

RAJALAKSHMI ENGINEERING COLLEGE
(An Autonomous Institution Affiliated to Anna University Chennai)

DEPARTMENT OF MECHATRONICS ENGINEERING
CURRICULUM AND SYLLABUS – R2023
Choice Based Credit System
B.E. MECHATRONICS ENGINEERING

VISION:

To attain excellence in academics, research and technological advancement in Mechatronics Engineering with a concern for society.

MISSION:

- To impart high quality professional education and produce Mechatronics Engineers with all round knowledge of multi-disciplinary branches of engineering and technology.
- To foster skill sets required to be a global professional in the areas of automation, intelligent systems, robotics, research for technology management and to fulfill the expectations of industry and needs of the society.
- To inculcate entrepreneurial qualities for creating, developing and managing global engineering ventures.

Programme Educational Objectives (PEOs):

PEO I

Graduates will have comprehensive knowledge in the analytical, scientific and engineering fundamentals necessary to model, analyse and solve engineering problems and to prepare them for graduate studies and for successful careers in industry.

PEO II

Graduates will effectively design and develop products in the areas such as automation, manufacturing, Internet of Things, machine vision, system simulation, intelligent systems and robotics.

PEO III

Graduates will acquire Technical expertise, Leadership skills, Ethical practices and Team spirit with a concern towards greener society.

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Engineering Graduates will be able:

- PSO 1: To innovate a Mechatronics system to meet the requirements and specifications.
- PSO 2: To analyse and improve the performance of a Mechatronics system and enhance the intellectual capabilities of the system
- PSO 3: To lead professional career in industries or an entrepreneur by applying Engineering and Management principles and practices.

PEO / PO Mapping

Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
PEO I	3	3	2	2	2	1	1	-	2	1	1	1	3	2	2
PEO II	3	3	3	1	3	1	1	-	-	-	-	1	2	3	2
PEO III	-	-	-	-	-	3	3	3	3	2	2	2	2	2	3

CURRICULUM

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1.	HS23111	Technical Communication I	HSM	2	2	0	0	2
2.	MA23112	Algebra and Calculus	BS	4	3	1	0	4
3.	GE23111	Engineering Graphics	ES	4	2	0	4	4
4.	GE23211	Engineering Mechanics	ES	3	2	1	0	3
5.	GE23117	தமிழர்மரபு /Heritage of Tamils	MC	1	1	0	0	1
LAB ORIENTED THEORY COURSE								
6.	EE23132	Basic Electrical Engineering	ES	5	3	0	2	4
LABORATORY COURSE								
7.	GE23121	Engineering Practices – Civil and Mechanical	ES	2	0	0	2	1
8.	GE23122	Engineering Practices- Electrical and Electronics	ES	2	0	0	2	1
9.	MT23121	Computer Aided Drawing Laboratory	ES	2	0	0	2	1
MANDATORY COURSE								
10.	MC23112	Environmental Science and Engineering	MC	3	3	0	0	0
TOTAL				30	16	2	12	21

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1.	MA23212	Differential Equations and Complex Variables	BS	4	3	1	0	4
2.	GE23217	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	MC	1	1	0	0	1
LAB ORIENTED THEORY COURSE								
3.	CY23131	Chemistry for Electronics Engineering	BS	5	3	0	2	4
4.	PH23131	Physics of Materials	BS	5	3	0	2	4
5.	GE23131	Programming Using C	ES	7	1	0	6	4
6.	MT23131	Elements of Mechatronics	ES	4	2	0	2	3
LABORATORY COURSE								
7.	HS23221 / HS23222	Technical Communication II / English for Professional Competence	HSM	2	0	0	2	1
MANDATORY COURSE								
8.	MC23111	Indian Constitution and Freedom Movement	MC	3	3	0	0	0
TOTAL				31	16	1	14	21

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1.	MA23311	Transforms And Partial Differential Equations	BS	4	3	1	0	4
2.	MT23311	Analog Circuits and Drives	PC	3	3	0	0	3
3	MT23312	Mechanics of Solids	PC	3	3	0	0	3
4	MT23313	Digital System Design	PC	3	3	0	0	3
LAB ORIENTED THEORY COURSE								
5.	MT23331	Manufacturing Technology	PC	5	3	0	2	4
6.	CS23336	Introduction to Python Programming	ES	6	2	0	4	4
LABORATORY COURSE								
7.	MT23321	Analog and Digital System Design Laboratory	PC	2	0	0	2	1
TOTAL				26	17	1	8	22

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1	MT23411	Fluid mechanics and Thermal Sciences	PC	4	4	0	0	4
2		Open Elective - I	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSE								
3.	MA23432	Statistics and Numerical Methods	BS	5	3	0	2	4
4.	MT23431	Microcontrollers and Embedded Systems	PC	5	3	0	2	4
5.	MT23432	Sensors and Instrumentation	PC	5	3	0	2	4
6.	MT23433	System Dynamics and Control	PC	4	2	0	2	3
LABORATORY COURSE								
7.	MT23421	Strength of Materials and Fluid Mechanics Laboratory	PC	4	0	0	4	2
8	GE23327	Soft skills – I	EEC	2	0	0	2	1
TOTAL				32	18	1	12	25

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1	MT23511	Design of Mechatronics System	PC	3	3	0	0	3
2	MT23512	Theory of Machines And Mechanisms	PC	4	3	1	0	4
3		Open Elective - II	OE	3	3	0	0	3
4		Professional Elective -I	PE	3	3	0	0	3
LAB ORIENTED THEORY COURSE								
5	MT23531	Industrial Electronics	PC	5	3	0	2	4
LABORATORY COURSE								
6	MT23521	Theory of Machines Laboratory	PE	2	0	0	2	1
7	CS23422	Python Programming for Machine Learning	PC	4	0	0	4	2
8	MT23522	Industry Internship	EEC	2	0	0	2	1
9	GE23427	Soft Skills – II	EEC	2	0	0	2	1
TOTAL				28	15	1	12	22

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1	GE23311	Fundamentals of Management for Engineers	HSM	3	3	0	0	3
2	MT23611	Fundamentals of Machine Design	PC	3	2	1	0	3
3		Professional Elective -II	PE	3	3	0	0	3
LAB ORIENTED THEORY COURSE								
4	MT23631	Industrial Robotics	PC	6	2	0	4	4
5	MT23632	Applied Hydraulics and Pneumatics	PC	6	2	0	4	4
LABORATORY COURSE								
6	GE23627	Problem solving Techniques	EEC	2	0	0	2	1
7	MT23621	Design Thinking For Innovation In Mechatronics Engineering	EEC	3	1	0	2	2
TOTAL				26	13	1	12	20

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1		Professional Elective - III	PE	3	3	0	0	3
2		Professional Elective - IV	PE	3	3	0	0	3
LAB ORIENTED THEORY COURSE								
3	MT23731	Industrial Automation	PC	6	2	0	4	4
4	MT23732	Machine Vision	PC	6	2	0	4	4
LABORATORY COURSE								
5	MT23721	Computer Aided Engineering Laboratory	PC	2	0	0	2	1
6	MT23722	Mechatronics Engineering Problem Solving using AI, ML and DL	PC	4	0	0	4	2
7	MT23723	Project Work- Phase I	EEC	4	0	0	4	2
TOTAL				28	10	0	18	19

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSE								
1		Professional Elective - V	PE	3	3	0	0	3
2		Professional Elective - VI	PE	3	3	0	0	3
PRACTICAL COURSE								
3	MT23821	Project Work- Phase II	EEC	16	0	0	16	8
TOTAL				22	6	0	16	14

