COURSE STRUCTURE(R19)
AND
DETAILED SYLLABUS
(I YEAR)

MECHANICAL ENGINEERING

For

B.Tech., Four Year Degree Course

(Applicable for the batches admitted from 2019-20)

LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (CSE, EEE & ME)
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B.Tech Course Structure –R19

(w.e.f the Academic Year 2019-20)

Semester – 0							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-HM1001	Physical Activities (Sports, Yoga and Meditation, Plantation)	BS	0	0	3	0
2	R19CSE-ES1001	Career Counseling	ES	3	0	0	0
3	R19CSE-ES1002	Orientation (Know your Department)	ES	3	0	0	0
4	R19CSE-ES1003	Fundamentals of Computers	ES	3	0	2	0
5	R19BSH-MA1001	Basic Aptitude and Mathematical Skills	BS	3	0	0	0
6	R19BSH-MA1002	Remedial Training in Foundation Courses	BS	5	0	0	0
7	R19BSH-HM1002	Human Values & Professional Ethics	HM	3	0	0	0
8	R19BSH-HM1003	Communication Skills (Listening, Speaking, Reading skills Writing skills)	HM	2	1	2	0
			Total	**22**	**1**	**7**	**0**

I YEAR - I SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-MA1103	Linear Algebra and Ordinary Differential Equations	BS	3	0	0	3
2	R19BSH-PH1102	Engineering Physics	BS	3	0	0	3
3	R19EEE-ES1101	Basic Electrical & Electronics Engineering	ES	3	0	0	3
4	R19BSH- EN1101	English	HM	3	0	0	3
5	R19MEC-ES1101	Engineering Graphics	ES	1	0	3	2.5
6	R19BSH-PH1104	Engineering Physics Lab	BS	0	0	3	1.5
7	R19BSH-EN1102	Communicative English Lab -I	HM	0	0	3	1.5
8	R19EEE-ES1102	Basic Electrical and Electronics Engineering Lab	ES	0	0	3	1.5
9	R19BSH-MC1101	Constitution of India	MC	2	0	0	0
			Total	**15**	**0**	**12**	**19**

I YEAR – II SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-MA1207	Transform Techniques and Partial Differential Equations	BS	3	0	0	3
2	R19BSH-CH1201	Engineering Chemistry	BS	3	0	0	3
3	R19MEC-ES1204	Engineering Mechanics	ES	3	0	0	3
4	R19CSE-ES1203	Problem Solving and Programming using C	ES	3	0	0	3
5	R19MEC-ES1206	Engineering Workshop & IT Workshop Lab	ES	0	0	3	1.5
6	R19MEC-PC1201	Computer Aided Engg Drawing	PC	1	0	4	3
7	R19BSH-CH1204	Engineering Chemistry Lab	BS	0	0	3	1.5
8	R19CSE-ES1204	Problem Solving and programming using C Lab	ES	0	0	3	1.5
9	R19BSH-EN1201	Communicative English Lab -II	HM	0	0	3	1.5
10	R19BSH-MC1201	Environmental Science	MC	1	0	0	0
			Total	**14**	**0**	**16**	**21**

II YEAR – I SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-MA2104	Numerical Methods and Multi variable Calculus	BS	3	0	0	3
2	R19MEC-PC2101	Mechanics of Solids	PC	3	0	0	3
3	R19MEC-PC2102	Material Science & Metallurgy	PC	3	0	0	3
4	R19MEC-PC2103	Fluid Mechanics & Hydraulic Machines	PC	3	0	0	3
5	R19MEC-PC2104	Thermodynamics	PC	3	0	0	3
6	R19MEC-PC2105	Machine Drawing	PC	1	0	3	2.5
7	R19MEC-PC2106	Metallurgy & Mechanics of Solids Lab	PC	0	0	3	1.5
8	R19MEC-PC2107	Fluid Mechanics & Hydraulic Machines Lab	PC	0	0	3	1.5
9	R19MEC-MC2101	Virtual Lab	MC	0	0	2	0
10	R19MEC-MC2102	MOOCS-1	MC	0	0	0	0
11	R19BSH-MC2101	Essence of Indian Traditional Knowledge	MC	1	0	0	0
			Total	**17**	**0**	**11**	**20.5**

II YEAR – II SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-MA2202	Complex Variables, Probability& Statistics	BS	3	0	0	3
2	R19MEC-PC2201	Kinematics of Machinery	PC	3	0	0	3
3	R19MEC-PC2202	Applied Thermodynamics	PC	3	0	0	3
4	R19MEC-PC2203	Production Technology	PC	3	0	0	3
5	R19MEC-PC2204	Instrumentation & Control Systems	PC	3	0	0	3
6	R19MEC-PC2205	Design of Machine Members	PC	3	0	0	3
7	R19MEC-PC2206	Production Technology Lab	PC	0	0	3	1.5
8	R19MEC-PC2207	Instrumentation & Control Systems Lab	PC	0	0	3	1.5
9	R19BSH-MC2204	English Communication skills-II	MC	0	0	3	0
10	R19MEC-PJ2201	Socially relevant Project	PJ	0	0	1	0.5
11	R19MEC-MC2201	MOOCS-2	MC	0	0	0	0
12	R19MEC-SI2201	Summer Internship	MC	0	0	0	0
			Total	**18**	**0**	**15**	**21.5**

III YEAR – I SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19MEC-PC3101	Dynamics of Machinery	PC	3	0	0	3
2	R19MEC-PC3102	Design of Power Transmission Elements	PC	3	0	0	3
3	R19MEC-PC3103	Metal Cutting & Machine Tools	PC	3	0	0	3
4	R19BSH-HM3101	Managerial Economics and Industrial Management	HM	3	0	0	3
5	R19MEC-PC3104	IC Engines &Turbo Machinery	PC	3	0	0	3
6	R19MEC-PE3101	**Professional Elective -I**	PE	3	0	0	3
	R19MEC-PE3101.1	1. Power Plant Engineering					
	R19MEC-PE3101.2	2. Industrial Hydraulic & Pneumatics					
	R19MEC-PE3101.3	3. Mechanical Behaviour of Materials					
	R19MEC-PE3101.4	4. Composite Materials					
	R19MEC-PE3101.5	5. Advanced Manufacturing Processes					
	R19MEC-PE3101.6	6. Casting and Welding Techniques					
	R19MEC-PE3101.7	7. Statistical Quality Control					
	R19MEC-PE3101.8	8. Management Science					
7	R19MEC-PC3106	Thermal Engineering Lab	PC	0	0	3	1.5
8	R19MEC-PC3107	Machine Tools Lab	PC	0	0	3	1.5
9	R19BSH-EN3101	Advanced Communication Lab	HM	0	0	3	0
10	R19MEC-MC3101	MOOCS-3	MC	0	0	0	0
			Total	**18**	**0**	**9**	**21**

III YEAR – II SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19MEC-PC3201	CAD/CAM	PC	3	0	0	3
2	R19MEC-PC3202	Heat Transfer	PC	3	0	0	3
3	R19MEC-PC3203	Finite Element Methods	PC	3	0	0	3
4	R19MEC-PE3201	**Professional Elective –II**	PE	3	0	0	3
	R19MEC-PE3201.1	1. Refrigeration & Air Conditioning					
	R19MEC-PE3201.2	2. Renewable Energy Sources					
	R19MEC-PE3201.3	3. Advanced Mechanics of Solids					
	R19MEC-PE3201.4	4. Design for Manufacturing & Assembly					
	R19MEC-PE3201.5	5. Manufacturing Methods in Precision Engineering					
	R19MEC-PE3201.6	6. Manufacturing with Non Metallic Materials					
	R19MEC-PE3201.7	7. Supply Chain Management					
	R19MEC-PE3201.8	8. Industrial Psychology					
5	R19MEC-PE3202	**Professional Elective –III**	PE	3	0	0	3
	R19MEC-PE3202.1	1. Automobile Engineering.					
	R19MEC-PE3202.2	2. Cryogenic Engineering					
	R19MEC-PE3202.3	3. Power Transmission in Hybrid and Electric Vehicles					
	R19MEC-PE3202.4	4. Mechanical Vibrations					
	R19MEC-PE3202.5	5. Automation in Manufacturing					
	R19MEC-PE3202.6	6. Rapid Prototyping					
	R19MEC-PE3202.7	7. Entrepreneurship& Incubation					
	R19MEC-PE3202.8	8. Industrial Management					
6	R19MEC-PE3203	**Professional Elective –IV**	PE	3	0	0	3
	R19MEC-PE3203.1	1. Gas Dynamics and Jet Propulsion					
	R19MEC-PE3203.2	2. Wind Energy Systems					
	R19MEC-PE3203.3	3. Industrial Robotics					
	R19MEC-PE3203.4	4. Nano Materials					
	R19MEC-PE3203.5	5. World Class Manufacturing					
	R19MEC-PE3203.6	6. Industrial Safety and Hazard Management					
	R19MEC-PE3203.7	7. Business ethics and Corporate Governance					
	R19MEC-PE3203.8	8. Production Planning control					
7	R19MEC-PC3204	Heat Transfer Lab	PC	0	0	3	1.5
8	R19MEC-PC3205	CAE Lab	PC	0	0	3	1.5
9	R19MEC-PC3206	Theory of Machines Lab	PC	0	0	2	1
10	R19MEC-MC3201	MOOCS -4	MC	0	0	0	0
11	R19MEC-SD3201	Skill Development Course -1	SD	0	0	3	0
12	R19MEC-SI3202	Summer Internship	SI	0	0	0	0
			Total	**18**	**0**	**11**	**22**

