E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA (CSE, EEE, MECH)

NAGAPATTINAM – 611 002

B.E MECHANICAL ENGINEERING

First Year – First Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1901MA104	Engineering Mathematics –I (Linear Algebra, Calculus and Partial differentiation)	3	2	0	4	40	60	100
1901PH101	Introduction to Mechanics	3	0	0	3	50	50	100
1901GEX01	Basic Electrical and Electronics Engineering	3	0	0	3	40	60	100
1901GEX02	Engineering Graphics	2	2	0	3	50	50	100
Laboratory Course								
1901GEX51	CAD Lab	0	0	2	1	50	50	100
1901GEX52	Basic Electrical and Electronics Engineering Lab	0	0	2	1	50	50	100
1901PHX51	Engineering Physics Lab	0	0	2	1	50	50	100
1901HS151	Engineering Intelligence - I	0	0	2	1	100	0	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1901MA104	ENGINEERING MATHEMATICS –I (Linear Algebra, Calculus and Partial differentiation) (Common for ECE, MECH & BME Programme)	L	T	P	C
		3	2	0	4

MODULE I	MATRICES	12 Hours

Inverse and rank of a matrix - rank-nullity theorem - System of linear equations – Symmetric-skew-symmetric and orthogonal matrices – Determinants - Eigen values and Eigen vectors – Diagonalization of matrices – Cayley – Hamilton Theorem - Orthogonal transformation.

MODULE II	DIFFERENTIAL CALCULUS	12 Hours

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature- Evolutes and involutes.

MODULE III	INTEGRAL CALCULUS	12 Hours

Double integration – Cartesian and polar coordinates – Change the order of Integration – Applications: Area of a curved surface using double integral – Triple integration in Cartesian co-ordinates – Volume as triple integral.

MODULE IV	SEQUENCES AND SERIES	12 Hours

Convergence of sequence and series-Tests for convergence - Power series - Taylor's series, Series for exponential - trigonometric and logarithm functions.

MODULE V	PARTIAL DIFFERENTIATION	12 Hours

Partial derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers.

TOTAL: 60 HOURS

COURSE OUTCOMES:

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

CO1:	Calculate the nature of the matrix using Orthogonal Transformation.
CO2:	Develop the evolutes and envelopes of given curves by means of radius and centre of curvature
CO3:	Calculate the area and volume of a curve using double and triple integration.
CO4:	Determine the nature of series using comparison, Ratio, Leibnitz tests.
CO5:	Examine the maxima/minima for the given function with several variables by finding stationary points.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	2	1									
CO3	3	2	1									
CO4	3	2	1									
CO5	3	2	1									

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

REFERENCES:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2018.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010

1901PH101	INTRODUCTION TO MECHANICS (Common for Civil and Mech Programme)	L	T	P	C
		3	0	0	3

MODULE I	INTRODUCTION TO MECHANICS	9 Hours

Forces in Nature; Newton's laws and its completeness in describing particle motion- Solving Newton's equations of motion in polar coordinates and related problems.

MODULE II	VECTOR MECHANICS OF PARTICLES	9 Hours

Central forces: Conservation of Angular Momentum; Energy equation and energy diagrams - Elliptical, parabolic and hyperbolic orbits - Application: Satellite manoeuvres.
Five-term acceleration formula — Centripetal and Coriolis accelerations - Applications: Weather systems, Foucault pendulum - Harmonic oscillator - Damped harmonic motion.

MODULE III	RIGID BODY MECHANICS	18 Hours

Definition and motion of a rigid body in the plane - Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane - Angular momentum about a point of a rigid body in planar motion.
Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion – Examples - Introduction to three-dimensional rigid body motion — (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor.

MODULE IV	STATICS	9 Hours

Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1:	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple practical problems.
CO2:	Extend all of concepts of linear kinetics to systems in general plane motion.
CO3:	Apply basic dynamics concepts of force, momentum, work and energy to apply in Newton's laws of motion.
CO4:	Apply Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces.
CO5:	Apply the concepts of friction and conditions of equilibrium in two and three dimensions.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1				2	2			
CO2	3	2	2	1				2	2			
CO3	3	2	2	1				2	2			
CO4	3	2	2	1				2	2			
CO5	3	2	2	1				2	2			

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

REFERENCES:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow
4. Principles of Mechanics — JL Synge & BA Gri_ths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog

1901GEX01	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

MODULE I	INTRODUCTION TO DC AND AC CIRCUITS	7 Hours

Introduction to DC and AC circuits: Ohms law - Kirchhoff's laws - Mesh analysis - Nodal analysis - Generation of AC waveforms - Analysis of R-L, R-C, R-L-C circuits - Introduction to three phase systems - Types of connections.

