016.
2. PI Varghese, Engineering Graphics, McGrawHill Publishers 2013.
3. K.C. John, Engineering Graphics for Degree, PHI Publishers 2009.

I Semester	L	T	P	C
	0	0	3	1.5
19CS1L02 - **IT Workshop**				

Course Objectives:

1. Understand the components of personal computer system.
2. To Demonstrate the Use of Office Took
3. To know purpose of internet and how to use it.
4. To Introduce Programming Through Visual Programming Tool — Scratch.

Course Outcome: On completion of the course students will be able to

1. Identify the components of a personal computer system and know how it works
2. Demonstrate how to organize files and documents
3. Demonstrate window and menu commands and how they are used
4. Create, format and edit a word, excel documents and prepare PPTs.
5. Send and receive email messages (with or without attachments) and navigate and search through the Internet

LIST OF EXPERIMENTS:

Week l:

Inside a Computer Cabinet:

1. Demonstration of Hardware Components of a Computer.

Week 2:

Demonstration of Operating System:

2. Working with Different Operating Systems (Windows 7/10, Ubuntu).
3. Managing Files and Directories.

Week 3:

4. Working with Different MS-DOS and Unix command
5. Managing Files and Directories.

Week 4:

Text Editing (MS-Word)

6. Creating Bio-Data.
7. Sample Time Table creation.

Week 5:

Presentations (Ms-PowerPoint)

8. Simple presentation about your family and village.
9. Creating a Digital Story with Animations.

Week 6:

Spreadsheets (Ms-Excel)

10. Student Result data creation and Analysis.
11. Representation of student data using different charts.

Week 7:

Building Animations (Scratch)

12. Create an animation for the fall of Humpty Dumpty.

Week 8:

Using Internet

13. Communicating with e-mail.

Week 9:

Cloud based collaboration tools:

14. Event registrations, create quizzes, and analyze responses using Google Forms

Week 10:

15. Simple Static web page creation

Week 11:

16. Simple Static web page creation

References:

1. Anita Goal, Computer Fundamentals, Pearson Education, 1 e, 2010
2. https://scratch.mit.cdu/ideas
3. https://appinventormitedu/exploreki2/tutorials

I Semester	L	T	P	C
	0	0	3	1.5
19BS1L01 - **Engineering Physics Lab**				

STUDENT HAS TO DO ANY TEN OF THE FOLLOWING

1. Determination of wavelength of Laser using diffraction grating.
2. Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.
3. Determination of the charge carrier density by using Hall Effect.
4. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
5. Study of Characteristic curves (l/V) of a Zener diode to determine its Breakdown voltage.
6. Determination of Temperature coefficient of resistance of a Thermistor by using its Characteristic curve.
7. Study the variation of intensity of magnetic field along the axis of a circular current carrying coil by using Stewart and Gee's experiment.
8. Study of Characteristic curves (l/V) of a P-N diode.
9. Determine Frequency of given electrically driven tuning fork in Transverse and Longitudinal modes by using Melde's apparatus
10. Determine frequency of A.C. supply by using Sonometer.
11. Determination of the Time Constant for a C-R Circuit
12. Determination of the Planck's constant by using Photo-Cell
13. Determination of dielectric constant of a given material

I Semester	L	T	P	C
	0	0	3	1.5
19EE1L01 **- Basic Electrical Engineering Lab**				

COURSE OUTCOMES: ***After successful completion of this course, students should be able to:***

CO1 : Handle Various Electric Instruments and Solve DC Circuits Using Network Theorems

CO2 : Determine Resonance Frequency and Perform Voltage, Current and Power Measurement On Three Phase Circuit

CO3 : Determine and Predetermine the Performance of DC Machines

CO4 : Determine and Predetermine the Performance of Transformers and AC Machines

LIST OF EXPERIMENTS

1. Practice on Measuring Instruments – Voltmeter, Ammeter, Multimeter, Oscilloscope.
2. Verification of KCL and KVL.
3. Verification of Thevenin Theorem.
4. Verification Norton's Theorem.
5. Verification Superposition Theorem.
6. Resonance in R-L-C Circuits.
7. Three Phase Star and Delta Connections
8. Measurement of Three-Phase Power in Balanced Circuits.
9. Open Circuit Characteristics of DC Shunt Generator.
10. Load Characteristics of DC Shunt Generator.
11. Speed-Torque Characteristic of DC Motor.
12. Load Test on a Single Phase Transformer
13. Open Circuit and Short Circuit Test on a Single Phase Transformers.
14. Load Test on a Single-Phase Induction Motor.
15. Load Test on Three Phase Induction Motor.
16. Regulation of Alternator Using EMF Method.

Note: Any Ten Experiments will conduct from the above experiments

REFERENCE:

1. Department lab manual.

I Semester	L	T	P	C
	-	-	3	1.5
19HS1L01 **- English Proficiency Lab**				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) Reading Skills.

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

Unit	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:

"Infotech" by Maruthi Publications (2019)

Reference Books:

1. J. D. O'Connor, Better English Pronunciation, Cambridge, 2 e, 1980
2. Peter Roach ,Phonetics and Phonology, Cambridge University Press, 2009

II Semester	L	T	P	C
	3	0	0	3
19MA2T02 - **Differential Equations and Vector Calculus**				

Course Objectives:

1. To enlighten the learners in the concept of differential equations and vector calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Unit I: Ordinary Differential equations of first order and first degree:

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.
Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories

Learning Outcomes:
At the end of this unit, the student will be able to

- solve first order differential equations by appropriate method (K3)
- apply to geometrical and real world problems (K3)

Unit II: Linear differential equations of higher order:

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.
Applications: LCR circuit

Learning Outcomes:
At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients (K3)
- solve the linear differential equations with constant coefficients by appropriate method (K3)

Unit –III: Partial Differential Equations of First Order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

Learning Outcomes:
At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs (K3)
- outline the basic properties of standard PDEs (K2)

Unit IV: Vector differentiation

Scalar and vector point functions, vector operator del, del applied to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, physical interpretation of Gradient Div F and Curl F, Del applied twice to point functions Del applied to products of point functions.

Learning Outcomes:
At the end of this unit, the student will be able to

- apply del to Scalar and vector point functions (K3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (K3)

Unit V: Vector integration

Integration of Vectors Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Learning Outcomes:

At the end of this unit, the student will be able to

- find the work done in moving a particle along the path over a force field (k3)
- evaluate the rate of fluid flow along and across curves (K3)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (K3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna publishers, 42/e, 2012.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9/e, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Course Outcomes:

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

1. Solve the differential equations related to various engineering fields (K3)
2. Identify solution methods for partial differential equations that model physical processes (K3)
3. Interpret the physical meaning of scalar and vector point functions different operators such as del,gradient, curl and divergence (K3)
4. Estimate the work done against a field, circulation and flux using vector calculus and familiarize vector integral theorems. (K3)

II Semester	L	T	P	C
	3	0	0	3
19BS2T02 - **Engineering Chemistry**				

COURSE OUTCOMES

At the end of semester, the students will be able to

CO1: Explain the impurities present in raw water, problems associated and how to avoid them (K2)
CO2: Explain the advantages of Polymers in daily life (K2)
CO3: Explain the theory of construction of battery and fuel cells and theories of corrosion and prevention methods. (K2)
CO4: Differentiate conventional and non-conventional energy sources and their advantages and disadvantages. (K2)
CO5: Identify the usage of advanced materials in day to day life (K2)

UNIT I: WATER TECHNOLOGY

Hardness of water-types of hardness-disadvantages of hard water-determination of hardness by EDTA complexometric method. Portable water and its specifications-steps involved in purification of water-chlorination, break point of chlorination. Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.
Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

Learning Outcomes: At the end of this unit, the students will be able to explain
The impurities present in raw water, problems associated with them and how to avoid them

UNIT-II: POLYMERS AND COMPOSITE MATERIALS

Polymers-Introduction-Types of polymers-degree of polymerization-functionality-preparation properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

Plastics: Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process (Any Four) - recycling of e-waste.

Rubbers and elastomers: Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

Composite materials: Fiber reinforced plastics-biodegradable polymers-biomedical polymers-conducting polymers

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the properties of polymers and various additives added and different methods of forming plastic materials.
- **Explain** the preparation, properties and applications of some plastic materials.
- **Discuss** natural and synthetic rubbers and their applications.

UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION

Electrochemical Cells

Introduction-single electrode potential-electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode.

Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid, Ni-Cd, Zinc-Air and Li-ion) battery. Fuel cells (H_2-O_2, Methanol-Air cells).

Corrosion

Definition-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere.

