GOVERNMENT COLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University)

Coimbatore - 641 013

Curriculum For

B. E. MECHANICAL ENGINEERING

(Part Time)

2023

Regulations

OFFICE OF THE CONTROLLER OF EXAMINATIONS
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GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE – 641 013
B.E.MECHANICAL ENGINEERING - PART TIME
2023 REGULATIONS
(Candidates admitted during 2023-2024 and onwards)

FIRST SEMESTER

Sl. No.	Course Code	Course Title	CA Marks	End Sem Marks	Total Marks	L	T	P	C
THEORY									
1	23PTM1Z1	Applied Mathematics I (Common to Civil, Mech, EEE & ECE)	40	60	100	3	0	0	3
2	23PTM1Z2	Environmental Sciences and Engineering (Common to Civil, Mech, EEE & ECE)	40	60	100	3	0	0	3
3	23PTM103	Material Science	40	60	100	3	0	0	3
4	23PTM104	Basics of Electrical and Electronics Engineering	40	60	100	3	0	0	3
5	23PTM105	Applied Engineering Mechanics	40	60	100	3	0	0	3
	TOTAL		**200**	**300**	**500**	**15**	**0**	**0**	**15**

23PTM1Z1	APPLIED MATHEMATICS -I *(Common to Civil, Mech ,EEE & ECE)*	SEMESTER I

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	This course mainly deals with topics such as linear algebra, single variable calculus and numerical methods and plays an important role in the understanding of engineering science.
UNIT – I	**LINEAR ALGEBRA**	**9 Periods**

Consistency of System of Linear Equations, Eigenvalues and eigenvectors, Diagonalization of matrices by orthogonal transformation, Cayley-Hamilton Theorem, Quadratic form to canonical forms.

UNIT – II	**DIFFERENTIAL CALCULUS**	**9 Periods**

Radius of curvature, Centre of curvature, Circle of curvature , Evolutes of a curve, Envelopes

UNIT – III	**INTEGRAL CALCULUS**	**9 Periods**

Evaluation of definite and improper integrals, Applications: surface area and volume of revolution (Cartesian coordinates only).

UNIT – IV	**NUMERICAL SOLUTION OF EQUATIONS**	**9 Periods**

Algebraic and Transcendental equation: Fixed point iteration method, Bisection method, Newton-Raphson method, Simultaneous equation: Gauss elimination method, Gauss-Jordan method, Gauss Seidal method.

UNIT – V	**NUMERICAL INTERPOLATION**	**9 Periods**

Equal interval: Newton's forward and Backward difference interpolation formulae, Gauss forward and Backward difference interpolation formulae, Unequal interval: Lagrange's interpolation, Newton's divided difference interpolation.

Contact Periods:

Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 60 Periods

TEXT BOOK

1	*VeerarajanT., "**Engineering Mathematics I"**, Tata McGraw-Hill Education(India)Pvt. Ltd, New Delhi,2015.*
2	*P. Kandasamy, K. Thilagavathy, K. Gunavathi, "**Numerical Methods"**, S. Chand & Company, 3nd Edition, Reprint 2013.*

REFERENCE BOOK

1	*B.S.Grewal, " **Higher Engineering Mathematics"**, Khanna Publishers, 44thEdition, 2017.*
2	*David C.Lay, "**Linear Algebra and Its Application"**, PearsonPublishers, 6thEdition,2021.*
3	*Howard Anton, "**Elementry Linear Algebra"**,11thEdition,WileyPublication, 2013.*
4	*Narayanan.S and Manicavachagom Pillai. T.K. – **CalculasVol I and Vol II,**S.chand& Co, Sixth Edition, 2014.*
5	*S.S. Sastry, "**Introductory methods of numerical analysis"**, PHI, New Delhi, 5th Edition, 2015.* *Ward Cheney, David Kincaid, "**Numerical Methods and Computin"g,** Cengage Learning**,** Delhi, 7th Edition 2013.*
6	*Jain R.K. and Iyengar S.R.K., - **Advanced Engineering Mathematics**, NarosaPublicaitons, Eighth Edition, 2012.*

	COURSE OUTCOMES: On completion of the course, the students will be able to:	Bloom's Taxonomy Mapped
CO1	Use the essential tool of matrices and linear algebra in a comprehensive manner.	K3
CO2	Explain the fallouts of circle of curvature, evolute and envelops that is fundamental to application of analysis to Engineering problems.	K3
CO3	Interpret the integral calculus to notions of definite and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.	K3
CO4	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to polynomial and transcendental equations.	K3
CO5	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations.	K3

23PTM1Z2	**ENVIRONMENTAL SCIENCE AND ENGINEEREING** *(Common to Civil, Mech, , EEE, ECE)*	**SEMESTER** **I**

PREREQUISITES		L	T	P	C
	NIL	**3**	**0**	**0**	**3**

Course Objectives	The course is aimed at creating awareness among the students and also inseminates the critical ideas of preserving environment.

UNIT – I	**ENVIRONMENTAL ENERGY RESOURCES**	**9 Periods**

Food-effects of modern agriculture, fertilizers, pesticides, eutrophication & biomagnifications-Energy resources: renewable resources - Hydro Energy, Solar & Wind. Non-renewable resources – Coal and Petroleum - harnessing methods.

UNIT – II	**ECO SYSTEM AND BIODIVERSITY**	**9 Periods**

Eco system and its components - biotic and abiotic components. Biodiversity: types and values of biodiversity, hot spots of biodiversity, endangered and endemic species, conservation of biodiversity: In situ and ex situ conservation. Threats to biodiversity-destruction of habitat, habit fragmentation, hunting, over exploitation and man-wildlife conflicts. The IUCN red list categories.