TOTAL NO. OF CREDITS: 164

SUMMARY

DEPARTMENT OF MECHATRONICS ENGINEERING											
	Subject Area	Credits Per Semester								Credits Total	Percentage %
	Semester	I	II	III	IV	V	VI	VII	VIII		
1.	Humanities, Social Studies and management science (HSM)	3	2				3			8	4.88
2.	Basic Sciences (BS)	4	12	4	4					24	14.63
3.	Engineering Sciences (ES)	14	7	4						25	15.24
4.	Professional Core (PC)			14	17	14	11	11		67	40.85
5.	Professional Electives (PE)					3	3	6	6	18	10.97
6.	Open Electives (OE)				3	3				6	3.66
7.	Project Work/ Employability Enhancement Course (PR/EEC)				1	2	3	2	8	16	9.76
	TOTAL	21	21	22	25	22	20	19	14	164	
8.	Non-Credit*/ (Mandatory)	√	√	–	-	-	-	-	-		

SEMESTER I

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
HS23111	Technical Communication I	Theory	2	0	0	2
Common to all branches of B.E/B. Tech programmes – First Semester						

Objectives:
To facilitate students develop their comprehension skills
To enable students to improve their receptive skills
To equip learners with better vocabulary and enhance their writing skills
To aid students speak effectively in all kinds of communicative contexts.
To improve the learners' basic proficiency in workplace communication

UNIT-I	DEVELOPING COMPREHENSION SKILLS	6
Listening: Introduction to Informational listening – Listening to Podcasts, News Reading: Intentional Reading - Short Narratives and Passages. Speaking: Introducing Oneself, Narrating a Story / Incident. Writing: Sequential Writing – connecting ideas using transitional words (Jumbled Sentences), Process Description Grammar: Verbs – Main & Auxiliary: Simple Tenses – Form, Function and Meaning. Vocabulary: Word formation – Prefix, Suffix, Compound Words.		
UNIT-II	LISTENING AND EXTENDED READING	6
Listening: Deep Listening – Listening to Talk Shows and Debates Reading: In-depth Reading - Scanning Passages Speaking: Describing Current Issues, Happenings, etc., Writing: Note Making, Note Taking – Paragraph Writing Grammar: Continuous Tenses, Prepositions, Articles Vocabulary: One Word Substitutes, Phrasal Verbs.		
UNIT-III	FORMAL WRITING AND VERBAL ABILITY	6
Listening: Listening to Lectures and Taking Notes Reading: Interpretation of Tables, Charts and Graphs Speaking: SWOT Analysis on Oneself Writing: Formal Letter Writing and Email Writing Grammar: Perfect Tenses, Phrases and Clauses, Discourse Markers Vocabulary : Verbal Analogy / Cloze Exercise		
UNIT-IV	ENHANCING SPEAKING ABILITY	6
Listening: Listening to eminent voices of one's interest (Martin Luther King, APJ Abdul Kalam, etc..) Reading: Timed Reading, Filling KWL Chart. Speaking: Just a Minute, Impromptu Writing: Check-list, Instructions. Grammar: 'Wh' Questions / 'Yes' or 'No' Questions, Imperatives Vocabulary: Synonyms, Antonyms, Different forms of the same words.		
UNIT-V	LANGUAGE FOR WORKPLACE	6
Listening: Extensive Listening (Audio books, rendering of poems, etc.) Reading: Extensive reading (Jigsaw Reading, Short Stories, Novels) Speaking: Short Presentations on Technical Topics Writing: Recommendations, Essay Writing Grammar: Impersonal Passive, Reported Speech, Concord Vocabulary : Informal Vocabulary and Formal Substitutes		
Total Contact Hours: 30		

Course Outcomes:
On completion of the course students will be able to
apply their comprehension skills and interpret different contents effortlessly
read and comprehend various texts and audio visual contents
infer data from graphs and charts and communicate it efficiently in varied contexts
participate effectively in diverse speaking situations
to present, discuss and coordinate with their peers in workplace using their language skills

SUGGESTED ACTIVITIES

- Ice breaker
- Just A Minute
- Ship wreck
- Hot seat
- Vocabulary building
- Chinese whispers
- Case study

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous Assessment Tests

Text Book(s):

1. Effective Technical Communication by M. Ashraf Rizvi (Author) 2nd Edition Paperback 2017
2. Sylvan Barnet and Hugo Bedau, 'Critical Thinking Reading and Writing', Bedford/st. Martin's: Fifth Edition (June 28, 2004)
3. Meenakshi Upadhyay, Arun Sharma – Verbal Ability and Reading Comprehension.
4. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

Reference Books(s) / Web links:

1. Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers 2nd Edition by Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor)
2. Reading Development and Difficulties By Kate Cain
3. The 7 Habits of Highly Effective People by Stephen Covey, Simon and Schuster, UK
4. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Hardcover by Ann Handley (Author)

Course Code	Course Title	Category	L	T	P	C
MA23112	Algebra and Calculus	BS	3	1	0	4
Common to	AERO, AUTO, MECH, MCT, R&A, CIVIL , BIOTECH, FOODTECH, CHEM					

Objectives:

- To gain knowledge in using matrix algebra techniques and the concepts of rank and nature of the matrix.
- To understand the techniques by numerical way of solving matrix Problems.
- To understand the techniques of analysing the data and apply the concept of correlation and regression in real life problems.
- To understand the techniques of calculus those are applied in the Engineering problems.
- To understand the techniques of Integration those are applied in finding area and volumes.

UNIT-I	MATRICES	12
Matrices - Eigenvalues and eigenvectors - Diagonalization of matrices using orthogonal transformation - Cayley-Hamilton Theorem(without proof) -Quadratic forms- Reduction to canonical form using orthogonal transformation- Numerical computation of Eigen value using Power method		
UNIT-II	STATISTICS	12
Scatter diagram - Karl Pearson coefficient of correlation for raw data –Spearmanrank correlation coefficient - Lines of regression - Regression equation X on Y and Y on X- Curve fitting by Principle of least squares - Fitting a straight line $y = ax+b$ and a parabola $y = ax^2 + bx + c$.		
UNIT-III	FUNCTIONS OF SEVERAL VARIABLES	12

Partial differentiation–Total derivative–Change of variables–Jacobians–Partial differentiation of implicit functions– Taylor’s series for functions of two variables–Maxima and minima of functions of two variables–Lagrange’s method of undetermined multipliers.	
UNIT-IV	INTEGRAL CALCULUS
Integral Calculus: Definite Integrals as a limit of sums - Applications of integration to area, volume - Improper integrals: Beta and Gamma integrals- Numerical computation of integrals -Trapezoidal rule- Gaussian Two point quadrature	
UNIT-V	MULTIPLE INTEGRAL
Double integrals–Change of order of integration–Area enclosed by plane curves–Triple integrals–Volume of solids– Numerical computation of double integrals- Trapezoidal rule.	
Total Contact Hours:60	

Course Outcomes:
On completion of the course students will be able to:
<ul style="list-style-type: none"> Apply the concept of Eigenvalues and eigenvectors, diagonalization of a matrix for solving problems and numerical way of solving matrix problems
<ul style="list-style-type: none"> Apply the concept of analysis of data, correlation and regression in real life situation.
<ul style="list-style-type: none"> Analyse, sketch and study the properties of different curves and to handle functions of several variables and problems of maxima and minima.
<ul style="list-style-type: none"> Evaluate area and volume using single integration and numerical integration
<ul style="list-style-type: none"> Evaluate surface area and volume using multiple integrals.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> Problem solving sessions Activity Based Learning (Correlation and Regression using online calculator.) Implementation of small module (https://www.wolframalpha.com/calculators/eigenvalue-calculator)

UGGESTED EVALUATION METHODS
<ul style="list-style-type: none"> Tutorial problems Assignment problems Quizzes Class Presentation/Discussion

Text Book(s):
1. Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014. http://library.lol/main/753072EA7A0A4404C0C70587330B28AB
2. T Veerarajan ,Fundamentals of Mathematical Statistics , yesdee publications, 2017. http://library.lol/main/7400A01CB4E5D8CD7DA0631EE34A25D6
3. T Veerarajan, Engineering Mathematics –I , Mc Graw Hill Education, 2018. http://library.lol/main/7B66D2FA0CB50B3C37369267355677B8