Corrosion Prevention methods: Cathodic protection-Sacrificial anodic method-Impressed voltage method. Metallic coatings: Galvanization-Tinning-Electro plating-Electro less plating.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the theory of construction of battery and fuel cells.
- **Categorize** the reasons for corrosion and study some methods of corrosion control.

UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES

Conventional energy sources

Introduction to fuels-classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking-petrol and diesel knocking-octane number and cetane number-gaseous fuels-Natural gas-CNG-LPG

Non-conventional energy sources

Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell-Introduction to hydro power-geo thermal power-tidal and wave power.

Learning Outcomes: At the end of this unit, the students will be able to

- **Differentiate** conventional and non conventional energy sources and their advantages and disadvantages.
- **Explains** energy production by different natural sources

UNIT V: CHEMISTRY OF MATERIALS

Nano materials: Introduction-sol-gel method-characterization by BET, SEM and TEM methods-carbon nano tubes and fullerenes: Types, preparation and applications

Semiconductors: Preparation (Distillation, Zone refining, Czochralski crystal pulling epitaxy, diffusion, ion implantation)-semiconductor devices (P-N junction diode as rectifier, junction transistor)

Cement: Constituents of cement-setting and Hardening of cement, Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the awareness of materials like nanomaterials and fullerenes and their uses.
- **Explain** the techniques that detect and measure the surface properties of materials.
- **Illustrate** the commonly used industrial materials.

Text Books:

T1. N. Y. S. Murthy, V. Anuradha & K. Ramana Rao, A Text Book of Engineering Chemistry, Maruthi Publications. (2018)

T2. K. Sesha Maheswaramma, Mridula Chugh, A Text Book of Engineering Chemistry, Pearson Publications (2018).

Reference Books:

R1. Jain & Jain, Engineering Chemistry –Dhanpat Rai Publishing Company (2017)

R2. Shashi Chawla, Text Book of Engineering Chemistry - Dhanpat Rai & Co. (P) Limited (2017)

R3. Prasanta Rath, Subhendu Chakroborthy, Chemistry – Cengage publications (2018)

II Semester	L	T	P	C
	3	0	0	3
19CS2T01 - Problem Solving and Programming Using C				

Course Objectives:

- To impart adequate knowledge on the need of programming languages and problem solving techniques and develop programming skills.
- To enable effective usage of Control Structures and Implement different operations on arrays.
- To demonstrate the use of Strings and Functions.
- To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
- To understand structures and unions and illustrate the file concepts and its operations.
- To impart the Knowledge Searching and Sorting Techniques.

UNIT-I

Introduction to Computer Problem Solving: Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

UNIT-II

Introduction to C Programming: Introduction, Structure of a C Program, Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements, Operators, Type Conversion.

Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else–if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT-III

Arrays: Introduction, Operations on Arrays, Arrays as Function Arguments, Two dimensional Arrays, Multi-dimensional arrays.

Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

UNIT-IV

Functions: Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes, Recursion.

Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT-V

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type –enum variables, Using Typedef keyword, Bit Fields.

Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Course Outcomes:

At the end of the Course, Student will be able to:

- Illustrate the Fundamental concepts of Computers and basics of computer programming.
- Use Control Structures and Arrays in solving complex problems.
- Develop modular program aspects and Strings fundamentals.
- Demonstrate the ideas of pointers usage.
- Solve real world problems using the concept of Structures, Unions and File operations.

Text Books:

1. Reema Thareja, Computer Programming, Oxford University Press.2016.
2. R. G. Dromey , How to solve it by Computer, Pearson Education, 2011.

Reference Books:

1. Yaswanth Kanetkar, Let us C, BPB Publication, 16th Edition, 2019.
2. Ajay Mittal, Programming In C A-Practial Approach, Pearson. 2010

Web Links:

1. http://www.c4learn.com/
2. http://www.geeksforgeeks.org/c/
3. http://nptel.ac.in/courses/122104019/
4. http://www.learn-c.org/
5. https://www.tutorialspoint.com/cprogramming/

II Semester	L	T	P	C
	3	0	0	3
19HS2T01 - **English**				

COURSE OBJECTIVES

1. To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. To assist students to carry on the tasks and activities through guided instructions and materials.
4. To effectively integrate English language learning with employability skills and training.
5. To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
6. To provide hands-on experience through case –studies, mini –projects, group and individual presentations.

COURSE OUTCOMES

A) Reading Skills

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

B) Writing Skills

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, e-mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

C) Interactive skills

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

D) Grammar in context

- Enable the skills of grammar using in a situation
- Identifying the needs of apt grammar in life related situation
- Promoting discourse with grammar effectively

Syllabus :

S No	Content
UNIT –I	**Vocabulary Building** **1.1** Video Lesson 1.2.1 Word formation 1.2.2. Root words 1.2.3. Prefixes and Suffixes 1.2.4. Synonyms and Antonyms **1.3 Parts of Speech** **1.4 Note- making, Note-taking**
UNIT -II	**Basic Writing Skills** **2.1** Video Lesson 2.2.1 Basic sentence structure 2.2.2. Clauses and Phrases 2.2.3 Punctuations 2.2.4 Creating coherence 2.2.5 Organizing principles of paragraph documents 2.2.6 Techniques for writing precisely **2.3 Tenses** **2.4 Letter Writing**
UNIT-III	**Identifying Common Errors in Writing** **3.1** Video Lesson 3.2.1 Sub + verb agreement 3.2.2 Noun pronoun agreement 3.2.3 Articles 3.2.4 Preposition 3.2.5 Redundancies 3.2.6 Clichés **3.3.1 Active - Passive Voice** **3.3.2 Reported Speech** **3.4 Resume Writing**
UNIT-IV	**Nature and Style of sensible Writing** **4.1** Video Lesson 4.2.1 Describing 4.2.2 Classifying 4.2.3 Writing Introduction and conclusion **4.3.1 Conditional Sentences** **4.3.2 Degrees of Comparison** **4.4 Email writing**
UNIT-V	**Writing Practice** **5.1** Video Lesson 5.2.1 Comprehension 5.2.2 Precise writing 5.2.3 Essay Writing **5.3 Simple Compound and Complex Sentences** **5.4 Report Writing**

TEXT BOOK: Building Effective Communication Skills
By Maruti Publications (2019)

II Semester	L	T	P	C
	2	0	2	3
19ME2T03 **- Computer Aided Engineering Drawing**				

COURSE OBJECTIVE:

To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.

COURSE OUTCOMES: Students will be able to

CO1: Draw the projections solids by auxiliary views and development of surfaces of regular solids. (K3)
CO2: Draw the isometric and perspective projections of planes and solids. (K2)
CO3: Draw the geometric entities and to create 2D and 3D wire frame modeling. (K3)
CO4: Identify the view points and view ports. (K2)
CO5: Create different Machines and Machine parts using CAD software. (K3)

UNIT – I

Projections of Solids: Projection of regular solids inclined to both the planes using auxiliary views and sectional views of regular solids.

Development of Surfaces of Right Regular Solids: Prisms, Cylinders, Pyramids and Cone.

UNIT –II

Isometric Projections and Orthographic Projections: Compound solids, isometric projections of objects having non-isometric lines and spherical parts.

Perspective Projections: perspective view of points, lines, plane figures and simple solids- vanishing point method (General method only)

UNIT-III

Introduction to Computer Aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Object selection commands, edit, zoom, crosshatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling

UNIT-IV

View Points and View Ports: View point coordinates and views displayed, examples to exercise different options like save, restore, delete, joint, single option.

UNIT-V

Computer Aided Solid Modeling: Modeling of simple solids and modeling of different Machines and Machine parts

TEXT BOOKS:

1. N.D.Bhatt , Engineering Drawing, Charotar publications,53 e, 2016
2. K Venugopal, V. Prabhu Raja, Engineering Drawing + AutoCad , New Age, 5 e, 2011

REFERENCE BOOKS:

1. K.Venkata reddy, Text book of Engineering Drawing with AutoCAD, B.S.Publications, 2017
2. .L.Narayana, P.Kannaiah, and K.Venkata Reddy, Engineering Drawing, New Age International Publishers. 2016
3. R.K. Dhawan, Engineering Drawing, S.Chand, 2012.

The syllabus in respect of the subject "Computer Aided Engineering Drawing Practice" consists of two major portions

1. Unit I to II - conventional drawing pattern.
2. Unit III to V - computer lab pattern using any drafting package.

Max Marks – 100.

Internal Marks: 30 & External Marks: 70

The examination in respect of the above may conducted on par with lab with the following pattern:

Mid Exam:

I Mid Exam from first Two Units- Conventional Drawing

II Mid Exam from Last three Units - Computer Lab

END SEMESTER EXAM:

Part - A - Conventional Drawing test in Drawing Hall from first Two Units - 2 hrs duration.