IV YEAR – I SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19MEC-PC4101	Mechatronics	PC	3	0	0	3
2	R19MEC-PC4102	Engineering Metrology	PC	3	0	0	3
3	R19MEC-PC4103	Operations Research	PC	3	0	0	3
4	R19MEC-PE4101	**Professional Elective –V**	PE	3	0	0	3
	R19MEC-PE4101.1	1. Computational Fluid Dynamics					
	R19MEC-PE4101.2	2. Alternative fuels and Emission Control in Automotives					
	R19MEC-PE4101.3	3. Condition Monitoring					
	R19MEC-PE4101.4	4. Non Destructive Evaluation					
	R19MEC-PE4101.5	5. Flexible Manufacturing Processes					
	R19MEC-PE4101.6	6. CNC and Adaptive Control					
	R19MEC-PE4101.7	**7.** Organizational Behaviour.					
	R19MEC-PE4101.8	8. Operations Management					
5	R19MEC-OE4101	**OPEN ELECTIVE -I**	OE	3	0	0	3
	R19MEC-OE4101.1	1. MEMS					
	R19BSH-OE4101.2	2. Optimization Methods					
	R19MEC-OE4101.3	3. Nano Technology					
	R19MEC-OE4101.4	4. Sensors for Intelligent Manufacturing.					
	R19CSE-OE4101.5	5. Internet of Things (IoT)					
6	R19MEC-PC4104	Engineering Metrology Lab	PC	0	0	3	1
7	R19MEC-PC4105	Mechatronics Lab	PC	0	0	3	1
8	R19MEC-PJ3101	Mini Project	PJ	0	0	8	4
9	R19MEC-SD4101	Skill Development Course -2	SD	0	0	3	0
			Total	**15**	**0**	**17**	**21**

IV YEAR – II SEMESTER							
S. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R19MEC-OE4201	**OPEN ELECTIVE –II**	OE	3	0	0	3
	R19EEE-OE4201.1	Energy Consumption and Management					
	R19BSH-OE4201.2	Intellectual Property Rights & Patents					
	R19MEC-OE4201.3	Image Processing					
	R19MEC-OE4201.4	Data Base Management System					
2	R19MEC-OE4202	**OPEN ELECTIVE –III**	OE	3	0	0	3
	R19BSH-OE4202.1	Total Quality Management					
	R19BSH-OE4202.2	Supply Chain Management					
	R19MEC-OE4202.3	Product Design & Development					
	R19MEC-OE4202.4	Advanced Materials					
	R19EEE-OE4202.5	Energy Auditing					
	R19CSE-OE4202.6	Neural Networks and Fuzzy Techniques					
	R19CSE-OE4202.7	JAVA					
3	R19MEC-PJ4201	Project	PI	0	0	16	8
				6	**0**	**16**	**14**

I Year –I Semester

Subject Code	Subject Name	L	T	P	C
R19BSH- MA1103	Linear Algebra and Ordinary Differential Equations	3	0	0	3

Course Objectives:

- This course is designed to equip the students with the necessary Mathematical skills and techniques that are essential for an engineering course.
- To enlighten the learners in the concept of Linear Algebra and Calculus.
- 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.

Course Outcomes:

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

1. Apply the matrix algebra techniques to engineering applications. (L3)
2. Apply the concepts of eigen values and eigen vectors to free vibration of a two mass systems. (L3)
3. Apply mean value theorems to real world problems.(L3)
4. Solve the first order ordinary differential equations related to various engineering fields. (L3)
5. Solve the higher order differential equations and analyze physical situations. (L3)

Unit I

Matrix Operations and Solving Systems of Linear Equations:

Rank: Rank of a matrix, echelon form and normal form of a matrix, finding the non singular matrices P, Q of a matrix A such that PAQ is in normal form.

Linear Equations: Solving system of homogeneous and non-homogeneous linear equations using-Row-Rank Method, Direct Methods (Gauss elimination method, Gauss Jordan method) and Iterative methods (Jacobi's iteration method, Gauss Seidel method).

Application: Finding the current in an electrical circuit.

Learning Outcomes:

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

- find the rank of a given matrix. (L2)
- solve the system of linear equations using various matrix techniques. (L3)
- apply the matrix methods to find the current in an electrical circuit at any time. (L3)

Unit II

Eigen values, Eigen vectors and Quadratic forms:

Eigen values and Eigen vectors**:** Eigen values and Eigen vectors and their properties (without proofs), diagonalisation of a matrix, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by using Cayley-Hamilton theorem.

Quadratic forms**:** Quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation, rank, index and signature of a quadratic form, Sylvester's law of inertia (without proof), nature of the quadratic forms.

Application: Free vibration of two mass systems.

Learning Outcomes:

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

- find the eigen values and eigen vectors of the given matrix.(L2)
- find the inverse and powers of the matrix using Cayley- Hamilton theorem.(L2)
- identify special properties of a quadratic form(or corresponding matrix). (L3)

Unit III

Mean Value Theorems & Sequences and Series (without proofs): Mean Value Theorems: Rolle 's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders.

Sequences and Series: Sequence, series, convergence and divergence of series, geometric series, auxiliary series, comparison tests, ratio test, integral test, Cauchy's root test, Raabe's test, alternating series, Leibnitz test, absolute and conditional convergence.

Learning Outcomes:

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

- analyze the behaviour of functions by using mean value theorems. (L3)
- translate the given function as series of Taylor's and Maclaurin's with remainders. (L3)
- apply the suitable test to study the convergence of a given series. (L3)

Unit IV

Differential Equations of first Order and First Degree: Linear and Bernouill's equations, exact differential equation and differential equations reducible to exact equations.

Application: Orthogonal trajectories, Newton's law of cooling, physical applications (motion of boat across a stream, velocity of escape from the earth, rotating cylinder containing liquid).

Learning Outcomes:

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

- solve the first order differential equation by appropriate method. (L2)
- formulate the first order linear differential equation for a physical situation. (L3)
- apply suitable method to solve the real world problem using the concept of differential equations.(L3)

Unit V

Linear Differential Equations of Higher Order: Definitions, complete solution, operator D, rules for finding complementary function, inverse operator, rules for finding particular integral (The RHS term of the type e^{ax} , Sin ax, cos ax, polynomial in x, e^{ax} V(x), xV(x)), method of variation of parameters, simultaneous linear equations with constant coefficients using direct elimination method.

Applications: L-C-R Circuits.

Learning Outcomes:

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

- solve the linear differential equations with constant coefficients by appropriate method. (L3)
- solve the higher order differential equation by analyzing physical situations. (L3)
- convert second and third order differential equation to a system of linear differential equations. (L2)
- solve the system of linear differential equations with constant coefficients. (L3)

Textbooks

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
5. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.

Subject Code	Subject Name	L	T	P	C
R19BSH-PH1102	Engineering Physics	3	0	0	3

Course Objectives:

- To impart knowledge in basic concepts of friction, acoustics, material properties and heat transfer and thermodynamics
- Familiarize types of sensors for various engineering applications

Course Outcomes:

After the completion of this course, the student can able to

1. Apply the principles of acoustics and Ultrasonics for noise reduction (L3)
2. Develop the relationship between elastic constants(L3)
3. Identify the principles of lasers and mechanics (L2)
4. Explain the various types of crystal systems and nano materials(L2)
5. Demonstrate the working principles of heat engine and refrigerator using laws of thermodynamics(L3)

Unit I

Acoustics and Ultrasonics:

Acoustics: Classification of sound- Sabine's formula-derivation-Absorption Coefficient and its determination- factors affecting acoustics of buildings and their remedies.

Applications: Noise control and construction of acoustically good hall

Ultrasonics: Production of Ultrasonics by magnetostriction and piezoelectric methods-Non Destructive testing- pulse echo system through transmission and reflection modes- A, B.

Applications: Sonogram and ultrasonic echo sounder

Learning outcomes:

After the completion of this chapter the student can able to

- Identify the requirements of acoustically good hall(L2)
- Determine the Coefficient of Absorption(L2)
- Derive the Sabine's formula for reverberation time(L3)
- Demonstrate the Production of Ultrasonics by magnetostriction and piezoelectric experiments(L3)
- Compare the various types of scans(L2)

Unit II

Elasticity: Concepts of elasticity- Plasticity- Hook's law- Elasticity Constants- Young's Modulus-Bulk Modulus-Rigidity Modulus-Poisson's ratio and their relationships-stress-strain Curve-Strain Harding-Yielding Point

Applications**:** Elastic behavior of materials, Crane lifting of heavy loads and beams under the bridges.

Learning Outcomes

After the completion of this chapter the student can able to

- Compare the concepts of elasticity and plasticity (L2)
- Identify the relation between elastics constants (L2)
- Draw the stress-stain curve (L3)

Unit III

Mechanics and Lasers:

Mechanics: Basic laws of vectors and scalars-vector addition, multiplication- dot product and cross product-conservative forces- F=-grad V, Newton's laws in inertial frames of reference – System of variable mass

Applications: Motion of rocket and launching of satellite or rocket(multistage rocket)

Lasers: Characteristics- Spontaneous and Stimulated Emissions- Pumping and Population Inversion-Ruby Laser-He-Ne-Laser

Applications: LINAR, Laser Welding, cutting and drilling

Learning Outcomes

After the completion of this chapter the student can able to

- Identify the forces and moments in mechanical systems using scalar and vectors(L3)
- Relates Newton's second law for inertial and non-inertial frame of reference (L2)
- Compare scalar with vector (L2)
- Explain the Characteristics of Lasers(L2)
- Construct three level and four level laser systems(L3)
- Analyze the applications of lasers (L4)

Unit IV

Crystallography and Physics of Nanomaterials:

Crystallography: Space Lattice-Basis set- Unit Cell-Lattice Parameters- Bravis Lattice-Crystal systems-packing fraction of simple Cubic-Body Centered cubic–Face Centered cubic lattice- Bragg's law

Applications: Determination of crystal structure byX-ray diffraction powdered method.