Reference Books(s) / Web links:
<ul style="list-style-type: none"> Ramana. B.V., " Higher Engineering Mathematics ", McGraw Hill Education Pvt.Ltd, New Delhi, 2016. Gupta S.C. and Kapoor V.K."Fundamentals of Mathematical Statistics", Sultan and Sons. Erwin Kreyszig , " Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

GE23111	Engineering Graphics	ES	L	T	P	C
	Common to I sem. B.E. – Aeronautical Engineering ,Automobile Engineering, Civil Engineering, Mechanical Engineering , Mechatronics& Robotics and Automation		2	0	4	4

Objectives:	
•	To understand the importance of the drawing in engineering applications
•	To develop graphic skills for communication of concepts, ideas and design of engineering products
•	To expose them to existing national standards related to technical drawings.
•	To improve their visualization skills so that they can apply these skill in developing new products.
•	To improve their technical communication skill in the form of communicative drawings

CONCEPTS AND CONVENTIONS (Not for Examination)

1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning, Basic Geometrical constructions

UNIT-I	PLANE CURVES AND PROJECTION OF POINTS	5+12
Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Cycloidal Curves – Construction of cycloid, epicycloid and hypocycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Principles of Projection and Projection of points.		
UNIT-II	PROJECTION OF POINTS, LINES AND PLANE SURFACES	6+12
Projection of straight lines (First angle projection) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.		
UNIT-III	PROJECTION OF SOLIDS AND PROJECTION OF SECTIONED SOLIDS	6+12
Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method. Sectioning of solids in simple vertical position when the cutting plane is inclined to HP and perpendicular to VP – obtaining true shape of the section. Practicing three-dimensional modeling of simple objects by CAD software (Not for examination)		
UNIT-IV	DEVELOPMENT OF SURFACE AND ISOMETRIC PROJECTIONS	6+12
Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders and cones Model making of isometric projection of combination of solids as assignment (Not for End semester)		
UNIT-V	FREE HAND SKETCHING AND PERSPECTIVE PROJECTIONS	6+12
Free Hand sketching: Freehand sketching of multiple views from pictorial views of objects - Freehand sketching of pictorial views of object from multiple views Perspective projection of simple solids-Prisms, pyramids, cylinder and cone by visual ray method.		
Total Contact Hours		: 90

Text Book (s):	
1	Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50 th Edition, 2010.
2	Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2017.

Reference Books(s) / Web links:	
1	Varghese P I., “Engineering Graphics”, McGraw Hill Education (I) Pvt.Ltd., 2013.
2	Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P)Limited, 2008.
3	Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2017.
4	Basant Agarwal and Agarwal C.M., “Engineering Drawing”, McGraw Hill Publishing Company Limited, New Delhi, 2018.
Course Outcomes:	
On completion of the course students will be able to	
•	To construct different plane curves and to comprehend the theory of projection
•	To draw the basic views related to projection of lines and planes

●	To draw the projection of simple solids and to draw the projection of development of surfaces of Sectioned solids in simple vertical position
●	To draw the orthographic projection from pictorial objects and Isometric projections of simple solids
●	To visualize Perspective view of simple solids

Subject Code	Subject Name	Category	L	T	P	C
GE23211	Engineering Mechanics (Common to Mech, Aero, Auto, Civil and MCT)	ES	2	1	0	3

Objectives: The students can be able to	
●	To understand the basics of mechanics and apply the concept of equilibrium of system of forces.
●	To understand the concept of equilibrium and to solve problems of rigid bodies.
●	To learn about the centroid and centre of gravity of objects and moment of inertia
●	To learn the basic concepts of friction.
●	To learn the concepts in kinematics and kinetics of rigid bodies in plane motion.

UNIT-I	STATICS OF PARTICLES	9
Introduction – Units and Dimensions – Laws of Mechanics – Lami’s theorem, Parallelogram and triangular Law of forces – Resolution of forces – Vector operations of forces - Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.		
UNIT-II	EQUILIBRIUM OF RIGID BODIES	9
Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force - Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in and three dimensions (class room lecture only) – (Descriptive treatment only)		
UNIT-III	PROPERTIES OF SURFACES AND SOLIDS	12
Centroids - First moment of area – Second moment of area and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia – mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.		
UNIT-IV	DYNAMICS OF PARTICLES	7
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton’s laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.		
UNIT-V	FRICTION AND RIGID BODY DYNAMICS	8
Friction force – Laws of sliding friction - Characteristics of dry friction – equilibrium analysis of simple systems with sliding friction – wedge friction, Ladder friction, Rolling resistance - Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.		
Total Contact Hours		45

Course Outcomes: Upon completion of this course, the students will be able to:	
CO1	Analyze the forces in the system and to understand vectorial and scalar representation of forces and moments
CO2	Study about the rigid body in equilibrium and to analyze the problems in engineering systems using the concept of static equilibrium
CO3	Determine the properties of surfaces and solids by means of finding centroid, centre of gravity and moment of inertia.
CO4	Solve problems involving kinematics and kinetics of rigid bodies in plane motion.
CO5	Solve problems involving frictional phenomena in machines by understanding the concept of friction and the effects by the laws of friction

Text Books:

1	Beer, F.P and Johnston Jr. E.R, Cornwell and Sanghi ., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 12 th Edition, McGraw-Hill Publishing company, New Delhi (2018).
2	Rajasekaran S and Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3 rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

Reference Books(s) / Web links:

1	Meriam J.L. and Kraige L.G., “Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, 7 th Edition, Wiley India, 2018.
2	Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 14 th Edition, Pearson Education 2017.
3	Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics” 4 th Edition, Pearson Education 2006.
4	Bhavikatti S S, Engineering Mechanics, New Age International Publishers, 2016
5	Vela Murali, “Engineering Mechanics”, Oxford University Press 2010
6	Palanichamy M S, Nagan S, Elango P, Engineering Mechanics: Dynamics, Tata McGraw-Hill Publishing Company Limited, 2004

CO & PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO	3	3	1	2	-	-	1	-	2	1	3	2	3	-	3
CO	3	3	1	2	-	-	1	-	2	1	3	2	3	-	3
CO	3	3	1	2	-	-	1	-	1	1	3	2	3	-	3
CO	3	3	1	2	-	-	1	-	3	1	3	2	3	-	3
CO	3	3	1	2	-	-	1	-	3	1	3	2	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

அலகு I மொழி மற்றும் இலக்கியம்:

3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழிக் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை:

3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:

3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:

3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:

3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS**TEXT-CUM-REFERENCE BOOKS**

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C	
EE23132	BASIC ELECTRICAL ENGINEERING	ES	3	0	2	4	
Objectives:							
•	To provide knowledge on the analysis of DC circuits.						
•	To teach methods of analysis of AC circuits.						
•	To impart knowledge on principles of operation of electrical machines.						
•	To teach the basics of electrical safety measures.						
•	To provide hands on experience on electric circuits and machines						
UNIT-I	DC CIRCUITS						9
Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's laws, Mesh and Nodal Analysis, Superposition, Thevenin's, Norton's Theorems and Maximum Power Transfer Theorem							
UNIT-II	AC CIRCUITS						9
Representation of sinusoidal waveforms, Power and Power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations. Three phase balanced circuits.							
UNIT-III	DC MOTORS AND TRANSFORMERS						9
Construction, working and characteristics of DC motors. Construction, principle of operation of single-phase Transformer, EMF Equation.							
UNIT-IV	AC ROTATING MACHINES						9
Construction and basic working of three phase Alternators and Induction motors, Construction and Types of single-phase induction motors- Construction and basic working of Stepper motor, Permanent magnet Brushless Motor (PMBLDC) (Qualitative Treatment Only).							
UNIT-V	ELECTRICAL SAFETY MEASURES						9
Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection -Safety in the use of portable tools - Preventive maintenance- Types of earthing and its importance-Safety precautions for electrical appliances- National electrical Safety code - Indian electricity acts and rules							
					Total Contact Hours	:	45