Part - B - Exam in Computer Lab using any drafting package - 2 hrs duration.

End Exam duration - 4 hrs

II Semester	L	T	P	C
	0	0	3	1.5
19ME2L01 - **Engineering Workshop**				

COURSE OBJECTIVE: To impart hands–on practice on basic Engineering trades and skills.

COURSE OUTCOMES: Students will be able to

CO1: Model and Develop various basic prototypes in Carpentry trade [K3]

CO2: Model and Develop various basic prototypes in Fitting trade [K3]

CO3: Perform Various Forging Operations [K3]

CO4: Perform various House Wiring Techniques. [K3]

CO5: Develop various basic prototypes in the trade of Sheet metal. [K3]

NOTE: At least **Two** Exercises to be done from each trade.

TRADE:

I. CARPENTRY:

1. CROSS LAP JOINT 2. DOVETAIL JOINT 3. MORTISE and TENNON JOINT

II. FITTING:

1. SQUARE FIT 2. V-FIT 3. HALF ROUND FIT

III. FORGING:

1. ROUND ROD TO SQUARE
2. S-HOOK
3. ROUND ROD TO SQUARE HEADED BOLT

IV. HOUSE WIRING:

1. PARALLEL/SERIES CONNECTION OF THREE BULBS
2. STAIRCASE WIRING
3. FLOURESCENT LAMP FITTING

V. SHEET METAL:

1. SQUARE TRAY 2. HOLLOW CYLINDER 3. OPEN SCOOP

MANUAL:

1. Engineering Workshop Practice Lab Manual Prepared by Mechanical Faculty.

II Semester	L	T	P	C
	0	0	3	1.5
19BS2L02 - Engineering Chemistry Lab				

Outcomes: The experiments introduce volumetric analysis: Acid-Base, complexometric, Redox, Conductometric and potentiometric titrations. Then they are exposed to a few instrumental methods of chemical analysis.

Thus at the end of the lab course, the student is exposed and able to

1. Identify the concentration of given solution by different methods of chemical analysis (**K3**)
2. Analyze the water purity by checking hardness, DO and Acidity. (**K4**)
3. Estimate the Cu^{+2}, Fe^{+3}, Ca^{+2}, Mg^{+2} ions and Ascorbic acid present in given solution. (**K4**)
4. Identify the pour and cloud point of lubricants. **(K3)**
5. Understand the principles of conductometric and potentiometric titrations. (**K_2**)

Syllabus:

1. Estimation of HCl using standard Na_2CO_3 through acid-base titration.
2. Estimate the total hardness of water using standardized EDTA solution through complexometric titration.
3. Estimation of $KMnO_4$ using standard $H_2C_2O_4$ through redox titration method.
4. Estimation of Dissolved Oxygen in given water sample by Wrinkler's Method
5. Determination of ferric (Fe^{+3}) ions using standard KCr_2O_7 solution
6. Determination of copper (II) using standard hypo solution.
7. Estimation of strong acid by using strong base through conductometric titration method.
8. Estimation of strong acid by using strong base through potentiometric titration method.
9. Preparation of polymer (Demo).
10. Determination of Vitamin 'C'.
11. Determination of Pour and Cloud Point of lubricating oils

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

II Semester	L	T	P	C
	0	0	3	1.5
19CS2L01 - **C Programming Lab**				

Course Objectives:

- To impart knowledge on various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure, Unions and files for solving various problems.

List of Experiments:

1. Introduction to Algorithms and Flowcharts

1.1) Implement Algorithm Development for Exchange the values of Two numbers.

1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.

1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

2.1) Exposure to Turbo C, Code Blocks IDE, Dev C++, Falcon C++.

2.2) Writing simple programs using printf(), scanf() .

3. Raptor

3.1) Introduction to Raptor.

3.2) Draw a flow chart to find the Sum of 2 numbers.

3.3) Draw a flow chart to find Simple interest.

4. Basic Math

4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.

4.2) Write a C Program to find largest of three numbers using ternary operator.

4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.

5.2*)* Write a C program to find the roots of a Quadratic Equation.

5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch…case.

6. Control Flow- II

6.1) Write a C Program to Find Whether the Given Number is Prime number or not.

6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.

6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

7.1) Write a C program to find the sum of individual digits of a positive integer.

7.2) Write a C program to check whether given number is palindrome or not.

7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$.

Practice Programs:

Write a C program to print all natural numbers from 1 to n. - using while loop

Write a C program to print all natural numbers in reverse (from n to 1). - using while loop

Write a C program to print all alphabets from a to z. - using while loop
Write a C program to print all even numbers between 1 to 100. - using while loop
Write a C program to print sum of all even numbers between 1 to n.
Write a C program to print sum of all odd numbers between 1 to n.
Write a C program to print table of any number.
Write a C program to find first and last digit of any number.
Write a C program to count number of digits in any number.
Write a C program to calculate sum of digits of any number.
Write a C program to calculate product of digits of any number.
Write a C program to swap first and last digits of any number.
Write a C program to enter any number and print its reverse.
Write a C program to enter any number and check whether the number is palindrome or not.
Write a C program to find frequency of each digit in a given integer.
Write a C program to enter any number and print it in words.
Write a C program to print all ASCII character with their values.
Write a C program to enter any number and print all factors of the number.
Write a C program to enter any number and calculate its factorial.
Write a C program to find HCF (GCD) of two numbers.
Write a C program to find LCM of two numbers.
Write a C program to check whether a number is Prime number or not.
Write a C program to check whether a number is Armstrong number or not.
Write a C program to check whether a number is Perfect number or not.
Write a C program to check whether a number is Strong number or not.
Write a C program to print Fibonacci series up to n terms.

8. Arrays

8.1) Write a C program to search an element in the given array (Linear Search).
8.2) Write a C program to perform matrix addition.
8.3) Write a C program to perform matrix multiplication.

Practice Programs:

Write a C program to read and print elements of array.
Write a C program to find sum of all array elements. - using recursion.
Write a C program to find maximum and minimum element in an array. - using recursion.
Write a C program to find second largest element in an array.
Write a C program to copy all elements from an array to another array.
Write a C program to insert an element in an array.
Write a C program to delete an element from an array at specified position.
Write a C program to print all unique elements in the array.
Write a C program to print all negative elements in an array.
Write a C program to count total number of even and odd elements in an array.
Write a C program to count total number of negative elements in an array.
Write a C program to count total number of duplicate elements in an array.
Write a C program to delete all duplicate elements from an array.
Write a C program to count frequency of each element in an array.
Write a C program to merge two array to third array.
Write a C program to find reverse of an array.
Write a C program to convert lowercase string to uppercase.
Write a C program to convert uppercase string to lowercase.
Write a C program to toggle case of each character of a string.

Write a C program to find total number of alphabets, digits or special character in a string.

9. Pointers

9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.

9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

10.1) Write a C Program to demonstrate parameter passing in Functions.

10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.

10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

Practice Programs:

Program to change the value of constant integer using pointers.

Program to print a string using pointer.

Program to count vowels and consonants in a string using pointer.

Program to read array elements and print with addresses.

11. Strings

11.1) Implementation of string manipulation operations with library function:

a) copy
b) concatenate
c) length
d) compare

11.2) Implementation of string manipulation operations without library function:

a) copy
b) concatenate
c) length
d) compare

11.3) Verify whether the given string is a palindrome or not.

12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.

12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.

13.2) Write a C program to copy content of one file to another file.

13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Course Outcomes:

- Implement basic programs in C and design flowcharts in Raptor.
- Use Conditional and Iterative statements to solve real time scenarios in C.
- Implement the concept of Arrays and Modularity and Strings.
- Apply the Dynamic Memory Allocation functions using pointers.

- Develop programs using structures, and Files.

Reference Books:

1. Yashwanth Kanetkar, Let Us C, 16th edition, BPB Publications, 2019,
2. Ajay Mittal, Programming In C A-Practical Approach, Pearson. 2010

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

II Semester	L	T	P	C
	0	0	3	1.5
19HS2L02- **English Communication Skills Lab**				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES:

a) Reading Skills.

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice the language he is learning in order to acquire communication skills. 'Enrich your interactive Skills: Part - B' is designed to provide opportunities for engineering students to revise and consolidate communication skills in different contexts formal and informal. It prepares the student for facing Interviews, participating in group discussions and making presentations.

PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

UNIT	TOPIC
1	Oral Activity : JAM, Hypothetical situations, self / peer profile, Common errors in pronunciation, Neutralizing Accent
2	Oral Activity : Telephonic Etiquette, Role plays, Poster presentations and e-mail Writing
3	Oral Activity : Oral Presentation Skills, Public Speaking Data Interpretation
4	Oral Activity : Group Discussion: Do's and Don'ts –Types, Modalities
5	Oral Activity : Interview Skills: Preparatory Techniques, FAQ, Mock Interviews Pronunciation : Connected speech (pausing, tempo, tone, fluency etc.,)

Text Book:

"Infotech" by Maruthi Publications (2019)

Reference Books:

1. Clive Fletchers, How to Face Interviews
2. Stephen Covey , The 7 Habits of Highly Effective People.

III Semester	L	T	P	C
	3	0	0	3
19BM3T01- **Managerial Economics and Financial Analysis**				

COURSE OBJECTIVES:

1. To acquire knowledge of economics to facilitate the process of economic Decision making
2. To analyze production function and its laws of variable proportions and cost concepts
3. To differentiate and distinguish price and output decisions in different market structures
4. To compare and contrast the difference between private and public sector in their functioning
5. To develop the skills to analyze financial statements.

COURSE OUTCOMES

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

1. Describe the importance of Managerial Economics and its utility in decision making

2. Understand the meaning and usefulness of production function and cost function in analyzing firm's production activity.

3. Comprehend the concept of Market structure, different types of Markets and pricing policies.

4. Identify different forms of business organizations and analyze their merits and demerits.

5. Evaluate the investment proposals through techniques of capital budgeting and Financial performance of the company through Financial Statements.

UNIT–I Managerial Economics &Demand Analysis: Definition – Nature and Scope - Relation with other disciplines - Concept of Demand-Types-Determinants - Law of Demand – Exceptions - Elasticity of Demand - Types and Measurement-Demand forecasting and its Methods.

UNIT–II Production and Cost Analysis: Production function - Law of Variable proportions - Isoquants and Isocosts -Law of returns Economies of Scale - Cost Concepts - Fixed, Variable Costs, Explicit Costs, Implicit Costs & Opportunity cost - Cost Volume Profit Analysis - Break Even Point (Simple Problems)

UNIT-III Market Structures & Pricing Policies: Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly – Features – Price & Output Determination - Pricing Methods

UNIT-IV Forms of Organizations & Business Cycles: Business Organization- Sole Trader – Partnership - Joint Stock Company - State/Public Enterprises and their forms - Business Cycles: Meaning and Features - Phases of Business Cycle.

UNIT–V Capital Budgeting and Accounting: Concept and sources-Techniques of capital budgeting-Traditional and Modern Methods (Simple problems)

Introduction to accounting: Branches-Systems of Accounting-Single Entry-Double Entry System-Journal-Ledger-Trail Balance-Final Accounts(Simple problems)

TEXTBOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. T.V.Ramana & B. Kuberudu: Managerial Economics and Financial Analysis, Himalaya Publishing House,Mumbai
3. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

REFERENCE BOOKS:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson. 7. Narayanaswamy: Financial Accounting A Managerial Perspective, PHI.
8. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas.

III Semester	L	T	P	C
	3	0	0	3
19CS3T05- **Internet of Things**				

COURSE OBJECTIVE

- Discuss the fundamentals relating to IoT, Things in IoT, Communication Models and APIs
- Explain the difference between M2M and IoT, and familiarize the concepts of SDN and Network Virtualization.
- Expose various hardware used for IoT Applications
- Demonstrate the use of IoT through various case studies
- Familiarize IIoT and Industry 4.0.

COURSE OUTCOMES: Students will be able to

CO1: **Summarize** the basic principles, Physical and logical design, functional blocks, Communication systems and API of IoT systems. **[K2]**
CO2: **Differentiate** between IoT and M2M technologies; **explain** the concepts of Software Defined Networks (SDN) and Network Virtualization. **[K2]**
CO3: **Describe** hardware components used for computing, communicating, sensing, Actuation, I/O interfaces in IoT. **[K2]**
CO4: **Summarize** the applications of IoT through various case studies. **[K2]**
CO5: **Explain** the concepts of IIoT and Industry 4.0, their requirements and benefits **[K3]**

UNIT – I

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

UNIT – II

IOT & M2M: Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Software defined networks (SDN), Network Virtualization

UNIT -III

ELEMENTS OF IOT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.

UNIT – IV

IOT CASE STUDIES: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

UNIT – V

IIOT: Key IIOT Technologies, Catalysts and Precursors of the IIoT, Innovation and the IIoT, Intelligent Devices, Key Opportunities and benefits, **INDUSTRY 4.0:** Definition, four main characteristics of Industry 4.0, Industry 4.0 design principles, Building blocks of Industry 4.0, Smart Manufacturing.

TEXT BOOKS:

1. Arsheep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach Paperback, Orient Blackswan Private Limited, 1st Edition, (2015)
2. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, Internet of Things Paperback Wiley (2019)
3. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things , 1st edition, Apress (2017)

REFERENCE BOOKS:

1. Rajkumar Buyya, Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, 1st Edition, Morgan Kaufmann (2016).
2. Dimitrios Serpanos, Marilyn Wolf, Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies, 1st Edition, Springer(2018)
3. Marco Schwartz , Internet of Things with Arduino Cookbook , Packt Publishing Limited (2016)
4. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things Springer (2011)

III Semester	L	T	P	C
	3	1	0	4
19ME3T01- **Engineering Mechanics**				

COURSE OBJECTIVES:

- To impart knowledge on the concept of forces and its resolution in different planes, resultant of force system and moment of forces.
- To develop capacity to forecast the effect of force and its motion.
- To make the students compute the centre of gravity and moment of inertia.
- To educate the students about dynamic forces in rigid body.

COURSE OUTCOMES: Student will be able to

CO1. Illustrate the various types of forces and moments.[K2]
CO2. Analyze the rigid body in equilibrium and determine the effects by the laws of friction.[K4]
CO3. Evaluate the centroid, moment of inertia of surfaces and centre of gravity, mass moment of inertia of solids. [K5]
CO4. Calculate the kinetics and kinematics force exerted in rigid body. [K3]
CO5. Perceive the concept of work energy principle and virtual work its application.[K3]

UNIT-I

Introduction to Engineering Mechanics: System of Forces, Coplanar Concurrent Forces, Components in plane - Resultant- Moment of Forces and its Application; Couples - General case of parallel forces in a plane. Equilibrium of Rigid Bodies in two dimensions - Free body diagram.

UNIT-II

Spatial Systems: Components of force in space – Resultant- Moment of Forces and its Application.

Friction: Introduction, Types of friction, Laws of Friction, Limiting friction, Angle of repose, Angle of friction, Cone of friction. Equilibrium analysis of simple systems with sliding friction, Wedge friction, Screw friction.

UNIT-III

Centroid & Centre Of Gravity: Centroid- Simple and Composite figures. Centre of gravity - Simple and Composite bodies, Theorems of Pappus.

Moment Of Inertia: Moment of Inertia, Product of Inertia and Principal moment of inertia for planes. Mass moment of inertia for solids.

UNIT-IV

Kinetics: Analysis as a Particle and analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Kinematics: Rectilinear and Curvilinear Motion – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

UNIT-V

Work Energy Method: Work-Energy principle and its Application in plane motion of connected bodies. Impulse-Momentum method.

Virtual Work: Virtual displacements, Principle of virtual work for particle and Ideal system of rigid bodies. Application of virtual work principle.

TEXT BOOKS:

1. S. Timoshenko & D.H. Young, Engineering Mechanics, McGraw Hill education, 5th edition, 2017.
2. Bansal R.K.by Laxmi Publications, A Text Book of Engineering Mechanics, 6th edition, 2013.
3. R.S. Khurmi & N.Khurmi, , Engineering Mechanics, S. Chand publications, 22nd edition, 2019.
4. D.S. Bedi and MP Poonia, Engineering Mechanics, Khanna Book Publishing Co. (P) Ltd, 2nd edition, 2019.
5. DP Sharma, Engineering Mechanics, Pearson Education, 1st edition, 2011.

REFERENCE BOOKS:

1. S. S. Bhavikatti, Engineering Mechanics - New Age International Publishers, 6th edition, 2018.
2. A.K.TAYAL Engineering Mechanics, UMESH Publications, 14th edition, 2010.
3. Reddy Vijay Kumar K. and J. Suresh Kumar, Engineering Mechanics – Statics & Dynamics - BSP Books Pvt.Ltd, 3rd edition,2010.