Physics of Nanomaterials:

Properties of Nanomaterials- Synthesis-Sol-gel Method, preparation of CNT-pulsed laser deposition techniques–Properties of CNT

Applications: electrical circuits, Computer applications, CNT gas sensor

Learning Outcomes

After the completion of this chapter the student can able to

- Explain the various types of crystal systems(L2)
- Draw the structures of simple cubic, Body Centered cubic and Face Centered cubic lattice(L3)
- Demonstrate the Bragg's law- X-ray diffraction powdered method(L3)
- Analyze the size dependent properties of Nano materials(L4)
- Enumerate the method for the preparation of CNT's (L2)

Unit V

Thermodynamics: First law of thermodynamics and its applications-reversible and irreversible Processes-Heat Engine-Carnot Cycle and its Efficiency –second law of thermodynamics and entropy

Applications: Heat engine and Refrigerators

Learning Outcomes

After the completion of this chapter the student can able to

1. Describe the basic laws of thermodynamics(L2)
2. Derive the efficiency of Carnot's cycle(L3)
3. Demonstrate the principles of heat engine and Refrigerators(L3)

Text Books

1. Ch. Srinivas, Ch. SeshuBabu, "Engineering Physics", Cengage Learning
2. Gaur R.K and Gupta S.L., "Engineering Physics" –Dhanpat Rai Publishers, 2012
3. M.N. Avadhanulu, P.G. Kshrisagar "A Text book of Engineering Physics" –S. Chand Publications, 2017

Reference Books

1. M.K. Varma "Introduction to Mechanics" –Universities Press-2015
2. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics" –Oxford Publications -2015
3. Sanjay D Jain, Girish G Shastra Buddi, "Engineering Physics" –University Press
4. D. Kleppner and Robert Kolenkow "An Introduction to Mechanics" –II Cambridge University Press, 2015
5. Charles Kittle Introduction to Solid State Physics", Wiley Publications,2011
6. S.L.Gupta and Sanjeev Gupta, "Unified Physics", Vol. I& Vol.II, Jai Prakash Nath & co.
7. Bhattacharya and Poonam Tandon, "Engineering Physics" , Oxford Publications

Subject Code	Subject Name	L	T	P	C
R19EEE-ES1101	Basic Electrical & Electronics Engineering	3	0	0	3

Course Objectives

- To familiarize with the basic DC and AC networks.
- To explain the concepts of electrical machines and their characteristics.
- To identify the importance of transformers in transmission and distribution of electric power.
- To impart knowledge about the characteristics of semi-conductor devices.
- To expose basic concepts and applications of Operational Amplifiers.

Course Outcomes:

After the completion of this course, the student can able to

1. Analyze the behavior of an electrical circuit. (L4)
2. Measure the performance quantities such as losses, efficiency of DC machines and transformers. (L3)
3. Measure the performance quantities such as losses, efficiency of transformer and induction motor. (L3)
4. Understand the importance and applications of p-n junction diode. (L2)
5. Evaluate the configurations and applications of Op-Amps. (L5)

Unit I

Basic laws and Theorems: Ohms law, Kirchoff's Laws, series and parallel circuits, Types of elements and sources, source transformations, delta-wye conversion, Mesh analysis, nodal analysis. Linearity and superposition theorem, Thevenin's and Norton's theorem with simple examples, maximum power transfer theorem with simple examples, Applications.

Unit outcomes: The students are able to

- Apply Ohms and Kirchhoff's Laws (L3)
- Analyze theorems such as Linearity &superposition theorem, Thevenin's & Norton's theorem and maximum power transfer theorem. (L4)
- Determine the current, voltage and power in a given electrical circuit(L3)

Unit II

DC Machines: Construction and working of DC Generator, E.M.F. Equation, types and characteristics of generator, construction and working of DC Motor, Torque Equation, types and characteristics of DC Motor and speed control of separately excited dc motor, Starters: 2-point, 3-point starters, losses and efficiency, efficiency by direct and indirect loading, Applications.

Unit outcomes: The students are able to

- Understand the constructional features of DC machines. (L2)
- Analyze EMF, torque and performance characteristics of DC machines. (L3)
- Select suitable starters for DC motors. (L3)
- Estimate losses and efficiency of electrical machines. (L3)

Unit III

AC Machines: Representation of Sinusoidal waveform and Phasor diagrams of R, L, and C parameters, Constructional details, EMF equation, Equivalent circuit of transformer, voltage regulation, losses and efficiency, open and short- circuit tests and determination of efficiency, Applications.

Introduction of Three Phase Induction Motors: Construction, working principle of three phase induction motor, Production of rotating magnetic field, types of Three phase Induction Motors, Torque-Slip characteristics, Applications.

Unit outcomes: The students are able to

- Outline the constructional details and principle of transformers.(L2)
- Analyze the efficiency and voltage regulation of a transformer. (L4)
- Explain the principle of three phase induction motor. (L2)

- Identify the characteristics, losses and efficiency of a three phase induction motor.(L2)

Unit IV

Semiconductor Devices: p-n Junction diode - Basic operating principle, current-voltage characteristics, rectifier circuits (half-wave, full-wave, rectifier with filter capacitor), Zener diode as Voltage Regulator, BJT Principle, types and configuration, FET as an amplifier and switch, MOSFET operation, Applications of Semiconductor Devices.

Unit outcomes: The students are able to

- Analyze the device structure, operation and characteristics of a p-n junction diode. (L3)
- Apply p-n diode for various applications. (L3)
- Explain the construction, operation and applications of MOSFETs(L2)

Unit V

Operational Amplifiers: The Ideal Op Amp, The Inverting Configuration, The closed loop gain, Effect of Finite open-loop gain, The Non-inverting Configuration, The closed loop gain, Characteristics of Non Inverting Configuration, Effect of finite open loop gain, the voltage follower, Difference amplifiers, A Single Op-amp difference amplifier-Applications

Unit outcomes: The students are able to

- Illustrate the operation of Op Amps. (L2)
- Explain different modes of operationof Op Amps. (L2)
- Make use of Op Amp in different applications. (L2)

Text Books

1. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st edition, McGraw Hill Education (India) Private Limited,2017.
2. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, 1st edition, S. Chand Publishing,New Delhi, 2006.
3. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits 6th edition, Oxford University Press, 2014.

References

1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education,2011.
2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2/e, Pearson Education, 2008.
3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi,2012.

I Year –I Semester Syllabus

Subject Code	Subject Name	L	T	P	C
R19BS- EN1101	English	3	0	0	3

Course Objectives:

- Educate students in the acquisition of the English language through the study of literature and other contemporary forms of culture.
- Help students to explore literature in order to learn how the world works to understand the complex dynamics of human interpersonal relationships.
- Promote the development of empathy by engaging students in a discussion of literary works, highlighting the emotional aspects of the pieces.
- Assist students in the development of intellectual flexibility, creativity, and cultural literacy by involving them in life-long learning.
- Acquire a wide range of vocabulary, an understanding of grammar and knowledge to demonstrate students' ability to think creatively in order to express effectively.

Course Outcomes:

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

1. Understand the value of Human Conduct for career development through life skills: Ethics & Values and use root words and Prepositions without errors. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading
2. Observe the significance of imagery in poetry to use it in real-time contexts and learn to use and misuse of Articles, Prefixes, Suffixes, and Punctuations. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading
3. Acquire conversation skills through drama and enhance the correct use of Nouns, Pronouns, Verbs and Concord to write paragraphs effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading
4. Develop reading for inspiration, interpretation & innovation and learn to use modifiers, synonyms and antonyms to write essays effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading
5. Learn meaningful use of language by avoiding meaningless cliches, bureaucratic euphemisms and academic jargon in order to acquire the skill of summarising.Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading

Unit I

On the Conduct of Life: William Hazlitt-Reading; Grammar-Prepositions; Vocabulary-Word Formation-I; Introduction to Word Formation; Writing-Clauses and Sentences; Life-Skills: Values and Ethics. If-- Rudyard Kipling.

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--1. Strong Roots--2.Early Influences-3.Education Provides a Solid Foundation-for Extensive reading-Reading for Pleasure-Information and General Understanding

Learning Outcomes:

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

- instill one's own creativity through poetry and prose for LSRW skills development(L3)
- build one's critical thinking skills (L3)
- enrich social skills which in turn make him/her a good engineer to the society(L3)
- impart reading skills that sensitize about worldly topics.(L2)
- understand new phrases and vocabulary to use in both communication and writing (L2)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)

Unit II

The Brook: Alfred Tennyson: Reading; Grammar-Articles; Vocabulary-Word Formation-II: Root Words from Other Languages; Writing-Punctuation; Life-Skills: Self-Improvement. How I Became a Public Speaker: George Bernard Shaw.

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--4.Preparing to Start a Career--5.Work Begins in Earnest--6. From Hovercraft to Rockets -for Extensive reading-Reading for Pleasure-Information and General Understanding

Learning Outcomes:

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

- experience literary imagery to use it in conversational English(L4)
- become aware of his/her responsibility towards nation(L2)
- understand his/her ability to write effectively through reading(L2)
- acquaint with perfect use of grammar and language(L3)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)

Unit III

The Death Trap: Saki: Reading; Grammar-Noun-Pronoun Agreement-Subject-Verb Agreement; Vocabulary-Word Formation-III: Prefixes and Suffixes from Other Languages; Writing-Principal of Good Writing-Paragraph Writing; Life-Skills: Time Management- On Saving Time: Seneca

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--7.Adding Momentum to Space Research--8.Balancing Defence Technology with Space Research--for Extensive reading-Reading for Pleasure-Information and General Understanding

Learning Outcomes:

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

- instill empathy and a sense of humanity through the given literary piece (L3)
- acquire the ability to manage time in terms of goal setting (L3)
- communicate effectively with proper grammatical syntax and semantics (L3)
- understand new phrases and vocabulary to use in both communication and writing (L2)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)

Unit IV

Chindu Yellamma: Reading; Grammar-Misplaced Modifiers; Vocabulary-Synonyms & Antonyms; Writing-Essay Writing; Life-Skills: Innovations. Muhammad Yunus.