List of Experiments							
1	Kirchhoff's laws.						
2	Network theorems (Thevenin's, Norton's and Maximum Power Transfer Theorems)						
3	Determination of Impedance and Current in RL, RC and RLC series circuits						
4	Measurement of voltage and current in three phase balanced star & delta connected loads.						
5	Load test on DC shunt motor (Virtual Lab)						
6	Load test on single-phase transformer (Virtual Lab)						
7	Load test on three phase induction motor (Virtual Lab)						
8	Load test on Single phase induction motor.						
					Contact Hours	:	30
					Total Contact Hours	:	75
Course Outcomes:							
On completion of the course, the students will be able to							
•	analyse DC circuits and apply circuit theorems.						
•	calculate the power and power factor in AC circuits						
•	comprehend the principles of electrical machines.						
•	Realise the electrical safety precautions.						
•	experimentally analyze the electric circuits and machines.						
Suggested Activities							
•	Problem solving sessions						
Suggested Evaluation methods							
•	Quizzes						
•	Class Presentation / Discussion						
Text Book(s):							
1	E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.						
2	J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2010.						
3	K.Venkatratnam, —Special Electrical Machines, Universities Press (India) Private Limited, 2008.						
4	John Cadick, P.E. Mary Capelli-Schellpfeffer, M.D., M.P.A. Dennis K. Neitzel, C.P.E. "Al Winfield Electrical Safety Hand Book, fifth edition, The McGraw-Hill 2012						

Reference Books(s) / Web links:															
1	Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Schaum Series and Systems", Schaum"s Outlines, Tata McGrawHill, Indian. 5th Edition , 2017														
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.														
3	D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.														
4	L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.														
5	https://nptel.ac.in/courses/108108076														
6	E G Janardanan, —Special Electrical Machines, Prentice Hall India Limited, 2013.														
7	Maxwell Adams.J, "Electrical safety- a guide to the causes and prevention of electric hazards",The Institution of Electric Engineers, 1994.														
COs/POs&PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	3		3	1	1	2	1	1	1	1	2	
CO 2	3	3	3	3		3	1	1	2	1	1	1	1	2	
CO 3	3	3	3	3		3	1	1	2	1	1	1	1	2	
CO 4	3	3	3	3		3	1	1	2	1	1	1	1	2	
CO 5	3	3	3	3		3	3	1	2	1	1	1	1	2	
Average	3	3	3	3		3	1.4	1	2	1	1	1	1	2	

GE23121	ENGINEERING PRACTICES – Civil and Mechanical	ES	L	T	P	C
			0	0	2	1

Objectives:

To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

List of Experiments

CIVIL ENGINEERING PRACTICE	
1.	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2.	Preparation of basic plumbing line sketches for wash basins, water heaters, etc.
3.	Hands-on-exercise: Basic pipe connections – Pipe connections with different joining components.
Carpentry Works:	
4.	Study of joints in roofs, doors, windows and furniture.
5.	Hands-on-exercise: Woodwork, joints by sawing, planing and chiselling.
MECHANICAL ENGINEERING PRACTICE	
6.	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
7	Gas welding practice.
Basic Machining:	
8	Simple Turning and Taper turning
9	Drilling Practice
Sheet Metal Work:	
10	Forming & Bending:
11	Model making – Trays and funnels
12	Different type of joints.
Machine Assembly Practice:	
13	Study of centrifugal pump
14	Study of air conditioner
Total Contact Hours	
: 30	

Course Outcomes:

On completion of the course students will be able to

•	Perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc.
•	Perform wood working carpentry activities like sawing, planing, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.
•	Produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories
•	Perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine
•	Perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays, funnels, etc.

Subject Code	Subject Name	Category	L	T	P	C
GE23122	ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS	ES	0	0	2	1

Objectives:

- To provide hands-on experience on various basic engineering practices in Electrical Engineering.
- To impart hands-on experience on various basic engineering practices in Electronics Engineering.

List of Experiments

A. ELECTRICAL ENGINEERING PRACTICE

- 1 Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- 2 Fluorescent lamp wiring.
- 3 Stair case wiring.
- 4 Measurement of electrical quantities – voltage, current, power & power factor in RL circuit.
- 5 Measurement of resistance to earth of electrical equipment.
- 6 Study of Ceiling Fan and Iron Box

B. ELECTRONICS ENGINEERING PRACTICE

- 1 Study of electronic components and equipment's – Resistor, colour coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
- 2 (a) Study of Multimeter
(b) Testing of electronic components.
- 3 Study of logic gates AND, OR, EXOR and NOT.
- 4 Generation of Clock Signals.
- 5 Soldering practice – Components Devices and Circuits – Using general purpose PCB.
- 6 Measurement of ripple factor of HWR and FWR.

Total Contact Hours : **30**

Course Outcomes:

On completion of the course, the students will be able to

- fabricate the electrical circuits
- construct the house wiring circuits
- fabricate the electronic circuits
- verify the truth table of logic gates
- design the AC-DC converter using diodes and passive components

SUGGESTED EVALUATION METHODS

- Experiment based Viva

REFERENCE

- 1 Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2007.
- 2 Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
- 3 Jeyapooan T., Saravanapandian M. &Pranitha S., "Engineering Practices Lab Manual",Vikas Publishing House Pvt.Ltd, 2006.
- 4 Rajendra Prasad A. &Sarma P.M.M.S., "Workshop Practice", SreeSai Publication, 2002.

MT23121	COMPUTER AIDED DRAWING LABORATORY	ES	L	T	P	C
			0	0	2	1

Objectives:

- To introduce the students the Indian standard code of practice for engineering drawing and general symbols and abbreviation used on the drawing.
- To provide hands on experience to develop 2D and 3D models of engineering components.
- To provide knowledge to use Drawing/Modeling software.

List of Experiments

1	CODES AND STANDARDS Indian standard code of practice for engineering drawing – general principles of Presentation. Conventional representations of threaded parts, springs, gear and Common features. Abbreviations and symbols for use on technical drawings. Conventions for sectioning and dimensioning.
2	GEOMETRIC DIMENSIONING & TOLERANCING (GD&T) PRINCIPLES Tolerances – types – representation of tolerances on drawing, fits – types – selection of Fits – allowance. Geometric tolerances – form and positional tolerances – datum, datum Features. Maximum material principle – symbols and methods of indicating it on drawing Surface finish symbols–welding symbols and methods of indicating it on drawing.
3	INTRODUCTION TO DRAFTING SOFTWARE Introduction to the use of any drafting software – creation of simple geometric bodies using primitives (line, arc, circle etc.,) and editing for the drawing, Dimensioning and text writing, concept of layer creation and setting, line types.
4	MANUAL AND CAD DRAWING OF MACHINE ELEMENTS Preparation of 2-D drawings using CAD software for components and assemblies of Plummer block, screw jack, machine vice, lathe tailstock, tool head of the shaper. Introduction to 3-D modeling solid and frame modeling.
Total Contact Hours : 30	

Course Outcomes:

- On completion of the course, the students will be able to
- Ability to develop engineering drawing and dimensioning for the industrial component using Indian Standard code of practice.
 - Able to implement Geometric Dimensioning & Tolerancing principles in production drawing.
 - Use CAD software for drafting machine components.
 - Recognize various working principles of different machine elements.
 - Ability to develop 2D and 3D models of the component using manual/software.