III Semester	L	T	P	C
	3	0	0	3
19MA3T05- **Probability and Statistics**				

Course Objectives:

1. To familiarize the students with the foundations of probability and statistical methods
2. To impart probability concepts and statistical methods in various applications of Engineering
3. To introduce the correlation and regression and method of least squares

Unit-1 Probability:

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Learning Outcomes:

At the end of this unit, the student will be able to

- define the terms trial, events, sample space ,probability, and laws of probability (K_1)
- make use of probabilities of events in finite sample space from experiments (K_3)
- apply Baye's theorem to real time problems(K_3)
- explain the notion of random variable, distribution functions and expected value(K_2)

Unit-2 Probability distributions:

Probability distribution-Binomial, Poisson approximation to the binomial distribution and normal distribution –their properties.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply Binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies (K_3)
- interpret the properties of normal distribution and its applications (K_2)

Unit-3 Sampling distribution and Testing of hypothesis, large sample tests:

Basic terminology in sampling, sample techniques (with and without replacement), sampling distribution of means for large and small samples (with known and unknown variance).
Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors.
Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of sampling distribution for large and small samples (K_2)
- apply the concept of hypothesis testing for large samples (K_4)

Unit-4 Small sample tests:

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variance (F- test), Chi-square test for goodness of fit and independence of attributes.

Learning Outcomes:
At the end of this unit, the student will be able to

- apply the concept of testing of hypothesis for small samples to draw the inferences (K_3)
- estimate the goodness of fit (K_4)

Unit-5 Curve Fitting and Correlation:

Curve Fitting : Method of least squares -Fitting a straight line, Second degree parabola -exponential curve-power curves
Correlation: Simple correlation, correlation coefficient (for ungrouped data), rank correlation. Linear regression, regression lines, regression coefficients.

Learning Outcomes:
At the end of this unit, the student will be able to

- Adopt correlation methods and principle of least squares, regression lines (K_4)

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

1. make use of the concepts of probability and their applications (k3)
2. apply discrete and continuous probability distributions(K3)
3. design the components of a classical hypotheses test(K6)
4. infer the statistical inferential methods based on small and large sampling tests(K6)
5. adopt correlation methods and principle of least squares, regression lines (K_4)

Books:

1. Dr. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 42nd Edition, 2012.
2. Dr. K. Murugesan & P.Gurusamy, Probability and Statistics, Anuradha Publications, 2011.

Reference:

1. Miller & Freund, Probability and statistics for engineers, Prentice Hall,8th Edition, 2011.
2. Ramana B.V., Higher Engineering Mathematics, Tata Mc Graw Hill New Delhi 11th Reprint 2010

III Semester	L	T	P	C
	3	0	0	3
19ME3T02- **Fluid Mechanics and Hydraulic Machinery**				

COURSE OBJECTIVES:

- To understand the conservation laws of fluid flow, the dimensional analysis applied to fluid flow and hydraulic machines.
- To understand the behavior of fluids at various conditions

COURSE OUTCOMES: Students will be able to

CO1. Define the fundamental properties of fluids and apply the concepts of fluid statics. [K1]
CO2. Apply the principles of fluid kinematics and boundary layer concepts for fluid flow problems.[K3]
CO3. Analyze the fluid flow through pipes. [K4]
CO4. Explain working principles of hydraulic turbines. [K2]
CO5. Explain working principles of hydraulic pumps. [K2]

UNIT I

Basic Concepts and Properties: Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids: density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillarity and surface tension. Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

UNIT II

Fluid Kinematics and Boundary Layer Concepts: Fluid Kinematics: Flow visualization, lines of flow, types of flow, continuity equation (one dimensional flow) - Fluid dynamics: equations of motion, Euler's equation along a streamline, Bernoulli's equation, applications, Venturimeter, Orifice meter, Pitot tube - Boundary layer flows, boundary layer thickness, boundary layer separation - drag and lift coefficients.

UNIT III

Flow Through Pipes and Dimensional Analysis: Flow through pipes: Darcy -Weisbach equation, pipe roughness, friction factor, minor losses. Flow through pipes in series and in parallel, power transmission - Dimensional analysis, Buckingham's π theorem, applications, similarity laws and models. Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications.

UNIT IV

Hydraulic Turbines: Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies - performance curves of turbines.

UNIT V
HYDRAULIC PUMPS:

Pumps- classifications - Centrifugal pump- classifications, working principles, priming, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump- classification, working principles, slip, performance curves and work saved by air vessels - cavitations in pumps.

TEXT BOOKS:

1. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2011.

2. Rajput.R.K, A Textbook of Hydraulic Machines in SI Units (Fluid Mechanics and Hydraulic Machines Part –II), Reprint 2012, Laxmi publications (P) Ltd., New Delhi, 2012.

REFERENCE BOOKS:

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (9th edition), Laxmi publications (P) Ltd., New Delhi, 2010.
2. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2011.
3. Som, S.K., Biswas, G., "Introduction to fluid mechanics and fluid machines", Tata McGraw-Hill, 4th Edition, 2011.
4. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi (7th edition), 2011.
5. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 2011.

III Semester	L	T	P	C
	3	0	0	3
19ME3T03- **Production Technology**				

COURSE OBJECTIVES:

- To impart the students to understand the fundamentals of casting and their application.
- To make the knowledge of solidification of metals and melting furnace working principle.
- To perceive the students various types of welding processes and welding defects.
- To enable the students to acquire Hot and Cold working processes concept.
- To introduce the fundamentals of plastic processing techniques and Rapid Prototyping.

COURSE OUTCOMES: Students will be able to

CO1. Explain various metal casting processes. [K2]
CO2. Illustrate melting furnace working principle and solidification processes. [K2]
CO3. Explain various welding techniques, soldering and brazing. [K2]
CO4. Summarize various hot working and cold working methods of metals. [K2]
CO5. Explain plastics processes and Rapid Prototyping. [K2]

UNIT I

Casting Processes: Basic casting process and its characteristics, Patterns and Pattern making, Pattern allowances and their application, Principles and design of Gating systems, Special moulding methods and processes- CO_2 & Shell moulding processes and machine moulding. Centrifugal, Cold & Hot chamber Die Casting, Investment Casting processes.

UNIT II

Melting and Solidification: Crucible melting and cupola operation, steel making processes, Solidification of casting, Solidification of pure metal and alloys, short & long freezing range alloys, Principles and design of Rising system.

UNIT III

Welding Processes: Classification of welding processes, Types of welded joints and their characteristics, Welding processes: Gas welding and cutting, Arc welding, Resistance welding, Thermit welding and Plasma welding processes and their characteristics. Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in Welding, Welding defects.

UNIT IV

Mechanical Working of Metals - Extrusion of Metals:

Hot and cold working processes, characteristics, recovery, recrystallization and grain growth analysis, Theory of rolling, Fundamentals, types of Rolling mills and products. Analysis of rolling process and estimation of power requirement.
Introduction of extrusion process and its characteristics, Press working operations and their characteristics, Extrusion of metals**,** Drawing processes and its force analysis, Hot and Cold spinning.

UNIT V

Plastic Process & Rapid Prototyping: Plastics processing methods & Equipment (blow & injection moulding), Introduction to powder metallurgy. Fundamentals of Rapid Prototyping Technologies, Stereolithography, Selective Laser Sintering, Laminated Object Manufacturing, Fused Deposition Modeling, 3D Printing.

TEXTBOOKS

1. S Kalpakjian, S R. Schmid, Manufacturing- Engineering and Technology, Pearson publications, 7th Edition, 2014.
2. P.C Sharma, Production Technology, S.Chand and Co. Ltd., 2014.
3. Gerardus Blokdyk, Rapid Prototyping, Emereo Pty Limited, 3rd Edition, 2018.

REFERENCES

1. R. K. Jain, Production Technology, Khanna publishers, 16th Edition, 2014.
2. G.Thirupati Reddy, Production Technology, Scitech Publications, 2013.
3. P.N. Rao, Manufacturing Technology - Foundry, Forming and Welding, 4th Edition, TMH-2013

III Semester	L	T	P	C
	0	0	3	1.5
19ME3L01- **Fluid Mechanics and Hydraulic Machinery Lab**				

COURSE OBJECTIVE

To impart practical exposure on the performance evaluation methods of various flow measuring equipments, hydraulic turbines and pumps.

COURSE OUTCOMES: Students will be able to

CO1. Predict major and minor losses in various piping system.

CO2. Predict performance characteristics of various Turbines and Pumps.

CO3. Calibrate Venturi meter and Orifice meter.

CO4. Apply the impulse momentum concepts on jets.

LIST OF EXPERIMENTS:

1. Impact of jet on flat plate.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturi meter.
9. Calibration of Orifice meter.
10. Determination of friction factor of a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Determination of loss of head due to sudden enlargement in a pipeline.
13. Bernoulli's apparatus.

NOTE: Any 10 of the above 13 experiments are to be conducted

III Semester	L	T	P	C
	0	0	3	1.5
19ME3L02- **Production Technology Lab**				

COURSE OBJECTIVES

To make the students familiarize with

- Design and manufacture of simple patterns.
- Sand testing.
- Arc welding, gas welding and resistance welding equipment for the fabrication of welded joints.
- Injection and blow moulding processes.