MODULE II	ELECTRICAL MACHINES	6 Hours

Electrical Machines: DC Generator, DC Motor, Transformer, Induction Motor: Working principle, construction and applications.

MODULE III	MEASURING INSTRUMENTS	6 Hours

Measuring instruments: Classification of instruments; Voltmeter, Ammeter, Wattmeter, Energy meter, Multimeter, CRO: Principles and operation.

MODULE IV	SEMICONDUCTOR DEVICES	7 Hours

Semiconductor devices: V-I characteristics of PN junction diode and Zener diode; Rectifiers - Half wave and full wave rectifiers; BJT - configurations; Amplifiers & Oscillators: classification, operation and applications; SCR: Construction and V-I characteristics; Basic power converters (Block diagram approach only).

MODULE V	DIGITAL SYSTEMS	6 Hours

Digital systems: Boolean algebra - Reduction of Boolean expressions - De-Morgan's theorem - Logic gates - Implementation of Boolean expressions.

MODULE VI	COMMUNICATION SYSTEMS	6 Hours

Communication Systems: Model of communication system - Analog and digital, Wired and wireless channel - Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system.

MODULE VII	ELECTRICAL SAFETY AND WIRING	7 Hours

Electrical safety and wiring: Safety measures in electrical system - Safety devices - types of wiring - Wiring accessories- staircase, fluorescent lamps and corridor wiring - Basic principles of earthing - Types of earthing – layout of generation, transmission and distribution of power (Single line diagram).

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1:	Apply the fundamental concepts to solve problems in DC circuits and AC circuits.
CO2:	Explain the construction and principle of operation of DC machines, AC machines and electrical measuring instruments.
CO3:	Elucidate the characteristics of Diode, Zener diode, BJT, SCR and their applications
CO4:	Implement Boolean expressions using logic gates.
CO5:	Explain the operation of various communication system and electrical safety systems.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									
CO2	3	2	1									
CO3	3	2	1									
CO4	3	3	2									
CO5	3	1	1			1						

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	2		
CO2	2		
CO3		2	
CO4		2	
CO5	2	2	

REFERENCES:

1. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, PHI Learning, 2010.
2. R. Muthusubramaniam, S. Salaivahanan and K.A. Mureleedharan, "Basic Electrical Electronics and Computer Engineering",Tata McGraw Hill, 2004.
3. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI learning, New Delhi, 2004
4. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics", S.K. Kataria and Sons, Reprint 2012 Edition.
5. R.L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson, 11th Edition, 2013.
6. George Kennedy and Bernard Davis, "Kennedy's Electronic communication Systems", McGraw Hill Education, 5th Edition, 2011.
7. Donald P. Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", McGraw-Hill Education, 8th Edition, 2014.

1901GEX02	ENGINEERING GRAPHICS (Common for all B.E./B.Tech. Programme)	L	T	P	C
		2	2	0	3

MODULE I	CONCEPTS AND CONVENTIONS (Not for Examination)	
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.		
MODULE II	**PLANE CURVES AND FREE HAND SKETCHING**	**9 Hours**
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of Objects.		
MODULE III	**PROJECTION OF POINTS, LINES AND PLANE SURFACES**	**9 Hours**
Orthographic projection- principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.		
MODULE IV	**PROJECTION OF SOLIDS**	**9 Hours**
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.		
MODULE V	**PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES**	**9 Hours**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.		
MODULE VI	**ISOMETRIC AND PERSPECTIVE PROJECTIONS**	**9 Hours**
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.		
		TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1:	Develop various types of curves and free hand sketches of orthographic projections.
CO2:	Draw the projection of points, lines and plane surfaces.
CO3:	Draw the projection of solids.
CO4:	Model the section of solids and demonstrate the development of surfaces.
CO5:	Model the isometric and perspective projections of solids.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	3			1	1	3		
CO2	3	2		2						3		
CO3	2	2		3						3		
CO4	3	1	1	3	3			1	1	3		
CO5	3	2	1	3	3			1	1	2		

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1		2	3
CO2		2	
CO3		2	
CO4		2	3
CO5		3	3

REFERENCES:

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore,2016.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2015.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2017.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2015.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2016.