PO/PSO CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MT19221.1	1	1	-	-	3	-	-	-	-	2	-	2	2	1	-
MT19221.2	1	1	-	-	3	-	-	-	-	2	-	2	2	1	-
MT19221.3	1	1	-	-	3	-	-	-	-	2	-	2	2	1	-
MT19221.4	1	1	-	-	3	-	-	-	-	2	-	2	2	1	-
MT19221.5	1	1	-	-	3	-	-	-	-	2	-	2	2	1	-
AVERAGE	1	1			3					2		2	2	1	

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC23112	ENVIRONMENTAL SCIENCE AND ENGINEERING	MC/BS	3	0	0	0

Objectives:
<ul style="list-style-type: none"> To develop the understanding of environmental and associated issues To develop an attitude of concern for the environment To promote enthusiasm in participating environmental protection initiatives To develop skills to solve environmental degradation issues

UNIT-I	Air and Noise pollution	9
Definition –sources of air pollution –chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, ozone depletion, particulate pollutants-Air quality standards-Air quality indices - control of particulate air pollutants-gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP)-catalytic converters Noise pollution -Sources; Health Effects-Standards- Measurement and control methods		
UNIT-II	Water pollution and its management	9
Definition-causes-effects of water pollution-point and nonpoint sources of wastewater-marine pollution-thermal pollution-control of water pollution by physical, chemical and biological methods–wastewater treatment-primary, secondary and tertiary treatment-sources and characteristics of industrial effluents-wastewater recycling and zero liquid discharge		
UNIT-III	Solid waste and Hazardous waste management	9
Solid waste – types- municipal solid waste management: Sources, characteristics, collection, and transportation- sanitary landfill, recycling, composting, incineration, energy recovery options from waste - Hazardous waste – Types, characteristics, and health impact - Hazardous waste management: Treatment Methods – neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal E-waste-definition-sources-effects on human health and environment- E-waste management- recovery of metals-Role of E-waste management within the initiatives of the Govt. of India- Swachh Bharat Mission-soil contamination and leaching of contaminants into groundwater		
UNIT-IV	Sustainable Development	9
Sustainable development- concept-dimensions-sustainable development goals-Value Education- Gender equality- Poverty-Hunger-Famine-Natural Hazards management- -Twelve principles of green chemistry, Green technology- definition, importance, factors affecting green technology- Cleaner development mechanism, role of industry; reuse, reduce and recycle, raw material substitution; wealth from waste; carbon credits, carbon trading, carbon sequestration, eco labeling-International conventions and protocols-Disaster management.		
UNIT-V	Environmental Management and Legislation	9
Environmental Management systems - ISO 14000 series- Environmental audit-Environmental Impact Assessment- Life cycle assessment- Human health risk assessment-Environmental Law and Policy- Objectives; Polluter pays principle, Precautionary principle; The Water and Air Acts with amendments-The Environment (Protection) Act (EPA) 1986; Role of Information technology in environment and human health.		
Total Contact Hours		: 45

Course Outcomes:	
On completion of the course, the students will be able to	
•	associate air and noise quality standards with environment and human health.
•	illustrate the significance of water and devise control measures for water pollution.
•	analyze solid wastes and hazardous wastes.
•	outline the goals of sustainable development in an integrated perspective.
•	comprehend the significance of environmental laws.

Text Books:	
1	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016
2	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
3	Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi

Reference Books	
1	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38. Edition 2010.
2	Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3	Fowler B, Electronic Waste – 1 st Edition (Toxicology and Public Health Issues), 2017Elsevier

Web links:	
1	https://onlinecourses.nptel.ac.in/noc19_ge22/
2	NPTEL
3	https://news.mit.edu/2013/ewaste-mit

Suggested activities

1. Case studies presentation

Method of evaluation

1. Classroom presentations on case studies (or) Site visits, instead of CAT-I (or)CAT-II or CAT III

SEMESTER II

Course Code	Course Title	Category	L	T	P	C
MA23212	DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES	BS	3	1	0	4
Common to II Sem. B.E. –AERO, AUTO, BME, CIVIL, EEE, ECE, MECH, MCT, R&A and B. Tech. - BT, FT & CHEM						

Objectives:

- To provide students with an introduction to the theory of ordinary differential equations through applications, methods of solution, and numerical approximations.
- To introduce students to how to solve linear Partial Differential with different methods.
- To enable the students to study the Laplace Transforms, properties of Laplace Transform, inverse Laplace Transform and some applications to solve the differential equations and integral equations.
- To explain the concept of a vector integration in a plane and in space.
- To describe basic properties of complex variables and to have the ability to compute complex integrals.

UNIT-I	ORDINARY DIFFERENTIAL EQUATIONS	12
Second and higher order Linear differential equations with constant coefficients - Method of variation of parameters – Legendre’s linear equations – Numerical solution of ODE - Single Step methods: Taylor’s series method, Euler’s method.		
UNIT-II	PARTIAL DIFFERENTIAL EQUATIONS	12
Formation of partial differential equations - Classification of PDE – Solutions of standard types of first order partial differential equations - Lagrange’s linear equation –Linear homogeneous partial differential equations of second and higher order with constant coefficients.		
UNIT-III	LAPLACE TRANSFORM	12
Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse functions, periodic functions. Inverse Laplace transform – Problems using Convolution theorem – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques		
UNIT-IV	VECTOR CALCULUS	12
Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.		
UNIT-V	COMPLEX VARIABLES	12
Analytic functions — Construction of analytic function - Bilinear transformation –Singularities – Cauchy’s integral theorem (without proof) - Residues – Residue theorem (without proof) - Simple problems - Contour integral over $ z =1$.		
Total Contact Hours: 60		

Course Outcomes:

On completion of the course students will be able to

- Apply the methods as a potent tool in the solution of a variety of problems in the natural sciences and technology.
- Develop specific methodologies, techniques and resources in Partial differential equations to conduct research and produce innovative results in the area of specialisation.
- Use Laplace transform and inverse transform techniques to solve the complex problems in engineering and technology.
- Apply the concepts in multivariable analysis, including space curves; directional derivative; gradient; multiple integrals; line and surface integrals; vector fields; divergence, curl ; the theorems of Green and Stokes, and the divergence theorem in different fields of engineering.
- Demonstrate the concept of Analytic functions, conformal mapping and complex integration in solving Engineering problems.

SUGGESTED ACTIVITIES

- Problem solving sessions
- Activity Based Learning

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

4.	Grewal B.S., "Higher Engineering Mathematics ", Khanna Publishers, New Delhi, 43rd Edition, 2014.
5.	Veerarajan. T, Engineering Mathematics –II, Mc Graw Hill Education, 2018.
6.	Erwin Kreyszig," Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.
7.	Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4th Edition, New Delhi, 2011.
8.	Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, 5 th Edition, New Delhi, 2017.

Reference Books(s) / Web links:

1.	Ramana. B.V., "Higher Engineering Mathematics ", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
2.	T Veerarajan, Transforms and Partial Differential Equations, Third Edition, 2018.
3.	Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 4 th Edition 2006.
4.	Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, 7th Edition, New Delhi, 2012.

GE23217**தமிழரும் ததொழில்நுட்பமும்****LT P C 1 0 0 1****அலகு I தெசவு மற்றும் பொனைத் ததொழில்நுட்பம்:****3**

சங்க காலத்தில் நெசவுத் நதாழில் - பானைத் நதாழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பண்டங்களில் கீறல் குறியீடுகள்.

அலகு II வடிவனமப்பு மற்றும் கட்டிடத் ததொழில்நுட்பம்:**3**

சங்க காலத்தில் வடிவனமப்பு மற்றும் கட்டுமாைங்கள் & சங்க காலத்தில் வீட்டுநபாருட்களில் வடிவனமப்பு - சங்க காலத்தில் கட்டுமாை நபாருட்களும் ெடுகல்லும் - சிலப்பதிகாரத்தில் மமனட அனமப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், மகாவில்களும் - மசாழர் காலத்துப் நபருங்ககாயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - ொயக்கர் காலக் மகாயில்கள் - மாதிரி கட்டனமப்புகள் பற்றி அறிதல், மதுனர மீண்ாட்சி அம்மை ஆலயம் மற்றும் திருமனல ொயக்கர் மஹால் - நசட்டிண்ாடு வீடுகள் - பிரிட்டிஷ் காலத்தில் நசைனையில் இம்மதா - சாமராநசைிக் கட்டிடக் கனல.

அலகு III உற்பத்தித் ததொழில் நுட்பம்:**3**

கப்பல் கட்டும் கனல - உமலாகவியல் - இரும்புத் நதாழிற்சானல - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சாண்றுகளாக நசம்பு மற்றும் தங்க ொணயங்கள் - ொணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் நதாழிற்சானலகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - நதால்லியல் சாண்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வனககள்.