COURSE OUTCOMES: Students will be able to

CO1. Describe effects of the properties of green sand of grain size, moisture content, compressive strength, shear strength, permeability. [K2]

CO2. Perform Arc Welding and Spot Welding. [K3]

CO3. Perform the Metal Casting and Press working operations.[K3]

CO4. Perform the Pattern making. [K3]

I. METAL CASTING LAB:

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and Permeability.
3. Moulding Melting and Casting.

II WELDING LAB:

1. ARC Welding Lap & Butt Joint.
2. Spot Welding.

III METAL FORMING:

1. Blanking & Piercing operations, study of simple, compound and progressive dies.

2. Deep Drawing and Extrusion operations.

IV PROCESSING OF PLASTICS:

1. Injection Moulding.
2. Blow Moulding.

III Semester	L	T	P	C
	0	0	2	1
19CS3L04- **Internet of Things Lab**				

COURSE OBJECTIVE

- Familiarize students with the use of Arduino for sensing and actuation purposes.

COURSE OUTCOMES: Students will be able to

CO1: **Measure** temperature and humidity using various sensors **[K3]**
CO2: **Use** IR sensor/push button to on/off LED **[K3]**
CO3: **Interface** Bluetooth module with Arduino and **Use** the same **[K3]**
CO4: **Interface** Actuating elements with Arduino and control the same **[K3]**

Expt 1: Familiarization with Arduino and perform necessary software installation.
Expt 2: To interface LED/Buzzer with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds.
Expt 3: To interface Push button/Digital sensor (IR/LDR) with Arduino and write a program to turn ON LED when push button is pressed or at sensor detection.
Expt 4: To interface DHT11 sensor with Arduino and write a program to print temperature and humidity readings.
Expt 5: To interface motor using relay with Arduino and write a program to turn ON motor when push button is pressed.
Expt 6: To interface OLED with Arduino and write a program to print temperature and humidity readings on it.
Expt 7: To interface Bluetooth with Arduino and write a program to send sensor data to smart phone using Bluetooth.
Expt 8: To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
Expt 9: To interface Servo motor with Arduino and write a program to control the same
Expt 10: To interface Stepper motor with Arduino and write a program to control the same using potentiometer
Expt 11: To interface thermistor with Arduino for temperature measurement
Expt 12: To measure temperature using thermocouple by interfacing it with Arduino
Expt 13: Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
Expt 14: Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

NOTE: Any 10 of the above 14 experiments are to be conducted

III Semester	L	T	P	C
	2	0	0	0
19BM0M04- **Essence of Indian Traditional Knowledge**				

Course Objectives:

1. The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.

2. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.

3. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
Course Outcomes:

4. Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective. Course Content

5. Basic Structure of Indian Knowledge System

6. Modern Science and Indian Knowledge System

7. Yoga and Holistic Health care

8. Case Studies.

Suggested Text/Reference Books:

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai,5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritz of Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad,Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi,2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma (English translation), Shodashang Hridayam

IV Semester	L	T	P	C
	3	1	0	4
19ME4T01- **Thermodynamics**				

COURSE OBJECTIVES:

To impart the knowledge of the thermodynamic laws and principles so as to enable the student to prepare an energy audit of any mechanical system that exchange heat and work with the surroundings

COURSE OUTCOMES: Students will be able to

CO1: Apply basic principles and Zeroth law of thermodynamics to solve problems. [K3]
CO2: Apply first law of thermodynamics to different thermodynamic systems. [K3]
CO3: Apply second law of thermodynamics and general thermodynamic property relations to solve problems. [K3]
CO4: Describe the thermodynamic concepts of pure substances and identify their properties using standards. [K2]
CO5: Analyze various power cycles, vapour power cycles and Refrigeration cycles. [K4]

UNIT – I

Introduction: Basic Concepts : System, Surroundings, Boundary, Universe, Types of Systems, Control volume, Macroscopic and Microscopic view points, Thermodynamic Equilibrium, Property, State, Process, Cycle , Quasi - static Process, Irreversible Process, Causes of Irreversibility , Energy in State and in Transition- Types- Work and Heat, Point function and Path function, Zeroth Law of Thermodynamics , Concept of Temperature, Principles of Thermometry – Reference Points – Constant Volume gas, electrical resistance thermometers and thermocouple, Ideal Gas Scale.

UNIT II

First Law of Thermodynamics: Perfect Gas Laws – Equation of State, specific heat at constant volume, specific heat at constant pressure and Universal Gas constant, Joule's Experiment – First law for a closed system undergoing a cycle and a change of state – PMM I , First law applied to a Process, various Non-flow processes- properties-end states-Heat transfer-Work Transfer-change in Internal Energy, Throttling and Free Expansion Processes, First law applied to a flow system – Steady Flow Energy Equation –Applications.

UNIT – III

Second Law of Thermodynamics: Limitations of the First Law, Thermal Reservoir, Heat Engine, Refrigerator and Heat pump, Parameters of performance, Second Law of Thermodynamics – Kelvin-Planck and Clausius Statements and their Equivalence – PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Availability and

Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV

Properties of Pure Substances: Pure Substances – Phase Transformation–P-V diagram – P-T diagram– T-S diagram and h-s diagram or Mollier Chart– P-V-T- surface –Triple point at critical point, Dryness Fraction – Steam Calorimetry, Property tables, Various Thermodynamic processes and energy Transfer.

UNIT - V

Power Cycles: Otto, Diesel, Dual Combustion cycles – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Vapour Power & Refrigeration Cycles: Brayton cycle and Rankine cycle – thermal efficiency, Bell- Coleman cycle and Vapour compression refrigeration cycle - Coefficient of performance – simple problems on ideal cycles.

TEXT BOOKS:

1. P.K. Nag, Engineering Thermodynamics, Tata McGraw Hill Education Private Limited, New Delhi, 6th Edition, 2017.
2. Yunus Cengel & M.A.Boles, Thermodynamics, An Engineering Approach –Tata McGraw Hill Publishing Company Limited, New Delhi. 2017

REFERENCE BOOKS:

1. Claus Borgnakke, Richard E. Sonntag, Fundamentals of Thermodynamics, John Wiley & Sons, 8th Edition, (2013)
2. R.K. Rajput, A Text Book of Engineering Thermodynamics, Lakshmi Publications, New Delhi, Tenth Edition, 2017
3. K. Ramakrishna, Engineering Thermodynamics, Anuradha Publishers, India, 2nd edition, 2011.
4. An Introduction to Thermodynamics- Y. V. C. Rao, Revised Edition, Universities Press, Hyderabad, India.2003

IV Semester	L	T	P	C
	3	1	0	4
19ME4T02- **Theory of Machines**				

COURSE OBJECTIVES

Machines are those mechanical systems which achieve their task through mobility. The first step in designing machines is synthesizing and performing rigid body dynamic analysis so as to estimate the velocities, accelerations and forces on various members. The current course aims at imparting knowledge as how to analyze various mechanisms for designing a machine. The objectives of the course are as follows:

1. To impart knowledge on various terminologies, criteria and analysis methods related to mechanisms, various mechanisms with lower pairs and their applications.
2. To impart skills to analyze the position, velocity and acceleration of mechanisms.
3. To familiarize higher pairs like cams and gears.
4. To impart mathematical methods for estimating rotary and reciprocating unbalance in mechanisms and machines.
5. To familiarize The Governors.

COURSE OUTCOMES: Students will be able to

CO1. Analyze and Explain the terminology and criteria of mechanisms as well as working of

mechanisms with lower pairs [K3, K2]

CO2. Analyze the velocity of various links in mechanisms using velocity diagrams or instantaneous

center method as well as **determine** the acceleration of links using acceleration diagrams. [K3]

CO3. Explain the terminology of Gears as well as **Analyze** Gears and Gear Trains kinematically.

[K2, K3]

CO4. Design and Analyze Cams for specified motion and follower. [K4, K3]

CO5. Estimate unbalances force in rotating members and reciprocating mechanisms and **Solve**

problems of Governors. [K3]

UNIT-I: SIMPLE MECHANISMS

Basics of Mechanisms And Machines: Types of links, Degrees of freedom, Kinematic pairs – lower pairs and higher pairs, Kinematic chains, mechanisms, Machines, Mobility (Chebychev–Grübler–Kutzbach criterion), inversions - Grashof's conditions for 4-bar chain, inversions of slider crank chain and double slider crank chain with their applications

Mechanisms with Lower Pair: Pantograph, Exact Straight-Line Mechanisms – Peaucellier, Hart and Scott Russell mechanisms, Approximate Straight-Line Mechanisms – Grasshopper, Watt, Tchebicheff and Robert Mechanisms, Modified Scott Russell mechanism, Hooke's Joint.