1901GEX51	CAD (COMPUTER AIDED DRAFTING) LAB (Common for all B.E./B.Tech. Programme)	L	T	P	C
		0	0	2	1

List of Experiments:

Basics commands of a CAD software- two-dimensional drawing, editing, layering and dimensioning - coordinate Systems-Drawing practice - orthographic views of simple solids using CAD software.

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using B-spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
7. Drawing isometric projection of simple objects.
8. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1:	Ability to use the software packers for drafting and modeling.
CO2:	Learned basic concept to drawing, edit, dimension, hatching etc. to develop 2& 3D Modelling.
CO3:	Able to create front view and top view of simple solids
CO4:	Able to create isometric projection of simple objects.
CO5:	Able to Create 3D models of Simple Objects and obtaining 2-D multi-view drawings from 3-D model

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3				3				2	2	2	2
CO2	3				3				2	2	2	2
CO3	3				3				2	2	2	1
CO4	3				3				2	2	2	1
CO5	3				3				2	2	2	1

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1			3
CO2			3
CO3			3
CO4			3
CO5			3

REFERENCES:

1. N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014.
2. P.S. Gill, A Textbook of Machine Drawing, Katson books, 2013.
3. R.K. Dhawan, A Textbook of Machine Drawing, S. Chand,2012.
4. K.C. John, Textbook of Machine Drawing, PHI Learning Pvt. Ltd.,2009.

1901GEX53	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY (Common for all B.E./B.Tech. Programme)	L	T	P	C
		0	0	2	1

List of Experiments:

1. Experiments related to verification of Ohm's law and Kirchhoff's laws
2. Experiments involving logic gates
3. Fan and light control using regulators
4. Design of 6V regulated power supply
5. Energy conservation demonstration experiment using energy meter
6. Waveform generation and calculation of rms and average values
7. IC 555 and IC 741 based experiments
8. Experiments in earthing
9. Staircase wiring and residential building wiring
10. Speed control of DC shunt motor

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1:	Develop domestic wiring connections.
CO2:	Design and implement electrical and electronic circuits using basic elements, logic gates and IC's.
CO3:	Elucidate the characteristics of Diode, Zener diode, BJT, SCR and their applications.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2		1			3	2	3	
CO2	3	3	3	3		1			3	3	3	
CO3	3	3	2	2		1			3	2	3	

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1	3		
CO2	3	3	
CO3	3		

REFERENCES:

1. Edward Hughes, "Electrical Technology,", Pearson Education
2. D.P. Kothari and Nagrath "Basic Electronics", MH Education 2013.
3. Paul Scherz and Simon Monk "Practical Electronics for inventors" Mc Graw Hill Publications 2013.

1901PHX51	ENGINEERING PHYSICS LABORATORY (Common for all B.E./B.Tech. Programme)	L	T	P	C
		0	0	2	1

List of Experiments:

1. Determination of wavelength of various colours of mercury spectrum using Laser grating
2. Determination of velocity of liquids using ultrasonic interferometer
3. Determine the dispersive power of a prism using spectrometer
4. Determine the unknown resistance of the given wire using Carey-Foster's Bridge
5. Determine the band gap of the given semiconductor
6. Determine the acceptance angle and particle size using Laser
7. Torsional pendulum – Rigidity modulus of a steel wire
8. Thickness of a thin wire – Air Wedge
9. Measurement of Young's modulus – Uniform and Non-uniform bending
10. Thermal conductivity –Lee's Disc method

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

CO1:	Apply the theoretical concepts of physics in procedures and techniques in performing the experiments.
CO2:	Apply and demonstrate, thermal conductivity, electrical properties of metals and semiconductors, elastic properties of materials and oscillations through experiential learning.
CO3:	Demonstrate the use of monochromatic light, lasers in optical fiber communication and quantum mechanics towards specific engineering applications.
CO4:	Use different measuring devices/ meters to record the data with precision and apply the mathematical concepts/equations to obtain quantitative results.
CO5:	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

COs Vs POs MAPPING:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3			1			3	3			
CO2	3	3			1			3	3			
CO3	3	3			1			3	3			
CO4	3	3			1			3	3			
CO5	3	3			1			3	3			

COs Vs PSOs MAPPING:

COs	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

REFERENCES:

1. 'Practical Physics', R.K. Shukla, Anchal Srivastava, New age international (2011).
2. 'B.Sc. Practical Physics', C.L Arora, S. Chand &Co. (2012).