அலகு IV வவளொண்னம மற்றும் ெீர்ப்பொசைத் ததொழில் நுட்பம்: 3

அணை, ஏரி, குளங்கள், மதகு - மசாழர்காலக் குழுழித் தூம்பிண் முக்கியத்துவம் - கால்னெட பராமரிப்பு - கல்னெடகளுக்காக வடிவனமக்கப்பட்ட கிணறுகள் - மவளாண்ம மற்றும் மவளாண்மச் சார்னெத் நசயல்பாடுகள் - கடல்சார் அறிவு - மீண்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - நபருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு V அறிவியல் தமிழ் மற்றும் கணித்தமிழ் :

3

அறிவியல் தமிழிண் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களள மிண்்பதிப்பு நசய்தல் - தமிழ் நமைநபாருட்கள் உருவாக்கம் - தமிழ் இனணயக் கல்விக்கழகம் - தமிழ் மிண் நூலகம் - இனணயத்தில் தமிழ் அகராதிக்கள் - நசாற்குனவத் திட்டம்.

TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - மக.மக. பிள்ளள (நவளியீடு: தமிழ்னாடு பாடநூல் மற்றும் கல்வியியல் பணிக்கழகம்).
2. கணித்தமிழ் - முனைவர் இல. சுனெ்தரம். (விகடைட் பிரசுரம்).
3. கீழடி - னவனக ஁திக்களரயில் சங்ககால ஁கர ஁காரிகம் (நதால்லியல் துனற நவளியீடு)
4. நபாருனெ - ஆற்றங்களர ஁காரிகம். (நதால்லியல் துனற நவளியீடு)
5. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr. S. Singaravelu)(Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr. S. V. Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name (Theory Laboratory embedded course)	Category	L	T	P	C
CY23131	CHEMISTRY FOR ELECTRONICS ENGINEERING	BS	3	0	2	4
Common to	B.E. - ECE, BME, EEE, MCT and R&A					

Objectives:
• To understand the principles of electrochemical processes
• To explore the functioning of sensors and their applications in industries and health care
• To get familiarized with the functioning batteries of and fuel cells
• To acquire knowledge on polymeric materials used in electronics
• To develop proficiency in nanomaterials

UNIT-I	DYNAMIC ELECTROCHEMISTRY	9
Applied Electrochemistry: Electrode Potential - EMF series - Corrosion- Causes, Consequences and Prevention. Surface Preparation- electropolishing -Electroplating of copper, electrophoretic deposition - Electrochemical machining, electrochemical etching - electrochemical etching of Cu from PCB.		
UNIT-II	ELECTROCHEMICAL SENSORS	9

Electrodes - reference electrodes - ion-selective electrode, determination of electrode potential - Galvanic and concentration cells - potentiometric, amperometric and conductometric methods of analysis - potentiometric sensor, optical sensor, thermal sensor, chemical biosignals - sensors for health care – glucose and urea sensors, gas sensors for CO ₂ , O ₂ and NH ₃ sensing- blood oxygen sensor.		
UNIT-III	ELECTROCHEMICAL ENERGY SYSTEMS	9
Batteries- types - characteristics-fabrication and working of lead-acid battery- NICAD battery – Nickel metal hydride batteries -lithium-ion battery - Supercapacitors- introduction - types - electrochemical double layer capacitor - activated carbon - carbon aerogels. Fuel cells - classification – principle, working and applications of hydrogen-oxygen fuel cell - solid oxide fuel cell - direct methanol fuel cell and proton exchange membrane fuel cells-biofuel cells.		
UNIT-IV	POLYMERS IN ELECTRONICS	9
Conducting polymers - conducting mechanisms- polyaniline, Poly pyrrole - photonic polymers - photo resists - Introduction, Liquid crystalline phases, Identification of the mesophases, Lyotropic main chain liquid crystalline polymers, Thermotropic main chain liquid crystal polymers, Applications of liquid Crystals in Displays (LCDs) - Organic LEDs- functioning-advantages and disadvantages over conventional LEDs- commercial uses.		
UNIT-V	NANO MATERIALS	9
Introduction-Types of nanomaterials-Emergence and challenges in nanotechnology- Synthesis routes for nanomaterials: Bottom-up and top-down approaches- Sol-gel, precipitation, Hydrothermal, Solvothermal, Microwave irradiation, Chemical Vapour Deposition (CVD), Electro deposition- Properties of nanomaterials- Mechanical properties, Chemical, Optical, Electrical and Magnetic properties-applications of nanomaterials.		
Total Contact Hours:45		

Description of the Experiments	Total Contact Hours:15
1. Construction and determination of EMF of simple electrochemical cells and concentration cells	
2. Estimation of acids by pH metry	
3. Determination of corrosion rate on mild steel by weight loss method	
4. Estimation of mixture of acids by conductometry	
5. Estimation of extent of corrosion of iron pieces by potentiometry	
6. Estimation of copper / ferrous ions by spectrophotometry	
7. Estimation of DO by using sensors	
8. Estimation of concentration of ions in the given sample solution.	
9. Determination of molecular weight of a polymer by viscometry method	
10. Synthesis of nanomaterials by simple precipitation method	

Course Outcomes:
<ul style="list-style-type: none"> ● Apply the knowledge of electrochemistry in exploring electrochemical processes. ● Associate the knowledge of sensors in health care and in pollution abatement ● Recognize the types of batteries and fuel cells ● Employ advanced materials in industrial applications and display techniques ● Develop nano and biomaterials for medical applications

SUGGESTED ACTIVITIES

- Electroplating process by group of students
- Ceramic coating on implant materials
- Electropolishing of metals and alloys

SUGGESTED EVALUATION METHODS

- Continuous assessment tests
- Assignments
- Model lab examination
- End semester examination

Text Book(s):

1. P. C. Jain and Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015
2. O.G. Palanna, "Engineering Chemistry", McGraw Hill Education (India) Pvt, Ltd, New Delhi, 2017
3. Shikha Agarwal "Engineering Chemistry-Fundamentals and applications", Cambridge University Press, New Delhi, 2015

Reference Books(s) / Web links:

- Gowarikar V. R., Viswanathan N.V. and Jayadev Sreedhar, —Polymer Science, New Age International (P) Ltd., New Delhi, 2011
 - Sujata V Bhat, "Biomaterials", Narosa Publishing House, New Delhi, 2002
 - Pradeep T, "A Text Book of Nanoscience and Nanotechnology", Tata McGraw Hill, New Delhi, 2012
 - AN INTRODUCTION TO NANOMATERIALS AND NANOSCIENCE (PB 2020) : Asim K DAS, Mahua Das, CBS publishers and distributors Pvt. Ltd.
 - NPTEL course Elementary Electrochemistry course url
https://onlinecourses.nptel.ac.in/noc23_cv19/preview
1. For downloading text/reference books the weblink is given below can be used
<http://libgen.rs/>