UNIT-II: VELOCITY & ACEELERATION DIAGRAMS

Velocity and Acceleration Analysis of Mechanisms: Velocity and acceleration – Motion of link in machine – Determination of Velocity Acceleration diagram for a given mechanism, Klein's construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Plane motion of body: Instantaneous center of rotation, centrodes and axodes – relative motion between two bodies – Three centers in line theorem – Graphical determination of instantaneous center, diagrams for Simple mechanisms and determination of angular velocity of points and links.

UNIT-III: GEARS & GEAR TRAINS

Gears & Gear Trains: Gear – Types and profile – nomenclature of spur & helical gears – laws of gearing – interference – requirement of minimum number of teeth in gears – gear trains – simple, compound and reverted gear trains – determination of speed and torque in epicyclic gear trains.

UNIT – IV: CAMS

Cams: Cam – Types of cams and followers – Cam design for different follower motions (SHM, Uniform Velocity, Uniform Acceleration, Cycloidal profiles), circular and tangent cams – pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers.

UNIT-V: BALANCING OF MASSES AND GOVERNORS

Balancing of Rotating Masses: Static and dynamic balancing, balancing of single rotating mass by balancing masses in same plane and in different planes.

Balancing of Reciprocating Masses: Inertia effect of crank and connecting rod, unbalance in slider crank mechanism

Governors: Introduction, Centrifugal governor, Watt, Porter and Proell governors, spring loaded governors, Hartnell and Hartung with auxiliary springs

TEXT BOOKS:

1. S.S Rattan, Theory of Machines, 5th Edition, Tata McGrawHill, 2017
2. Thomas Bevan, Theory of Machines, 3rd edition, CBS Publishers & Distributors, 2009.

REFERENCE BOOKS:

2. R. K. Bansal, Theory of Machines, Laxmi Publications (P)Ltd., 5th Edition, 2016.
3. John J. Uicker, Gordon R. Pennock, Joseph E. Shigley, Theory of Machines And Mechanisms, Oxford University Press, 4th Edition, 2014
4. Cleghorn W.L., Nikolai Dechev, Mechanics of Machines, Oxford University Press, 2015.

5. Ghosh A. and Mallick A.K., Theory of Mechanisms and Machines, Affiliated East-West Pvt. Ltd, New Delhi, 3rd Edition, 2008.
6. Robert L. Norton, Kinematics and Dynamics of Machinery, SIE, Tata McGrawHill, 2017.
7. R S Khurmi, Theory of Machines, S. Chand, 14th Edition, 2017.

IV Semester	L	T	P	C
	3	1	0	4
19ME4T03- **Strength of Materials**				

COURSE OBJECTIVES:

1. The student will acquire the fundamental concepts of deformable bodies.
2. The student will be able to draw the shear force and bending moment diagrams for various beams with different loads.
3. The student will acquire the knowledge to sketch both stress distribution curves for bending and shear loads for different sections.
4. The student will compute beam deflections under transverse loads using various methods.
5. The student will compute stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

COURSE OUTCOMES: Student will be able to:

CO1: Calculate stresses and strains in structural members subjected to various types of loadings.[K3]

CO2: Sketch the Shear force and Bending moment diagrams of beams subject to combination of loads.[K3]

CO3: Determine and Sketch the stress distribution in section of the beam subjected to Bending and Shear loads.[K3]

CO4: Determine the Shear stresses and Modulus of rigidity, Slope and Deflection in shafts.[K3]

CO5: Evaluate stresses in thin and thick cylinders.[K4]

UNIT – I

Simple Stresses and Strains: Introduction, Stress, Strain, Types of Stresses, Elasticity and Elastic Limit, Hooke's Law and Elastic Moduli, Modulus of Elasticity, Factor of Safety, Constitutive Relationship between Stress and Strain.

Elastic Constants: Introduction, Longitudinal Strain, Lateral Strain, Poisson's Ratio, Volumetric Strain, Volumetric Strain of a Cylindrical Rod, Sphere and Rectangular block Bulk Modulus, Expression for Young's Modulus in Terms of Bulk Modulus.

Principal Stresses and Strains

Introduction, Principal Planes and Principal Stresses, Methods of Determining Stresses on Oblique Section, Analytical Method for Determining Stresses on Oblique Section, Graphical Method for Determining Stresses on Oblique Section, Mohr's Circle.

UNIT – II

Shear Force and Bending Moment: Introduction, Types of Beams, Types of Loads, Sign Conventions for Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams for a Cantilever, simply supported and over hanging beams with different loads and combination of loads- Point loads, UDL,UVL and couple. Relation between Load, Shear Force and Bending Moment.

UNIT – III

Flexural Stresses: Introduction, Pure Bending or Simple Bending, Theory of Simple Bending with Assumptions Made, Expression for Bending Stress, Neutral Axis and Moment of resistance, Bending Stresses in Symmetrical Sections, Section Modulus, Section Modulus for Various Shapes of Beam Sections, and Bending Stress in Unsymmetrical Sections

Shear Stresses: Introduction, Shear Stress at a Section, Shear Stress Distribution for Different Sections like Rectangular, Circular, Triangular, I, T and Angle sections.

UNIT – IV

Deflection of Beams: Introduction, Deflection and Slope of a Beam Subjected to Uniform Bending Moment, Relation between Slope, Deflection and Radius of Curvature, Deflection of a Simply Supported, cantilever Beams Carrying point load and UDL using Macaulay's Method and Moment Area Method.

Torsion:

Introduction, Derivation of Shear Stress Produced in a Circular Shaft Subjected to Torsion, Maximum Torque Transmitted by a Circular Solid Shaft and Hollow Circular Shafts, Power Transmitted by Shafts, Expression for Torque in Terms of Polar Moment of Inertia, Polar Modulus, Strength of a Shaft of Varying Sections, Combined Bending and Torsion.

UNIT – V

Thin Cylinders and Spheres: Introduction, Stresses in a Thin Cylindrical Vessel Subjected to Internal Pressure, Expression for Circumferential Stress, Expression for Longitudinal Stress, Efficiency of a Joint, Effect of Internal Pressure on the Dimensions of a Thin Cylindrical Shell, Wire Winding of Thin Cylinders. Thin Spherical Shells, Change is Dimensions of a Thin Spherical Shell Due to an Internal Pressure.

Thick Cylinders: Introduction, Stresses in a Thick Cylindrical Shell, Stresses in Compound Thick Cylinders, Initial Difference in Radii at the Junction of a Compound Cylinder for Shrinkage.

TEXT BOOKS:

1. Popov E, Solid Mechanics, Prentice Hall India Learning Private Limited, 2nd edition, 2002.
2. R K Rajput , Strength of Materials, S. Chand Publishing, 6th Edition, 2015.

REFERENCES:

1. R. K Bansal, Strength of Materials, Laxmi Publications, New Delhi, Revised 4th Edition, 2010,
2. S.S. Rattan, Strength of Materials, Tata Mc-Graw Hill Private Limited, New Delhi, 2nd edition, 2012
3. Stephen P. Timoshenko, James M. Gere, Mechanics of Materials, , C B S Publishers, (2nd edition) 2011.

4. Ferdinand P. Beer, E. Russell Johnston Jr. , John T. DeWolf, David F. Mazurek , Mechanics of Materials, 7th Edition, 2014.
5. R K Rajput, Strength Of Materials, S. CHAND, 1st Edition, 2018.
6. Ramamrutham S, Strength of Materials, Dhanpat Rai Publishing Company (p) Ltd., 18th Edition, 2014.
7. U. C. Jindal, Strength of Materials, Pearson Education; 1st edition, 2012.

IV Semester	L	T	P	C
	3	0	0	3
19ME4T04- **Metallurgy and Material Science**				

COURSE OBJECTIVE

- Discuss the principles of physical metallurgy, i.e. crystallography of metals, constitution of alloys, phase diagrams and heat treatment of steels.
- Explain the methods to change the properties of materials through heat treatment processes.
- Expose commercially important metals and alloys (both ferrous and nonferrous) with engineering constraints.
- Familiarize properties and applications of ceramics, polymers and composite materials.
- Demonstrate the fundamental properties of Nano-materials and their applications.