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--9. Dreaming of Satellites--10.The End of an Era--for Extensive reading-Reading for Pleasure-Information and General Understanding

Learning Outcomes:

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

- understand the significance of art that brings the change in human.(L2)
- construct sentences with appropriate usage of grammar.(L3)
- develop writing skills through essay writing. (L3)
- acquire a wide range of vocabulary through synonyms and Antonyms.(L2)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)

Unit V

Politics and the English Language-George Orwell: Reading; Grammar-Cliches and Redundancies; Vocabulary-Common Abbreviations; Writing-Writing a summary; Life-Skills: Motivation- The Dancer with a White Parasol: Ranjana Deva

Wings of Fire" An Autobiography of Dr.APJ Abdul Kalam--11. Leading a Team--12. Dear ones Pass On--for Extensive reading-Reading for Pleasure-Information and General Understanding

Learning Outcomes:

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

- develop the Imagery techniques for speaking and writing. (L3)
- understand the gradual evolution in the field of Indian cinema. (L2)
- optimize the acquired skills of grammar and vocabulary contextually.(L3)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)

Textbooks

1. Language and Life -A skills Approach by Orient Black Swan.
2. Wings of Fire An Autobiography APJ Abdula Kalam with Arun Tiwari Abridged by Universities Press

Online References

1. https://www.gradesaver.com/the-poetry-of-dh-lawrence/study-guide/summary
2. https://englicist.com/notes/summary-where-the-mind-is-without-fear-rabindranath-tagore.
3. http://www.authorstream.com/Presentation/cse1amity-2314117-stench-kerosene-amrita-pritam/.
4. https://www.poemhunter.com/poem/dream-love-8/comments/
5. https://www.poetryfoundation.org/collections

Subject Code	Subject Name	L	T	P	C
R19BSH-ES1101	Engineering Graphics	1	0	3	2.5

Course Objectives:

- To enhance the communications of the students using engineering drawing.
- To make the student familiar to the drawing practices and convection.
- To familiarize the techniques of constructing polygons, curves and scales.
- To introduce the orthographic projections, projections of points, lines and planes.
- To make the students understand as to how the industry communicates technical information.
- To enable the student draft simple engineering components and analyze different views of components.

Course Outcomes:

After completing the course, the student will be able to

1. Apply the basics of engineering drawing to construct the polygons and curves. (L3)
2. Draw the orthographic projections of points and lines. (L3)
3. Draw the projections of planes in various conditions. (L3)
4. Draw the projections of regular solids inclined to one of the planes. (L3)
5. Imagine the isometric views of orthographic views and vice versa. (L6)

Unit I

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

Polygons: Constructing regular polygons by general method.,

Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

Applications:

- Conics are found in architecture, physics, astronomy and navigation, Bridges, buildings
- Parabola - satellite dishes, Eiffel tower, parabolic trajectory of a golf ball Hyperbola shape - cooling towers, Elliptical shape - bridges and arches, elliptical trammel
- Involute-Design of gear.
- Diagonal scale is used in engineering to read lengths with higher accuracy as it represents a unit into three different multiple in metres, centimeters and millimeters.
- vernier scales are used in Machine Shop Applications, Medical Applications, Research & Laboratory Applications etc.

Learning Outcomes:

- Identify the standards of BIS conventions. (L3)
- Draw Conic sections applied in engineering. (L3)
- Draw the Cycloid, epicycloids, hypocycloid and involute curves (L3)

Unit II

Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either two of the reference planes (HP,VP or PP)

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT.

Applications:

- Used in the design of different types of scales in manufacturing industry.
- Structural plans and elevations, stair casing designs.

Learning Outcomes:

- Draw the different types of scales. (L3)
- Draw the projections of points in various quadrants. (L3)
- Drawt the projections of lines in various conditions. (L3)

- Construct the traces of a line in various conditions. (L6)

Unit III

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

Applications: AC ducts and elevations, stair casing designs.

Learning Outcomes:

- Visualize and draw the projections of planes in various conditions. (L3)
- Draw the planes inclined to both the reference planes in engineering. (L3)

Unit IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Applications: Machine components, cooling towers, piping layouts.

Learning Outcomes:

- Draw the different types of solids graphically. (L3)
- To visualize and draw the projections of solids in different conditions.(L3)

Unit V

Isometric projections: Isometric projections -Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Applications: Structural drawings –industrial components, architectural drawing.

Learning Outcomes:

- Identify the orthographic views and isometric views, able to convert isometric views to orthographic views and orthographic views to isometric views, (L3)
- Draw the isometric Projections by using isometric scale. (L3)

Text Books

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
3. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Reference Books

1. Engineering Graphics, P I Varghese McGraw Hill Education (India) Pvt Ltd,
2. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
4. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
5. K.C.John, Engineering Graphics, 2/e, PHI, 2013

Subject Code	Subject Name	L	T	P	C
R19BSH-PH1104	Engineering Physics Laboratory	0	0	3	1.5

Course Objectives:

- To impart knowledge in basic concepts of mechanics, acoustics, material properties and heat transfer
- Familiarize types of sensors for various engineering applications

Course Outcomes:

After completing the course, the student will be able to

1. Apply the working principles of laboratory experiments in optics, mechanics, electromagnetic and electronics and perform the experiments using required apparatus. (L3)
2. Compute the required parameter by suitable formula using experimental values (observed values) in mechanics, optics, electromagnetic and electronic experiments. (L3)
3. Analyze the experimental results through graphical interpretation. (L4)
4. Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory. (L2)
5. Demonstrate the working principles, procedures and applications. (L3)

List of Experiments

1. Determine the rigidity modulus of material by Torsional pendulum
2. Verify the laws of transverse waves using sonometer.
3. Determination of wavelength of laser light by normal incidence method
4. Determine the Numerical Aperture of a given Optical Fiber and hence find its acceptance angle
5. Determine the energy band gap of a given semi-conductor
6. Measure the resistance with the sensing of temperature by thermistor.
7. Determine the velocity of sound using acoustics of volume resonator
8. Determine the acceleration due to gravity at a place in the inertial frame of reference using compound pendulum.

Virtual Lab Experiments

1. Determination of elastic constant of a material by Hook's law
2. Study the structures of various crystals and their sub lattices.

Reference Books

1. S.BalaSubrahmanian, M.N.Srinivasan, "A TextBook of practical physics" S.Chand publishers,2017
2. Dr.Y. Aparna&Dr.K.Venkateswarao "Engineering Physics Lab Manual" V.G.S.Book links.
3. C.H. Bernard and C.D. "Laboratory Experiments in College Physics' John Wiley and Sons, Inc., New York, 1995.
4. M.H.Shamos, Holt, Rinehart and Winston "Great Experiments in Physics" New York., 1959.
5. Narendra Kolla "Engineering physics Lab Manual" amigobookssales@gmail.com.
6. M.SriRamarao, Nityanand Choudhary, Daruka Prasad "Engineering physics Lab Manual" by (Acme Learning)

Web Source References

1. http://vlab.co.in/ba_labs_all.php?id=8
2. http://va-iitk.vlabs.ac.in/
3. http://vlab.amrita.edu/?sub=1&brch=282
4. http://vlab.amrita.edu/?sub=1&brch=192

Subject Code	Subject Name	L	T	P	C
R19BSH-EN1102	Communicative English Lab-I	0	0	3	1.5

Course Objectives

- Adopt activity-based teaching-learning methods to ensure that learners would be engaged in the use of language both in the classroom and laboratory sessions.
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role-plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well-organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

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

1. enhance pronunciation with befitting tone for clarity in a speech to communicate language effectively.
2. Participate in short conversations in routine contexts on topics of interest and ask questions and make requests politely.
3. Listen for specific information, gist, note-taking, note-making and comprehension and develop convincing and negotiating skills through debates
4. acquire effective strategies for good writing and demonstrate the same in summarizing and reporting
5. Gain knowledge of grammatical structures and vocabulary for day-to-day successful conversations.

Unit I

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information. Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes

At the end of the module, the learner will be able to

- identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (L3)
- ask & answer general questions on familiar topics (L2)
- employ suitable strategies for skimming & scanning to get the general idea of a text and specific information (L3)
- recognize paragraph structure with beginnings/endings (L3)
- form sentences using proper grammatical structures and correct word forms (L3)

Unit II

Listening: Answering a series of questions about the main idea and supporting ideas after listening to audio texts. Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Reading: Identifying sequence of ideas; recognizing verbal

techniques that help to link the ideas in a paragraph together. Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learner will be able to

- comprehend short talks on general topics (L2)
- speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)
- understand the use of cohesive devices for better reading comprehension (L2)
- write well-structured paragraphs on specific topics (L3)
- make necessary grammatical corrections in short texts (L3)

Unit III

Listening: Listening for global comprehension and summarizing what is listened to. Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learner will be able to

- summarize the content with clarity & precision from short talks (L3)
- report what is discussed in informal discussions (L3)
- infer meanings of unfamiliar words using contextual clues (L3)
- write summaries based on global comprehension of reading/listening texts (L3)
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing (L3)

Unit IV

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. Speaking: Roleplays for the practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

At the end of the module, the learner will be able to

- infer & predict about the content of spoken discourse (L4)
- engage in formal/informal conversations understanding verbal & non-verbal features of communication (L3)
- interpret graphic elements used in academic texts (L2)
- produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
- use language appropriate for description and interpretation of graphical elements (L4)

Unit V

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Reading: Reading for comprehension. Writing: Writing structured essays on specific topics using suitable claims and evidence

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement)

Learning Outcomes

At the end of the module, the learners will be able to

- take notes while listening to a talk/lecture to answer questions (L3)
- make formal oral presentations using effective strategies (L3)
- produce a well-organized essay with adequate details (L3)
- edit short texts by correcting common errors (L4)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

Sample Web Resources

Grammar/Listening/Writing

1. 1-language.com
2. http://www.5minuteenglish.com/
3. https://www.englishpractice.com/

Grammar/Vocabulary

1. English Language Learning Online
2. http://www.bbc.co.uk/learningenglish/
3. http://www.better-english.com/
4. http://www.nonstopenglish.com/
5. https://www.vocabulary.com/
6. BBC Vocabulary Games
7. Free Rice Vocabulary Game

Reading

1. https://www.usingenglish.com/comprehension/
2. https://www.englishclub.com/reading/short-stories.htm
3. https://www.english-online.at/

Listening

1. https://learningenglish.voanews.com/z/3613
2. http://www.englishmedialab.com/listening.html

Speaking

1. https://www.talkenglish.com/
2. BBC Learning English – Pronunciation tips
3. Merriam-Webster – Perfect pronunciation Exercises

All Skills

1. https://www.englishclub.com/
2. http://www.world-english.org/
3. http://learnenglish.britishcouncil.org/

Online Dictionaries

1. Cambridge dictionary online
2. MacMillan dictionary
3. Oxford learner's dictionaries

Subject Code	Subject Name	L	T	P	C
R19EEE-ES1102	Basic Electrical & Electronics Engineering Laboratory	0	0	3	1.5

Course Objectives:

- To verify Kirchhoff's laws and theorems.
- To plot the characteristics of DC Machines.
- To plot the V-I Characteristics of a diode.
- To design MOSFET, inverting and non-inverting amplifier
- To perform experiments using PSPICE.