Subject Code	Subject Name	Category	L	T	P	C
PH23131	PHYSICS OF MATERIALS Common to I sem. B.E. - Aero, Auto, Civil, Mech, MCT and R&A	BS	3	0	2	4
Objectives:						
• To enhance the fundamental knowledge of elasticity and its applications relevant to engineering streams.						
• To become proficient in crystal growth and crystal systems.						
• To introduce the essential of phase transformation in materials.						
• To impart knowledge on the structure, properties, treatment, testing and applications of metals and alloys.						
• To familiarize students with thermal properties and applications.						
UNIT-I	PROPERTIES OF MATTER					9
Elasticity–Hooke’s law–stress–strain–modulus of elasticity–stress–strain diagram–Poisson’s ratio–rigidity modulus–twisting couple on a cylinder–moment of inertia - torsional pendulum method. Bending of beams -bending moment–cantilever depression–theory and experiment - Young’s modulus determination–uniform and non-uniform bending-I–shape girders. Viscosity–flow of motion–Reynolds number.						
UNIT-II	CRYSTAL PHYSICS					9
Basis – lattices – unit cell–crystal systems – Bravais lattices –number of atoms, atomic radius, co-ordination number and packing fraction - SC, BCC, FCC, HCP lattices –diamond structure - polymorphism and allotropy–graphite structure - Miller indices – determination of d-space–crystal growth techniques–solution growth –melt growth- Czochralski and Bridgmann- crystal defects.						
UNIT-III	PHASE DIAGRAMS					9
Solid solutions - Hume-Rothery’s rules –Gibb’s phase rule – unary phase diagram- binary phase diagrams -isomorphous systems - tie-line and lever rule - eutectic, eutectoid, peritectic, peritectoid,						

monotectic and syntectic systems - formation of microstructures-homogeneous and non-homogenous cooling – nucleation (Qualitative)– iron-carbon phase diagram - eutectoid steel – hypo-eutectoid and hyper-eutectoid steel – diffusion - Fick’s laws – T-T-T diagrams.		
UNIT-IV	ADVANCED MATERIALS & TESTING	9
Metallic glasses – preparation, properties and applications - Ceramics – types, manufacturing methods and properties – applications - Composites – types and properties - Shape memory alloys – properties and applications - Nano-materials – top down and bottom up approaches –sol-gel method-pulsed laser deposition-ball milling-hydrothermal method-properties-applications - Tensile strength – Hardness – Fatigue - Impact strength – Creep - Fracture – types of fracture.		
UNIT-V	THERMAL PHYSICS	9
Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation –rectilinear heat flow – thermal conductivity - Forbe’s and Lee’s disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.		
		Contact Hours : 45
List of Experiments		
1	Determination of Young’s modulus of given material by non-uniform bending method	
2	Determination of moment of inertia and rigidity modulus of a wire by Torsional pendulum.	
3	Determination of Young’s modulus of given beam by cantilever method	
4	Determination of Velocity of ultrasound and compressibility of given liquid – Ultrasonic interferometer	
5	Find the wavelength of Laser and particle size of given powder.	
6	Study the Hysteresis loss of ferromagnetic material by B-H curve experiment	
7	Determination of Thermal conductivity of a bad conductor – Lee’s Disc method.	
8	Study the solar cell parameters.	
9	Find the thickness of a given thin wire – Air wedge method	
10	Determination of viscosity of the given liquid using Poiseuille’s method.	
		Contact Hours : 30
		Total Contact Hours : 75
Course Outcomes:		
On completion of the course, the students will be able to		
•	apply the elastic nature of materials and determine the elastic moduli of different materials.	
•	apply the basic knowledge of crystal structure in solids.	
•	analyse and measure the properties of alloys.	
•	analyse various material testing methods and use them in suitable applications.	
•	understand the concepts of heat transfer in various applications.	
Suggested Activities		
•	Problem solving sessions	
Suggested Evaluation Methods		
•	Quizzes	
•	Class Presentation / Discussion	
Text Book(s):		
1	Bhattacharya, D.K. & Poonam, T. “ <i>Engineering Physics</i> ”.Oxford University Press, 2018.	
2	Gaur, R.K. & Gupta, S.L. “ <i>Engineering Physics</i> ”.DhanpatRai Publishers, 2018.	
3	Raghavan, V. “ <i>Physical Metallurgy: Principles and Practice</i> ”. PHI Learning, 2019.	
Reference Books(s) / Web links:		
1	Balasubramaniam, R. “ <i>Callister's Materials Science and Engineering</i> ”.Wiley India Pvt. Ltd., 2017	
2	Resnick, R., Halliday, D., & Walker, J. “ <i>Principles of Physics</i> ”, Wiley India Pvt., 2018.	
3	Raghavan, V. “ <i>Materials Science and Engineering : A First course</i> ”. PHI Learning, 2019.	
4	https://nptel.ac.in/courses/113104068	
5	https://archive.nptel.ac.in/courses/115/105/115105099/	

Course Code	Course Title	Category	L	T	P	C
GE23131	Programming Using C	ES	1	0	6	4

Objectives:
<ul style="list-style-type: none"> To develop simple algorithms for arithmetic and logical problems.
<ul style="list-style-type: none"> To develop C Programs using basic programming constructs
<ul style="list-style-type: none"> To develop C programs using arrays and strings
<ul style="list-style-type: none"> To develop applications in C using functions , pointers and structures
<ul style="list-style-type: none"> To develop applications using structures and union

List of Experiments
1. Overview of C, Constants, Variables and Data Types
2. Operators and Expressions, Managing Input and Output Operations
3. Decision Making and Branching
4. Decision Making and Looping
5. Nested Loops - while and for, Jumps in Loops
6. One-Dimensional Arrays
7. Pointers
8. Searching Algorithms - Linear and Binary
9. Sorting Algorithms - Bubble and Selection
10. Two-Dimensional and Multi-dimensional Arrays
11. Character Arrays and Strings Handling Functions
12. User-Defined Functions - Recursive Functions
13. Passing Arrays and Strings to Functions
14. Scope, Visibility and Lifetime of Variables
15. Structures and Unions
16. The Preprocessor
Total Contact Hours: 90
Platform Needed: GCC Compiler for Windows/Linux

Text Book(s):
1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Second Edition, PHI
2. Byron Gottfried, "Programming in C", Second Edition, Schaum Outline Series

Reference Books(s) / Web links:
<ul style="list-style-type: none"> Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
<ul style="list-style-type: none"> Yashavant Kanetkar, "Let Us C", BPB Publications
<ul style="list-style-type: none"> E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
<ul style="list-style-type: none"> NPTEL course , "Problem Solving Through Programming In C", By Prof. Anupam Basu, IIT Kharagpur

Course Outcomes:
<ul style="list-style-type: none"> To formulate simple algorithms for arithmetic and logical problems.
<ul style="list-style-type: none"> To implement conditional branching, iteration.
<ul style="list-style-type: none"> To decompose a problem into functions and synthesize a complete program.
<ul style="list-style-type: none"> To use arrays, pointers and structures to formulate algorithms and programs.
<ul style="list-style-type: none"> To apply programming to solve simple numerical method problems.

MT23131	ELEMENTS OF MECHATRONICS	ES	L	T	P	C
			2	0	2	3

Objectives:	
•	Understand the fundamental knowledge of various elements of automation.
•	Understand the need for automation in process industries.
•	To impart basic knowledge of sensors and actuators
•	To apply the fundamental knowledge of hydraulic and pneumatic system
•	To provide a clear view on Programmable Logic Controllers (PLC) and its application

UNIT-I	INTRODUCTION TO AUTOMATION	9
Automated manufacturing systems - fixed /programmable /flexible automation - Need of automation, Basic elements of automated systems- power, program and control. Levels of automation; control systems: Continuous and discrete control; Low cost automation, Economic and social aspects of automation.		
UNIT-II	SENSORS AND TRANSDUCERS	9
Introduction to sensors and transducers - Static and dynamic characteristics-Types - Displacement, position and proximity. Velocity and motion - force - fluid pressure - liquid flow and level - Temperature - Light - Selection of sensors.		
UNIT-III	BASICS OF PNEUMATICS AND HYDRAULICS SYSTEM	9
Operational principles and application, air compressors, Pneumatic cylinders and air motors, Pneumatic valves Principles of hydraulics, Hydraulic fluids, Hydraulic- pumps, valves, and actuators.		
UNIT-IV	MECHANICAL AND ELECTRICAL ACTUATION SYSTEMS	9
Mechanical actuation System: Mechanical system - types of motion - Kinematic chain - cams - Gear Trains Belt and chain drives Mechanical aspects of Motor selection. Electrical actuation system: Stepper motor, Servo motor, Solenoid switches		
UNIT-V	PROGRAMMABLE LOGIC CONTROLLER	9
Introduction - Basic structure - Input/output processing - programming Timers and counters - Analogue input/output - Selection of PLC - Simple problems		
		Total Contact Hours : 45

LIST OF EXPERIMENTS

1. Displacement measurement using potentiometer and LVDT and plotting the characteristic curves.
2. Study of Characteristics and calibration of strain gauge and Load Cell
3. Temperature measurement using Thermocouple, Thermistor and RTD and comparing the characteristics.
4. Speed control of DC motor.
5. Study of various types of transducers.
6. Study of hydraulic, pneumatic and electro-pneumatic circuits.
7. Study of PLC and its applications.