COURSE OUTCOMES: Students will be able to

CO1. Explain the importance of material science in engineering and the concept of metallography in studying the microstructures of metals and alloys. **[K2]**

CO2. Illustrate various types of steels and cast iron, their properties and applications.**[K2]**

CO3. Describe the concept of heat treatment of steels and strengthening mechanisms. **[K2]**

CO4. Explain the importance of non-ferrous & composites metals and alloys in engineering applications.**[K2]**

CO5. Discuss mechanical properties and various methods to quantify their mechanical integrity.**[K2]**

UNIT – I

Structure of Metals: Crystal Structures: Unit cells, Metallic crystal structures.

Imperfection in Solids: Point, Line, interstitial and volume defects, dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Constitution of Alloys: Necessity of alloying, substitutional and interstitial solid solutions-phase diagrams: Interpretation of binary diagrams and microstructure development, eutectic, peritectic, peritectoid and monotectic reactions. Iron-Iron-carbide diagram and microstructural aspects of ferrite, cementite, austenite, ledeburite and cast iron.

UNIT -II

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, nodular cast iron, Alloy cast irons. Classification of alloy steel, structure and properties of plain carbon steels, Low alloy steels, tool and die steels, applications of cast iron and steels.

UNIT – III

Heat Treatment: Annealing, normalizing, tempering, Hardening, spheroidizing, isothermal transformation for Fe-Fe3C system, TTT diagrams, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT - IV

Non-Ferrous Metals and Alloys: Micro-Structure, properties and applications of copper and its alloys, Aluminium and its alloys, Titanium and its alloy.

Composite Materials: Classification of composites, various methods of fabrication of composites, particle reinforced and fiber reinforced composites.

UNIT – V

Fracture Mechanism: Types of fracture, methods of protection against fracture.
Mechanical Properties: Elasticity and plasticity in materials, Stress-strain curve, Resolved shear stress, Tensile properties, Hardness and hardness measurement, Impact properties, Fatigue, Creep.

TEXT BOOKS:

1. V. Rahghavan, Materials Science and Engineering, PHI Publications6thed, (2015).
2. Sidney H. Avener, Introduction to Physical Metallurgy, Tata McGraw Hill, 2nd ed, (1997).

REFERENCE BOOKS:

1. R.Balasubramaniam, Callister's Material Science and Engineering, wiley india, 2nd ed. (2014).
2. V.D. Kodgire, S.V.Kodgire, Material science and metallurgy,Everest Publishing House, 42nd edition (2018)
3. R.K.Rajput, Engineering materials and metallurgy, S.Chand & company, New Delhi, Revised edition (2012).
4. O.P.Khanna, Material Science & Metallurgy, Dhanpatrai publications, 2nd edition (2014).

IV Semester	L	T	P	C
	2	0	0	2
19CS4T06- **Python Programming**				

COURSE OUTCOMES:

At the end of the course students are able to

1. Recognize core programming basics and program design with functions using Python programming language.
2. Interpret the high-performance programs designed to strengthen the practical expertise.
3. Develop applications for real time problems by applying python data structure concepts.
4. Understand and apply the concepts of packages, handling, multithreading and socket programming.
5. Analyze the importance of object-oriented programming over structured programming.
6. Design user interface using case study for application development.

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT – II:

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators-Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

UNIT – III:

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – IV:

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from. Import statement, name spacing,

Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – V:

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor

Method, Inheritance, Overriding Methods, Data hiding,

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

TEXT BOOKS

1. Mark Lutz, Learning Python, O'rielly, 5th edition, 2013

2. Vamsi Kurama, Python Programming: A Modern Approach, Pearson, 2nd edition, 2018.

Reference Books:

1. Kenneth A, Introduction to Python, Lambert, Cengage, 2e, 2019.
2. W.Chun, Core Python Programming, Pearson, 2e, 2006.
3. Allen Downey, Think Python, Green Tea Press

IV Semester	L	T	P	C
	0	0	3	1.5
19ME4L01- **Theory of Machines Lab**				

COURSE OBJECTIVE:

- Expose the students practically to the concepts they studied in Theory of Machines subject.

COURSE OUTCOMES: Students will be able to

CO1: **Analyze** basic mechanisms like four bar mechanism, single slider crank chain and double slider crank chain mechanisms [**K3]**
CO2: **Analyze** kinematically working of cams with various types of followers **[K3]**
CO3: Experimentally **determine** the performance characteristics of different types of governors **[K5]**
CO4: **Estimate** unbalance existing in mechanisms **[K5]**

Any 10 out of below 14are to be executed

Expt 1: A study on a combination of Four bar Mechanisms
Expt 2: A study on single slider crank chain mechanisms.
Expt 3: A study on double slider crank chain mechanisms
Expt 4: A study on cam with reciprocating follower and oscillating follower
Expt 5: A study on single face cam and face follower mechanism
Expt 6: To perform experiment on watt Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
Expt 7: To perform experiment on porter Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
Expt 8: To perform experiment on proell Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
Expt 9: To perform experiment on Hartnell loaded Governors to prepare performance characteristic Curves, and to find stability & sensitivity.
Expt 10: To perform experiment on Hartung loaded Governors to prepare performance characteristic Curves, and to find stability & sensitivity.
Expt 11: To perform the experiment for static balancing on static balancing machine.
Expt 12: To perform the experiment for dynamic balancing on dynamic balancing machine.

Expt 13: To estimate the reciprocating unbalance in single cylinder engine.
Expt 14: To estimate the reciprocating unbalance in multi cylinder engine.

IV Semester	L	T	P	C
	0	0	3	1.5
19ME4L02- **Strength of Materials and Metallurgy Lab**				

COURSE OBJECTIVE:

To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures.

COURSE OUTCOMES: Students will be able to

CO1. Illustrate the impact resistance in machine components. [K3]

CO2. Determine the hardness of metals and rigidity modulus of spring. [K3]

CO3. Calculate torsional rigidity and elasticity modulus of the shaft. [K3]

CO4. Compare microstructure of the material with standard structure. [K2]

CO5. Observe how the hardness is changes by Jomney end quench test. [K2]

SECTION – A

MECHNICS OF SOLIDS LAB:

1. Direct tension test
2. Bending test
3. Torsion test
4. Hardness test
    a) Brinell's hardness test
    b) Rockwell hardness test
5. Test on springs.
6. Impact test

SECTION - B

METALLURGY LAB:

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jomney End Quench Test.

7. To find out the hardness of various treated and untreated steels.

Note: ANY 5 EXPERIMENTS FROM EACH SECTION A AND B.

IV Semester	L	T	P	C
	0	0	2	1
19CS4L04- **Python Programming Lab**				

COURSE OUTCOMES:

At the end of the course students are able to

CO1: Apply core programming basics and program design with functions using Python **K4**
CO2: programming language. **K3**
CO3: Interpret the high-performance programs designed to strengthen the practical expertise. **K3**
CO4: Develop applications for real time problems by applying python data structure **K4**
CO5: concepts. **K4**
CO6: Test and apply the concepts of packages, handling, multithreading and socket programming. **K3**

Divide the importance of object oriented programming over structured programming.
Design user interface using case study for application development.

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is an even number or not.
b) Using a "for loop", write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . .1/10
c) Write a program using a "for loop" that loops over a sequence. What is sequence?
d) Write a program using a "while loop" that asks the user for a number, and prints a count down from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued
a) Write a program combine lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files
a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions
a) Write a function ball collides that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a triple of (x, y, r), r being the radius
If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued
a) Write a function nearly equal to test whether two strings are nearly equal. Two strings A and B bare nearly equal when a can be generated by a single mutation on B.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving
a) Write a function cumulative product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute GCD, LCM of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists
a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules
a) Install packages requests, flask and explore them using (pip)
b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)
c) Write a simple script that serves a simple HTTP Response and a simple HTML Page

Exercise - 13 OOP
a) Class variables and instance variable and illustration of the self-variable
i) Robot
ii) ATM Machine

IV Semester	L	T	P	C
	2	0	0	0
19BM0M03- **Indian Constitution (Mandatory Course)**				

UNIT 1

Constitution – Structure and Principles

1.1: Meaning and importance of Constitution

1.2: Making of Indian Constitution – Sources

1.3: Salient features of Indian Constitution

UNIT 2

Fundamental Rights and Directive Principles

2.1: Fundamental Rights

2.2: Fundamental Duties

2.3: Directive Principles

UNIT 3

Government of the Union

3.1: President of India – Election and Powers

3.2: Prime Minister and Council of Ministers

3.3: Lok Sabha – Composition and Powers

3.4: Rajya Sabha – Composition and Powers

UNIT 4

Government of the States

4.1: Governor – Powers

4.2: Chief Minister and Council of Ministers

4.3: Legislative Assembly – Composition and powers

4.4: Legislative Council – Composition and powers

UNIT 5

The Judiciary

5.1: Features of judicial system in India

5.2: Supreme Court –Structure and jurisdiction

5.3: High Court – Structure and jurisdiction