Course Outcomes:

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

1. Prove laws and theorems (L5)
2. Determine the characteristics of DC Machines (L5)
3. Analyze the V-I characteristics of diode (L4)
4. Design MOSFET, Inverting and Non-Inverting Amplifier (L6)
5. Experiment with PSPICE (L3)

List of Laboratory Experiments

1. Verification of Kirchhoff's Laws KVL and KCL.
2. Verification of DC Superposition Theorem.
3. Verification of Thevenin's Theorem and Norton's Theorem.
4. OCC and External characteristics of separately excited DC generators.
5. Swinburne's test on a DC shunts motor.
6. OC and SC Tests on single phase transformer.
7. Brake Test on DC shunt motor.
8. Current Voltage Characteristics of a p-n Junction Diode/LED.
9. Diode Rectifier Circuits.
10. Voltage Regulation with Zener Diodes.
11. Design of a MOSFET amplifier and MOSFET inverter/NOR gate
12. Inverting and Non-inverting Amplifier Design with Op-amps.
13. Simulation experiments using PSPICE
    (a) Diode and Transistor Circuit Analysis.
    (b) MOSFET Amplifier design.
    (c) Inverting and Non-inverting Amplifier Design with Op-amps.

Subject Code	Subject Name	L	T	P	C
R19BSH-MC1101	Constitution of India	3	0	0	0

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state government aspects related to finance and administrative.

Course Outcomes:

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

- Impart knowledge on historical background of the constitution making and its importance for building a democratic India.(L2)
- Analyze the functioning of three wings of the government ie., executive, legislative and judiciary.(L2)
- Explain the value of the fundamental rights and duties for becoming good citizen of India.(L2)
- Analyze the decentralization of power between central, state and local self-government.(L4)
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.(L3)

Unit I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning Outcomes:

After completion of this unit student will be able to

- Understand the concept of Indian constitution (L2)
- Apply the knowledge on directive principle of state policy (L3)
- Analyze the History, features of Indian constitution (L4)
- Evaluate Preamble Fundamental Rights and Duties (L5)

Unit II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions.

Learning Outcomes:-

After completion of this unit student will be able to

- Understand the structure of Indian government (L2)
- Differentiate between the state and central government (L4)
- Explain the role of President and Prime Minister (L2)
- Know the Structure of supreme court and High court (L2)

Unit III

State Government and its Administration: Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

Learning Outcomes:-

After completion of this unit student will be able to

- Understand the structure of state government (L2)
- Analyze the role Governor and Chief Minister(L4)
- Explain the role of state Secretariat (L2)

- Differentiate between structure and functions of state secretariat (L4)

Unit IV

Local Administration: District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zilla Panchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning Outcomes:-

After completion of this unit student will be able to

- Understand the local Administration (L2)
- Compare and contrast district administration role and importance (L4)
- Analyze the role of Myer and elected representatives of Municipalities (L4)
- Evaluate Zilla panchayat block level organization (L5)

Unit V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning Outcomes:-

After completion of this unit student will be able to

- Know the role of Election Commission apply knowledge (L3)
- Contrast and compare the role of Chief Election commissioner and Commissiononerate (L4)
- Analyze role of state election commission (L4)
- Evaluate various commissions of viz SC/ST/OBC and women (L5)

References

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics, SAGE Publications India Pvt Ltd
4. D.C. Gupta, Indian Government and Politics, Vikas publishing house
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans, Novelty & Co.,
7. J. Raj Indian Government and Politics, SAGE Publications India Pvt
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-Resources

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Subject Code	Subject Name	L	T	P	C
R19BSH- MA1207	Transform Techniques and Partial Differential Equations	3	0	0	3

Course Objectives:

- To familiarize the transform techniques to solve partial differential and difference equations.
- To equip the students to solve application problems in their disciplines.

Course Outcomes:

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

1. Apply the Laplace transform for solving differential equations and integral equations. (L3)
2. Apply partial differentiation to find maxima and minima of functions of several variables. (L3)
3. Find the Fourier series expansions of various functions and apply integral expressions for the forwards and inverse Fourier transform. (L3)
4. Solve partial differential equations of first and higher order using analytical methods. (L2)
5. Develop Z transform techniques to solve discrete time systems. (L3)

Unit I

Laplace transforms (All Theorems/Properties without proofs): Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, initial and final value theorems.

Applications: Evaluation of improper integrals, solutions of ordinary differential equations, integral equations and system of ordinary differential equations.

Learning Outcomes:

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

- examine the properties of Laplace transforms (L2)
- apply the Laplace and inverse Laplace transforms for different types of functions. (L3)
- solve ordinary differential equations and system of ordinary differential equations by using Laplace transformation technique. (L3)

Unit II

Partial Differentiation: Partial derivatives, total derivative, chain rule, Taylor's series and Maclaurin's series of functions of two variables, change of variables, Jacobian, functional dependence.

Applications: Errors and Approximations, Tangent Planes and Normal Lines, maxima and minima of functions of two variables, method of Lagrange's multipliers.

Learning Outcomes:

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

- find partial derivatives, total derivatives and chain rule of functions of several variables. (L2)
- expand a function of two variables using Taylor's and Maclaurin's series expansion. (L2)
- apply the concept of Jacobian to test whether the given functions are functionally dependent or not. (L3)
- apply the knowledge of partial differentiation to find maxima and minima of functions of several variables. (L3)
- use partial differentiation to find tangent planes and normal lines. (L3)

Unit III

Fourier Series & Fourier transforms (without proofs):

Fourier Series**:** Fourier series, determination of Fourier coefficients, Dirichlet's conditions, Fourier series of even and odd functions, Fourier series of even and odd periodic functions in an arbitrary interval, Half-range Fourier sine and cosine expansions, Parseval's formula.

Applications: Practical harmonic analysis

Fourier transforms**:** Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform, properties, convolution theorem.

Learning Outcomes:

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

- evaluate the Fourier series expansion for different periodic functions. (L3)
- understand the nature of the Fourier series that represent even and odd functions.(L3)
- examine the properties of Fourier transformation. (L2)
- apply Fourier transformation for different functions. (L3)

Unit IV

Partial Differential Equations (PDE): First order partial differential equations, solutions of first order linear and standard forms of non-linear PDE, solutions of homogenous higher order linear PDE with constant coefficients.

Learning Outcomes:

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

- solve the first order linear PDE. (L2)
- solve the first order non- linear PDE. (L2)
- solve the homogeneous higher order linear PDE with constant coefficients. (L2)

Unit V

Z-transforms: Definition of Z-transform, elementary properties, linearity property, damping rule, shifting u_n to the right and left, multiplication by n, initial value theorem, final value theorem, inverse Z-transform, convolution theorem.

Applications: Solution of difference equations using Z-transforms.

Learning Outcomes:

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

- apply the properties of Z-transforms. (L2)
- find Z and inverse Z-transformations for different functions. (L3)
- solve difference equations by using Z-transforms. (L3)

Textbooks

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
3. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
4. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
5. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
6. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
7. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
8. Saber Elaydi, Introduction to Difference Equations, Springer, 3rd Edition.
9. W. G. Kelley, Allen C Peterson, Difference Equations, An Introduction with Applications, 2nd edition, Academic Press.

I Year –II Semester Syllabus

Subject Code	Subject Name	L	T	P	C
R19BSH- CH1201	Engineering Chemistry	3	0	0	3

Course Objectives:

- To acquaint the students with soft and hard water types and softening methods.
- To familiarize the students with engineering materials, their properties and applications.
- To impart knowledge on corrosion and its significance.
- To introduce different types of Nano materials and importance of green chemistry.

Course Outcomes:

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

1. Analyze the suitable method for industrial water treatment. (L-4)
2. Design the metallic materials to prevent the corrosion. (L-6)
3. Illustrate the properties and applications of polymers, understand the mechanism of setting and hardening of cement. (L-2)
4. Assess the quality of fuels and identify the suitable one. (L-5)
5. Demonstrate the preparation, properties and applications of nano materials and importance of green chemistry. (L-2)

Unit I

Water Technology: Introduction –Hard and Soft water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge-priming and foaming, specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Industrial water treatment – zeolite and ion-exchange processes- desalination of brackish water, reverse osmosis (RO) and electro dialysis.

Applications:

1. Hardness of water can be estimated by using EDTA.
2. Water using for industrial purpose can be treated and purified.
3. RO method is used for purification of water for drinking purpose.
4. Ion exchange method is used for de mineralization of water.