Total: 30 Periods

Course Outcomes:	
On completion of the course students will be able to	
•	Understand the fundamentals of automation system.
•	Classify and infer various types of sensors and transducers
•	Demonstrate various applications of hydraulic and pneumatic systems.
•	Illustrate the operations of mechanical and electrical actuation systems.
•	Acquire basic knowledge on PLC for various applications.

Text Book (s):	
1	Bolton W., Mechatronics: electronic control systems in mechanical and electrical engineering, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2013
2	Anthony Esposito, "Fluid Power with applications", Prentice Hall international, 2009.
	Mikell P Groover, "Automation Production Systems and Computer- Integrated Manufacturing" Pearson Education, New Delhi, 2008.

Reference Books(s) / Web links:	
1	Kuo .B.C, "Automatic control systems", Prentice Hall India, New Delhi, 2007.
2	Bagad V. S., Mechatronics, Technical Publication, Pune, 2009.
3	Devdas Shetty and Richard A. Kolk, Mechatronics System Design, Cengage Delmar Learning India Pvt Learning, 2012.

Subject Code	Technical Communication II	Category	L	T	P	C
HS23221		Theory	0	0	2	1
Common to all branches of B.E/B. Tech programmes – Second Semester						

Objectives:
<ul style="list-style-type: none"> To facilitate students to improve their vocabulary for a better communication To enable learners to understand and reproduce language To aid students to write technical reports in a convincing manner To expose students to different sentence structures To equip learners to present their ideas in an efficient manner

UNIT-I	VOCABULARY FOR BETTER COMMUNICATION	6
Listening: Telephonic Conversations and TV News Reading: Newspapers and Magazines Speaking: Conversational Practice: Speaking in a given situation, Asking permission and requesting etc., Writing: Job Application Letter and Resume Grammar: Reference words: pronouns and determiners Vocabulary: Guessing meanings of words in different contexts.		
UNIT-II	FUNCTIONAL LANGUAGE ASPECTS	6
Listening: Motivational listening – listening to real life challenges Reading: Articles and Technical reports Speaking: Using Polite Expressions, Indirect Questions Writing: Paraphrasing a Text, Poem Grammar: Purpose Statements, Cause and Effect Expressions Vocabulary: Neologisms.		
UNIT-III	TECHNICAL REPORTWRITING	6
Listening: Empathetic Listening – Giving Solutions to Problems Reading: Inferential Reading Speaking: Dialogues – Interviewing Celebrities / Leaders / Sportspersons, etc., Writing: Report Writing Grammar: Functional Usage of Expressions – used to, gone / been, etc., Vocabulary: Words Often Confused		
UNIT-IV	STRUCTURAL GRAMMAR	6
Listening: Comprehension (IELTS practice tests) Reading: Intensive Reading for specific information Speaking: Pick and Talk Writing: Proposals Grammar: Sentence Structures – Simple, Compound, Complex Sentences Vocabulary: Replacing dull words with vivid ones		
UNIT-V	PRESENTATION SKILLS	6
Listening: Discriminative listening – sarcasm, irony, pun, etc., Reading: Practice of chunking – breaking up reading materials Speaking: Mini presentation on some topic Writing: Minutes of the meeting Grammar: Correction of Errors Vocabulary: Advanced vocabulary – fixing appropriate words in the given context.		
Total Contact Hours: 30		

Course Outcomes:
On completion of the course students will be able to
<ul style="list-style-type: none"> communicate effectively using appropriate vocabulary
<ul style="list-style-type: none"> use the acquired language skills to comprehend various types of language contents
<ul style="list-style-type: none"> evaluate different texts and write effective technical content
<ul style="list-style-type: none"> use appropriate sentence structures to convey their thoughts in varied contexts
<ul style="list-style-type: none"> present their concepts and ideas in an effective manner

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> Story Lines One truth and two lies Hang Man Pictionary Word Scramble Case study

SUGGESTED EVALUATION METHODS
<ul style="list-style-type: none"> Assignment topics Quizzes Class Presentation/Discussion Continuous Assessment Tests

Text Book(s):
5. Raymond Murphy, "Intermediate English Grammar," Second Edition, Cambridge University Press, 2018
6. Meenakshi Raman & Sangeeta Sharma, "Technical Communication" Third Edition, Oxford University Press, 2015
7. Teaching Speaking: A Holistic Approach, Book by Anne Burns and Christine ChuenMeng Goh, Cambridge University Press

Reference Books(s) / Web links:
1. Michael McCarthy (Author), Felicity O'Dell (Author), John D. Bunting (Contributor), "Basic Vocabulary in Use: 60 Units of Vocabulary Practice in North American English With Answers" 2nd Edition
2. Dale Carnegie, "The Art of Public Speaking," Insight Press
3. Jack C. Richards & Theodore S. Rodgers, "Approaches and Methods in Language Teaching, Second Edition, Cambridge University Press

MC23111	Indian Constitution and Freedom Movement	Category	L	T	P	C
	Common to all branches of B.E/B. Tech Programmes – First / Second/third Semester	Theory	3	0	0	0

Objectives:
<ul style="list-style-type: none"> To apprehend the sacrifices made by the freedom fighters. To inculcate the values enshrined in the Indian constitution. To instil a sense of responsibility as the citizens of India. To familiarise about the functions of the various levels of Government. To be informed about Constitutional and Non- Constitutional bodies.

UNIT-I	INDIAN FREEDOM MOVEMENT	9
British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India-Indian Freedom Struggle under Mahatma Gandhi-Non- Cooperation Movement-Civil		

Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.		
UNIT-II	CONSTITUTION OF INDIA	9
Historical Background – Indian Constitution: Constitution’ meaning of the term, Sources and constitutional history, Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.		
UNIT-III	STRUCTURE AND FUNCTIONS OF CENTRAL GOVERNMENT	9
Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.		
UNIT-IV	STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY	9
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, Elected officials and their roles, Village level: Role of Elected and Appointed officials.		
UNIT-V	CONSTITUTIONAL FUNCTIONS AND BODIES	9
Indian Federal System – Centre – State Relations – President’s Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.		
Total Contact Hours: 45		

Course Outcomes: Upon completion of the course, students will be able to:
<ul style="list-style-type: none"> ● Appreciate the sacrifices made by freedom fighters during freedom movement. ● Be responsible citizens and abide by the rules of the Indian constitution. ● Be aware of the functions of the Indian government. ● Be knowledgeable about the functions of the state Government and the Local bodies. ● Apply the knowledge on constitutional functions and role of constitutional bodies and non-constitutional bodies.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> ● Famous speeches from around the world relating to independence ● Case study ● Quiz on Portfolio and Cabinet ● Discussions on International Associations like the UN, BRICS, QUAD ● Presentation on issues around the world

SUGGESTED EVALUATION METHODS
<ul style="list-style-type: none"> ● Assignment topics ● Quizzes ● Class Presentation/Discussion ● Continuous assessments (CAT)

Text Book(s):
1. M. Laxmikanth , “Indian Polity:, McGraw-Hill, New Delhi.
2. Durga Das Basu, “Introduction to the Constitution of India “, Lexis Nexis, New Delhi. 21 st ed 2013.
3. P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1 st ed , 2017.

Reference Books(s) / Web links:
1. Sharma, Brij Kishore, “Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, “Indian Political System “, New Academic Publishing House, Jalaendhar
3. Bipan Chandra, India’s Struggle for Independence, Penguin Books, 2016.
4. Maciver and Page, “Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.2 nd ed, 2014.
5. Bipan Chandra, History of Modern India, Orient Black Swan, 2009.