Learning outcomes:

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

- Differentiate between temporary and permanent hardness of water. (L-1)
- Explain the principles of reverse osmosis and electro dialysis. (L-2)
- Compare the quality of drinking water with BIS and WHO standards. (L-2)
- Illustrate problems associated with hard water. (L-2)
- Demonstrate the Industrial water treatment processes. (L-2)

Unit II

Corrosion Engineering: Corrosion: Definition – theories of corrosion, dry corrosion and electro chemical corrosion – factors affecting corrosion, nature of the metal and nature of the environment, galvanic corrosion, Differential aeration cell corrosion - water line corrosion, pitting corrosion,

Corrosion controlling methods**:** Sacrificial and Impressed current cathodic protection, Metallic coatings, anodic coatings, cathodic coating, galvanizing and tinning, anodic inhibitors and cathodic inhibitors.

Applications:

1. To control corrosion of various machines used in large scale industries.
2. Control of corrosion used to prevent the iron pipes, tables etc. by metallic coatings.

3. Control of corrosion used to prevent the underground pipes from leaking which causes environmental pollution.

Learning outcomes:

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

- Explain theories of corrosion. (L-2)
- Classify different corrosion methods. (L-2)
- Identify the various factors affecting corrosion. (L-3)
- Apply the principles of corrosion control. (L-3)

Unit III

Engineering Materials And Polymers: Cement: Portland cement, constituents, Manufacture of Portland Cement, chemistry of setting and hardening of cement (hydration, hydrolysis, equations).

Polymers: Introduction, differences between thermoplastic and thermo setting resins, compounding of plastics- Preparation, properties and uses of Bakelite, urea-formaldehyde, poly vinyl chloride, polystyrene and polyphosphazines.

Applications:

1. The setting and hardening of cement is useful to improve the quality of constructions.
2. Lubricants are used in lubrication of machinery parts of auto mobile vehicles.
3. Polymers also used in automobile industries for making body panel, vision window.
4. Polymers used for making house hold purpose articles like water bottles, refrigerator components, curtains, dining table cloths and carrier bags.

Learning outcomes:

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

- Illustrate the chemical reactions involved in the manufacturing of cement. (L-2)
- Identify the properties of lubricants. (L-3)
- Identify preparation and properties of polymers. (L-3)
- Distinguish between thermoplastic and thermo setting resins. (L-4)

Unit IV

Fuel Technology: Fuels: Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal (proximate and ultimate analysis), liquid fuels-refining of petroleum, cracking-catalytical cracking (moving bed and fixed bed), fuels for IC engines, knocking and anti-knock agents, Octane and Cetane values, power alcohol and bio diesel.

Lubricants: Definition, function, theory and mechanism of lubricants, Properties of Lubricants (Definition and importance)- Viscosity index, Flash and Fire Point, Acid Number, Cloud and Pour Point, Aniline point and Carbon residue.

Applications:

1. The quality of coal can be estimated by proximate and ultimate analysis.
2. The cracking method is used to increase the yield of gasoline.
3. Cetane and octane numbers are used to assess the quality of petrol and diesel respectively.

Learning Outcomes:

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

- Explain different types of fuels and analysis of coal (L2)
- Select suitable fuels for IC engines (L3)
- Explain calorific values, octane number, refining of petroleum and cracking of oils (L2)

Unit V

Advanced Topics in Chemistry: Nano Materials: Introduction – sol-gel method, chemical reduction method for preparation of metal nano particles, Types of nano materials-carbon nano tubes and fullerenes (preparation, properties and applications)-Applications of nano materials.

Green Chemistry: Principles of Green Chemistry- Methods of Green Synthesis (Super Critical Fluid extraction, aqueous phase Method and Microwave Induction)-Applications of Green chemistry

Applications:

1. Nano materials are used in paints, lubricants and medicine technology.
2. BET and TEM are used to characterize the Nano materials.
3. Green synthesis is used to make eco friendly reactions.

Learning outcomes:

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

- Classify nanomaterials. (L-2)
- Explain the synthesis and characterization methods of nano materials. (L-2)
- Compare the principles of BET and TEM. (L-4)
- Explain the importance of green synthesis. (L-2)

Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakasham, (2014).

References

1. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2. B.S Murthy and P. Shankar, A Text Book of NanoScience and NanoTechnology, University Press (2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand & Co, (2010)
4. V. Raghavan, A Material Science and Engineering, Prentice-Hall India Ltd, (2004).
5. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).
6. K. Sesha Maheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services, (2016).

Subject Code	Subject Name	L	T	P	C
R19MEC-ES1204	Engineering Mechanics	3	0	0	3

Course Objectives:

- Explain the effect of forces on the body.
- Analysis of the structure & Work done by the body.
- Teach the centroid, centre of gravity & moment of inertia of composite sections.
- Analyze the parameters like velocity, displacement &acceleration of dynamic body.
- Analysis of motion of the body with (or) without application of force.

Course Outcomes:

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

1. Find the resultant for any no of forces in mechanical system with (or) without application of concept of friction(L4)
2. Analyze the simple Structures& estimation of the work done by the forces (L4)
3. Determine the centroid /centre of gravity/moment of inertia for composite sections (L3)
4. Analyze the motion of the bodies with (or) without the application of force (L4)
5. Determine the displacement, velocity &acceleration relations in dynamic systems (L3)

Unit I

Introduction to Engineering Mechanics: Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

Friction: Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

Application: design of bearings.

Learning outcomes:

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

- Resolve the forces in mechanical systems (L2)
- Identify the moments and forces (L3)
- Draw free body diagram (L3)

Unit II

Analysis of Structures: Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

Virtual Work: Equilibrium of ideal systems, work done by a force, work done by a couple, principle of virtual work.

Application: supports for sheds.

Learning outcomes:

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

- Identify different types of trusses. (L2)
- Analyze the plane trusses by method of joints and the method of sections. (L4)
- Demonstrate equilibrium of ideal system. (L2)
- Estimate the work done by a force and work done by a couple. (L3)

Unit III

Properties of Surfaces and Volumes: Centroid and centre of gravity, derivation of centroids from first moment of area, centroids of composite sections, centre of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guidinus.

Moment of Inertia

Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes -thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

Application: analysis on wedges, screws, belts, and bearings.

Learning outcomes:

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

- Identify the centre of gravity of composite sections. (L3)
- Determine the centre of gravity of common solids. (L3)
- Determine moment of inertia for composite volumes. (L3)

Unit IV

Kinematics: Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates, radius of curvature, rotation of a rigid body about a fixed axis, introduction to plane motion.

Application: Robotic arms and Automobile Engines.

Learning outcomes:

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

- Write equations of motion for rigid bodies. (L3)
- Find velocity and acceleration in rectilinear and curvilinear motions (L4)
- Trace the path of projectile. (L3)

Unit V

Kinetics: Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

Ideal Systems: Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse, impact - types of impact.

Application: Rocket propulsion systems, missiles etc.

Learning outcomes:

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

- Apply D'Alembert's principle in rectilinear translation. (L3)
- Relate principle of work and energy in dynamic systems. (L3)
- Make use of principle of momentum and impulse to dynamic bodies. (L4)

Text Books

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, Sukumar Pati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 2013.
3. S S Bhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

References

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynam-ics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010.

Subject Code	Subject Name	L	T	P	C
R19CSE-ES1203	Problem Solving and Programming using C	3	0	0	3

Course Objectives:

- Formulating solutions to problems using algorithms and flowcharts and also Learning
- Structure of C program, basic C programs, Compiling and executing C Programs
- Understand branching, iteration statements
- Modular programming and recursive solution formulation.
- Understanding arrays, pointers and dynamic memory allocation and Comprehension of file Handling and user defined data types.

Course Outcomes:

1. Develop algorithms and flowcharts and also Understand the compilation, debugging, execution and writing of basic C programs
2. Develop C Programs using control and iterative statements
3. Develop C programs using Arrays and functions
4. Apply the knowledge of strings and pointers in programming
5. Comprehend file handling and user defined data types

Unit I

Introduction to Computers, Algorithm and Flowchart design through Raptor:

Introduction-Computer Hardware, Bits and Bytes, Components, types of languages

Algorithm- Definition, Characteristics, Steps to develop, examples.

Flow chart-Definition, symbols, Input/output, Assignment, conditional if, repetition, function and sub charts.

Introduction to C Programming- structure of c program**,** Identifiers, The main () Function, The printf () Function, - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization, Compiling and Executing C program

Learning outcomes: Student will be able to

- Acquire the knowledge on basic computer components, algorithms and flowcharts(L2)
- Understand the structure of algorithm and flowchart(L2)
- Develop basic flowcharts and algorithms for performing Input, Output and Computations (L3)
- Solve numerical problems using Raptor (L3)
- Acquire the knowledge on fundamentals of c programming.(L2)

Applications: Computer Networks, Word Processor, Email Client

Unit II

Programming Style Assignment: Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement

Learning Outcomes:

Student will be able to

- Analyze the structure of c programming (L4)
- Develop basic sequential programs(L3)
- Acquire the knowledge on control statements(L2)
- Analyze the different programs using loops and conditional statements.(L4)
- Implement programs using loops and branching statements.(L3)

Applications: Embedded Software's, Simulators, Development of New languages

Unit -III

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Multi Dimensional Arrays-Matrices

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function. Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

Learning Outcomes:

Student will be able to

- Acquire the knowledge on arrays and strings.(L2)
- Analyze the different types of arrays
- Acquire the knowledge on functions.(L2)
- Analyze the pre defined and user defined functions(L4)
- Implement functions of their own to solve complex problem.(L3)

Applications: Computer and Mobile Games, Design Compilers

Unit-IV

Pointers, Strings:

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

Learning Outcomes:

Student will be able to

- Acquire the basic knowledge on pointers.(L2)
- Understand user defined data types(L2)
- Implement string editing operations of their own to solve complex problem.(L3)

Applications: Operating Systems, Test code, Developing Verification software

Unit-V

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, enumeration.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Learning Outcomes:

Student will be able to

- Analyze the differences between structure, union.(L4)
- Implement different file handling programs using file handling functions.(L3)

Applications: Database and spread sheets, Word Processing, Database files systems, Online Reservation Systems

Text Books

1. How to Solve It By Computer By R G Dromey
2. C for Programmers with an Introduction to C11 (Deitel Developer Series) 1st Edition, Kindle Edition
3. Programming in ANSI C , McGrawHill, seventh edition by E.Balagurusamy.
4. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education
5. ANSI C Programming, Gary J. Bronson, Cengage Learning.

Reference Books

1. Let us "C" - Yashwant Kanetkar
2. Programming in C, Bl Juneja Anita Seth, Cengage Learning.
3. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
4. Programming in C, Reema Thareja, OXFORD
5. C by Example, Noel Kalicharan, Cambridge
6. https://raptor.martincarlisle.com/ (Download and Install Raptor software, Use the tool to draw flowcharts for the problems given.)

Subject Code	Subject Name	L	T	P	C
R19MEC-ES1206	Engineering Workshop & IT Workshop	0	0	3	1.5

Course Objective:

- Familiarize different wood working operation in carpentry.
- Understand to built different parts with sheet metal.
- Familiarize various fitting operations.
- Understand the smithy and black smithy operations for real world applications.
- Identify different types of electrical house wiring connections.
- Understand the basic components and peripherals of a computer

Course Outcomes:

After completion of this lab the student will be able to

1. Apply wood working skills in real world applications. (L3)
2. Build different parts with fitting in engineering applications. (L3)
3. Apply forging operations for different black smith applications. (L3)
4. Apply different types of basic electric circuit connections. (L3)
5. Understand the basic components, peripherals and basic operations of a computer. (L3)

List of Experiments (Engineering Workshop)

Carpentry (Any Two)

1 T-Lap Joint
2 Cross Lap Joint
3 Dovetail Joint
4 Mortise and Tennon Joint

Fitting (Any Two)

5 Vee Fit
6 Square Fit
7 Half Round Fit
8 Dovetail Fit

Black Smithy (Any One)

9 Round rod to Square
10 S-Hook
11 Round Rod to Flat Ring
12 Round Rod to Square headed bolt

House Wiring **(Any Two)**

13 Parallel / Series Connection of three bulbs
14 Stair Case wiring
15 Florescent Lamp Fitting
16 Measurement of Earth Resistance

Tin Smithy (Any Two)

17 Taper Tray
18 Square Box without lid
19 Open Scoop
20 Funnel

List of Experiments (IT Workshop)

1 System Assembling, Disassembling and identification of Parts / Peripherals
2 Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device Drivers.
3 MS-Office / Open Office
   a) Word - Formatting, Page Borders, Reviewing, Equations, symbols.
   b) Spread Sheet - organize data, usage of formula, graphs, charts.
   c) Power point - features of power point, guidelines for preparing an effective presentation.
   d) Access- creation of database, validate data.

I Year –II Semester Syllabus

Subject Code	Subject Name	L	T	P	C
R19MEC-PC1201	Computer Aided Engineering Drawing	1	0	4	3

Course Objectives:

- Enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modeling.
- The knowledge of projections of solids is essential in 3D modeling and animation.
- Make the students to draw the projections of the various types of solids in different positions inclined to both the planes.
- The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.
- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings. Train the usage of 2D and 3D modeling.
- Identify the different types of machine components.

Course Outcomes:

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

1. Draw the projections of solids and sections of solids in different types of projecting methods. (L3)
2. Draw the development of surfaces is required in designing and manufacturing of the objects. (L3)
3. Know the various commands in AutoCAD to draw the geometric entities.(L2)
4. Construct 3D objects using CAD software package. (L3)
5. Apply the principles of engineering drawing in machine drawing. (L3)

Unit I

Projections of Solids: Projections of Regular Solids inclined to both planes - auxiliary views.
Sections of Solids: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

Learning Outcomes:

- Visualize and draw the projections of various solids.(L3)
- Visualize and draw the projections section of various solids.(L3)

Unit II

Development and Interpenetration of Solids: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.
Interpenetration of Right Regular Solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Learning Outcomes:

- Draw the development of surfaces of solids. (L3)
- Draw the different intersections of solids. (L3)

Unit III

Introduction to Computer Aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modeling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling.
View Points and View Ports: View point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete, joint , single option.

Learning Outcomes:

- Know the various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models. (L2)
- Understand the use of different coordinate systems. (L2)

Unit IV

Computer Aided Solid Modelling: Isometric projections, orthographic projections of isometric projections, modeling of simple solids, Modeling of Machines & Machine Parts.

Learning Outcomes:

- Students create geometrical model of simple solids and machine parts. (L6)
- Identify the orthographic views and isometric views, able to convert isometric views to orthographic views and orthographic views to isometric views by using AUTOCAD.(L3)
- Draw the isometric Projections by using isometric scale by using AUTOCAD (L3)
- Able to generate drawings by using AUTOCAD (L2)

Unit V

Need for drawing conventions – introduction to IS conventions -Conventional representation of materials, common machine elements and parts .Drawing of Machine Elements and simple parts -Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

Learning outcomes:

After completion of this unit, students will be able to

- Draw the simple mechanical parts. (L3)
- Understand the product symbols, weld symbols, pipe joints. (L2)
- Understand the orthographic projections of machine elements. (L2)

Text Books

1. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
2. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

Reference Books

1. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008
2. MASTERING IN AUTOCAD AND AUTOCAD LT, autodesk by Wiley publications.
3. Ajeet Singh, Machine Drawing includes AutoCAD, 2nd Edition, McGraw Hill, 2012 4.
4. Goutam Pohit, Goutam Ghosh, Machine Drawing with AutoCAD, 1st Edition, Pearson Education, 2007
5. N. D. Bhatt, Machine Drawing, 49th Edition, Charotar Publishing House Pvt. Limited, 2014

Subject Code	Subject Name	L	T	P	C
R19BSH- CH1204	Engineering Chemistry Lab	0	0	3	1.5

Course Objectives

- To impart training for handling of different instruments.
- To familiarize with digital and instrumental methods of analysis.

Course Outcomes

1. Analyze the quality of ground water sample. (L-4)
2. Explain the functioning of the instruments such as pH, Viscometer, Cleve lands and Potentiometric meters. (L-2)
3. Prepare polymers and nano materials. (L-4)
4. Estimate the metal content in different ores (Fe & Cu). (L-3)
5. Identify the safety precautions to carry out the experiments in the laboratory using chemicals. (L-3)

List of Experiments

1. Determination of Hardness of a ground water sample.
2. Determination of strength of an acid by pH metric method.
3. Determination of Fe (II) in Mohr's salt by potentiometric method.
4. Determination of Sulphuric acid in lead-acid storage cell.
5. Estimation of iron as Ferrous iron in an ore sample.
6. Determination of copper in a copper ore.
7. Preparation of Phenol-formaldehyde resin.
8. Preparation of urea-formaldehyde resin.
9. Estimation of calcium in portland cement.
10. Determination of viscosity of a liquid.
11. Determination of flash and fire points of a fuel.
12. Determination of surface tension of a liquid.
13. Preparation of TiO_2/ZnO nano particles.

Text Books

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

Subject Code	Subject Name	L	T	P	C
R19CSE-ES1204	Problem Solving and Programming using C Lab	0	0	3	1.5

Course Objectives:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Course Outcomes:

1. Document and present the algorithms, flowcharts and programs in form of user-manual and also apply and practice logical ability to solve the problems.
2. Understand C programming development environment, compiling, debugging, and linking
3. And executing a program using the development environment
4. analyzing the complexity of problems modularize the problems into small modules and then convert them into programs
5. Understand and apply the in-built functions and customized functions for solving the problems.
6. Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

Exercise – 1 (Basic)

a) What are the OS Commands, Familiarization of Editors - vi, EMACS
b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Draw the flow chart for the following problems using Raptor package

a) Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers
b) Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, linear search, Binary Search

Exercise – 2 (Basic Math)

a) Write a C Program to Simulate 3 Laws at Motion
b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise –3 (Control Flow – I)

a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
b) Write a C Program to Add Digits & Multiplication of a number

Exercise –4 (Control Flow – II)

a) Write a C Program to Find Whether the Given Number is i) Prime Number ii) Armstrong Number
b) Write a C program to print Floyd Triangle
c) Write a C Program to print Pascal Triangle

Exercise – 5 (Functions)

a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise –6 (Control Flow – III)

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

b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise –7 (Functions – Continued)

Write a C Program to compute the values of sin x and cos x and e^x values using Series expansion.(use factorial function)

Exercise – 8 (Arrays)

Demonstration of arrays a) Search-Linear. b) Sorting-Bubble, Selection. c) Operations on Matrix.

Exercises - 9 (Structures)

a) Write a C Program to Store Information of a Movie Using Structure
b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 (Arrays and Pointers)

a) Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 (Dynamic Memory Allocations)

a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

Exercise – 12 (Strings)

a) Implementation of string manipulation operations with library function. i) copy ii) concatenate iii) length iv) compare
b) Implementation of string manipulation operations without library function. i) copy ii) concatenate iii) length iv) compare

Exercise -13 (Files)

a) a)Write a C programming code to open a file and to print it contents on screen.
b) b)Write a C program to copy files

Exercise - 14 (Files Continued)

a) Write a C program merges two files and stores their contents in another file.
b) Write a C program to delete a file.

I Year –II Semester

Subject Code	Subject Name	L	T	P	C
R19BSH-EN1201	Communicative English Lab-II	0	0	3	1.5

Course Objectives

- Adopt activity based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
- Facilitate active listening to enable inferential learning through expert lectures and talks
- Impart critical reading strategies for comprehension of complex texts
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids
- Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence
- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing

Course Outcomes:

After the completion of this course, the student can able to

1. Enabling students to use Computer assisted Language Laboratory (CALL) to enhance their pronunciation through stress, intonation and rhythm for routine and spontaneous interaction
2. Attainment of communicative competence for the fulfilment of academic, professional and social purposes.
3. Attainment of language Proficiency through Contextualized, Task Based Activities to realize employment potential at the end of the course.
4. Acquired listening, speaking, reading and writing skills necessary for the survival in the post modern society through task-based and skill-based communication practices with judicious integration of modern tools.
5. Development of fluency and accuracy for effective and professional communication in real-time situations by using appropriate verbiage and contextual knowledge.

Unit I

Listening: Listening for presentation strategies and answering questions on the speaker, audience, and key points. **Speaking:** Formal presentations using PPT slides without graphic elements. **Reading:** Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize academic style. **Writing:** Paraphrasing; using quotations in writing; using academic style - avoiding colloquial words and phrases. **Grammar and Vocabulary:** Formal/academic words and phrases.

Learning Outcomes

At the end of the module, the learners will be able to

- understand the purpose of a presentation & make note of key points (L2)
- make formal structured presentations on general topics using PPT slides without graphical elements (L3)
- prioritize information from reading texts after selecting relevant and useful points (L3)
- paraphrase short academic texts using suitable strategies and conventions (L3)
- cultivate awareness about plagiarized content and academic ethics (L2)

Unit II

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse. **Speaking:** Formal presentations using PPT slides with graphic elements. **Reading:** Understand formal and informal styles; recognize the difference between facts and opinions. **Writing:** Formal letter writing and email writing (enquiry, complaints, seeking permission, seeking internship);

structure, conventions and etiquette. **Grammar and Vocabulary:** Phrasal prepositions; phrasal verbs.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend academic lectures by taking notes to answer questions (L2)
- make formal structured presentations on academic topics using PPT slides with relevant graphical elements (L3)
- distinguish facts from opinions while reading (L2)
- write formal letters and emails (L3)
- use a range of vocabulary in formal speech and writing (L2)

Unit III

Listening: Identifying views and opinions expressed by different speakers while listening to discussions. **Speaking:** Group discussion on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position. **Reading:** Identifying claims, evidences, views, opinions and stance/ position. **Writing:** Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences. **Grammar and Vocabulary:** Language for different functions such as stating a point, expressing opinion, agreeing/ disagreeing, adding information to what someone has stated, and asking for clarification.

Learning Outcomes

At the end of the module, the learners will be able to

- follow a discussion (L2)
- participate in group discussions using appropriate conventions and language strategies (L3)
- comprehend complex texts identifying the author's purpose (L2)
- produce logically coherent argumentative essays (L3)
- use appropriate vocabulary to express ideas and opinions (L2)

Unit IV

Listening: Understanding inferences; processing of information using specific context clues from the text. **Speaking:** Group discussion; reaching consensus in group work (academic context). **Reading:** Reading for inferential comprehension. **Writing:** Applying for internship/ job - Writing one's CV/Resume and cover letter. **Grammar and Vocabulary:** Active and passive voice – use of passive verbs in academic writing.

Learning Outcomes

At the end of the module, the learners will be able to

- draw inferences and conclusions using prior knowledge and verbal cues (L3)
- express thoughts and ideas with acceptable accuracy and fluency (L2)
- develop advanced reading skills for deeper understanding of texts (L3)
- prepare a CV with a cover letter to seek internship/ job (L2)
- understand the use of passive voice in academic writing (L2)

Unit V

Listening: Understanding inferences - processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge. **Speaking:** Formal team presentations on academic/ general topics using PPT slides. **Reading for Writing:** Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; significance of references. **Grammar and Vocabulary:** Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

Learning Outcomes

At the end of the module, the learners will be able to

- develop advanced listening skills for in-depth understanding of academic texts (L3)
- collaborate with a partner to make presentations (L2)

- understand the structure of Project Reports (L2)
- use grammatically correct structures with a wide range of vocabulary (L3)

Reference Books

- Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
- Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. Cambridge Academic English (B2). CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)

Sample Web Resources

Grammar/Listening/Writing

1. 1-language.com
2. http://www.5minuteenglish.com/
3. https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online

1. http://www.bbc.co.uk/learningenglish/
2. http://www.better-english.com/
3. http://www.nonstopenglish.com/
4. https://www.vocabulary.com/
5. BBC Vocabulary Games
6. Free Rice Vocabulary Game

Reading

1. https://www.usingenglish.com/comprehension/
2. https://www.englishclub.com/reading/short-stories.htm
3. https://www.english-online.at/

Listening

1. https://learningenglish.voanews.com/z/3613
2. http://www.englishmedialab.com/listening.html

Speaking

1. https://www.talkenglish.com/
2. BBC Learning English – Pronunciation tips
3. Merriam-Webster – Perfect pronunciation Exercises

All Skills

1. https://www.englishclub.com/
2. http://www.world-english.org/
3. http://learnenglish.britishcouncil.org/

Online Dictionaries

1. Cambridge dictionary online
2. MacMillan dictionary
3. Oxford learner’s dictionaries

Subject Code	Subject Name	L	T	P	C
R19BSH-MC1201	Environmental Science	3	0	0	0

Course Objective:

- To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations.
- Students get awareness on pollution that is caused due to the day to day activities of human life to save earth from the inventions by the engineers.
- To make student get awareness on the social issues, environmental legislation.

Course Outcomes:

Student will be able to

1. Understand about the environment and natural resources.
2. Illustrate about the ecosystem and knows the importance of conservation of biodiversity.
3. Understands about various attributes of different types of pollution and their impacts on the environment and control methods along with waste management practices.
4. Relate the current environmental impacts with the societal problems.
5. Identify the current population growth with their impacts and apply the knowledge how to manage environment issues.

Unit I

Multidisciplinary Nature of Environmental Science: Definition, Multi disciplinary nature of environmental sciences, Scope and Importance, Need for Public Awareness.

Natural Resources: Forest resources – Uses and deforestation-causes, consequences, Water resources – Use and over utilization of surface and ground water, Floods, drought, conflicts over water, dams – benefits and problems, Food resources: World food problems, effects of modern agriculture, fertilizer-pesticide problems, pesticide related problems, water logging, salinity, Energy resources: Renewable and non-renewable resources – Natural resources and associated problems, Land Resources: Land degradation, Soil erosion, Desertification.

Learning Outcomes

Students will be able to

- Relate scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.(L1)
- Explain how water resources should be used.(L2)
- Articulate basic understanding of effects of modern agriculture on environment.(L2)
- Explain why renewable and non-renewable energy resources are important.(L2)
- Get awareness about land degradation, soil erosion & desertification.(L2)

Applications: Different conservation methods of different natural resources like afforestation programs, social forestry programs, soil conservation practices.

Unit II

Environmental Pollution and Solid Waste Management:

Environmental Pollution: Definition, Cause, effects and control measures of (a) Air Pollution. (b)Water pollution (c)Marine pollution (d) Noise pollution

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes, e-waste management, Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

Learning Outcomes

Students will be able to

- Define and explain the various causes, effects and control measures of different types of pollution.(L3)
- Characterize solid waste and e-waste management.(L2)
- Summarize about different natural disasters and how they could be managed.(L1)

Applications: Different treatment methods for different types of pollution cyclone separator, electrostatic precipitators, waste water treatment, solid waste management, e-waste management.

Unit III

Ecosystems, Biodiversity and its Conservation:

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem – Producers, consumers and decomposers, Food chains, food webs, Energy flow in the ecosystem, primary and secondary productivity, ecosystem regulation and development.

Biodiversity And Its Conservation: Definition: levels of biodiversity- genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity- consumptive use, Productive use, social, ethical, aesthetic and option values, ecosystem service value, India as a mega-diversity Nation, Hot-spots of biodiversity- Indo Burma, Eastern Himalayas, Western Ghats, Threats to biodiversity- habitat loss, poaching of wildlife, Global environmental issues, Pollution, Man-wildlife conflicts, Endangered and endemic species of India-Red Data Book, Conservation of biodiversity- In-situ and Ex-situ conservation of biodiversity.

Learning Outcomes

Students will be able to

- Understand the structure and functions of ecosystems.(L2)
- Identify the threats to biodiversity.(L2)
- Conduct basic conservation biology research.(L3)
- Compare endangered and endemic species of India.(L2)

Applications: Different conservation methods like gene bank, seed bank, botanical garden**.**

Unit IV

Social Issues and the Environment: From Unsustainable to Sustainable development, Water conservation- rain water harvesting and watershed management, Resettlement and rehabilitation issues of people, its problems and concerns, case studies, Climate change- global warming, acid rain, ozone layer depletion, nuclear accidents- their causes, effects and control measures, Environmental legislation- Wildlife Protection Act, Forest Conservation Act, Air (Prevention and Control of Pollution) Act and Water (Prevention and control of Pollution) Act.

Learning Outcomes:

Students will be able to

- Articulate the basic structure, functions, and processes of key social systems affecting the environment.(L3)
- Aware of the reasons for various global environmental challenges.(L2)
- Explain the enforcement of Environmental legislation.(L1)
- Remember the various Acts enforced in India and some of their features.(L1)

Applications:

- Water conservation practices like rainwater harvesting, soaking pits, and modern agricultural methods to minimize the environmental effects.
- Energy conservations methods in houses, industrial sector and commercial sector, apply environmental related laws in environmental issues.

Unit V

Human Population and Environmental Management:

Human Population- Population growth, variation among nations, Population explosion, Role of information Technology in Environment.

Environmental management- Environmental Impact Assessment- Methodology, Environmental Impact Statement, Environmental Management Plan, Environmental Audit-process, Significance of EIA.

Learning Outcomes:

Students will be able to

- Understand about the population effects on environment.(L2)
- Be acquainted with role of information technology in environment.(L2)
- Understand about the various environmental management practices. (L2)

Applications:

- Information Technology in different natural calamities and health aspect of view.
- Industrial and developmental activities.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books

1. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014.
2. Text Book of Environmental Studies, K. Raghavan Nambiar, Scitech Publications.
3. Environmental Studies by Palaniswamy – Pearson education
4. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

References

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental Studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.