UNIT – III	**ENVIRONMENTAL POLLUTION**	**9 Periods**

Air pollution, classification of air pollutants – sources, effects and control of gaseous pollutants SO_2, NO_2, H_2S, CO, CO_2 and particulates. Water pollution - classification of water pollutants, organic and inorganic pollutants, sources, effects and control of water pollution. Noise pollution - decibel scale, sources, effects and control.

UNIT – IV	**ENVIRONMENTAL THREATS**	**9 Periods**

Global warming-measure to check global warming - impacts of enhanced Greenhouse effect, Acid rain- effects and control of acid rain, ozone layer depletion- effects of ozone depletion, disaster management - flood, drought, earthquake and tsunami.

UNIT – V	**SOCIAL ISSUES AND ENVIRONMENT**	**9 Periods**

Water conservation, rain water harvesting, e-waste management, Pollution Control Act, Wild life Protection Act. Population growth- exponential and logistic growth, variation in population among nations, population policy. Women and Child welfare programs. Role of information technology in human and health, COVID-19 - effects and preventive measures.

Contact Periods:

Lecture:45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total:45 Periods

TEXT BOOK:

1	*Sharma J.P., "Environmental Studies", 4th Edition, University Science Press, New Delhi 2016.*
2	*AnubhaKaushik and C.P.Kaushik, "Environmental Science and Engineering", 7th Edition, New age International Publishers, New Delhi, 2021.*

REFERENCES:

1	*A k de, "Environmental Chemistry", eight edition, new age international publishers, 2017.*
2	*G Tyler miller and scott e. Spoolman, "Environmental Science", cengage learning indiapvt, ltd, delhi, 2014.*
3	*ErachBharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hydrabad, 2015.*
4	*Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 3rd Edition, Pearson Education, 2015.*

	COURSE OUTCOMES: On completion of the course, the students will be able to:	Bloom's Taxonomy Mapped
CO1	Recognize and understand about the various environmental energy resources and the effective utility of modern agriculture.	K2
CO2	Acquire knowledge about the interaction of biosphere with environment and conservation methods of bio diversity.	K2
CO3	Be aware of the sources of various types of pollution, their ill effects and preventive methods.	K2
CO4	Identify and take the preventive measures to control the environmental threats and effects of Global warming, Ozone depletion, Acid rain, and natural disasters.	K2
CO5	Demonstrate an idea to save water and other issues like COVID -19.	K2

22PTM103	MATERIAL SCIENCE	SEMESTER I

PREREQUISITES	L	T	P	C
NIL	3	0	0	3

Course Objectives	To study the basic concepts and properties of conducting materials, semiconducting materials, magnetic and super conducting materials, nanomaterials and advanced engineering materials.	
UNIT – I	**CONDUCTING MATERIALS**	**9 Periods**
Introduction to Conductors – classical free electron theory of metals – Draw backs of classical theory – quantum theory - Electrical and Thermal conductivity of Metals – Derivation for Wiedemann – Franz law – Lorentz number –– Fermi distribution function – density of energy states.		
UNIT – II	**SEMICONDUCTING MATERIALS**	**9 Periods**
Introduction – Properties – elemental and compound semiconductors - Intrinsic and extrinsic semiconductors – properties - Carrier concentration in intrinsic Semiconductor - extrinsic semiconductors - Carrier concentration in P- type and N-type semiconductors.		
UNIT – III	**MAGNETIC AND SUPERCONDUCTING MATERIALS**	**9 Periods**
Introduction - Classification of magnetic materials-dia, para and ferromagnetic materials- domain theory– hysteresis – hard and soft magnetic materials – superconducting materials and their properties-Type I and Type II superconductors- applications for superconducting materials-Magnetic levitation-cryotron.		
UNIT – IV	**NANOMATERIALS**	**9 Periods**
Nano materials-preparation- top-down and bottom-up methods – Ball milling - chemical vapour deposition - Properties and applications of nano materials-carbon nanotubes (CNT)- Structures and types- Properties and applications of carbon nanotubes.		
UNIT – V	**ADVANCED ENGINEERING MATERIALS**	**9 Periods**
Metallic glasses: melt spinning process, properties and applications - Shape memory alloys (SMA): two different phases-types of shape memory alloys, characteristics of SMA- Ni-Ti alloy -applications of SMA– Bio materials –Properties and applications.		
Contact Periods:		
Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods		

TEXT BOOK

1	*K.Rajagopal , **Engineering Physics**, 3rd edition, PHI Learning Private Ltd, 2015.*
2	*A. Marikani,**Engineering Phyiscs**, PHI Learning Private limited, 2013.*

REFERENCES

1	*P.K.Palanisamy, **Engineering Physics–II** , Scitech Publications (India) Pvt. Ltd, 2015.*
2	*William D Callister Jr., and David G. Rethwisch ,**Materials science & Engineering** : **An introduction,**9th edition , Wiley (2014)*
3	*Charles P.Poole, Jr; Frank J.Owens, **Introduction to Nanotechnology**, Wiley India, 2012.*
4	*S. M. Sze, Semiconductor Devices: **Physics and Technology**, 3 rd edition, Wiley (2015).*
5	*A. Marikani, **"Engineering Phyiscs"**, PHI Learning Private limited, 2013.*

COURSE OUTCOMES: On completion of the course, the students will be able to:		Bloom's Taxonomy Mapped
CO1	Calculate the Fermi energy and the carrier concentration in metals.	K4
CO2	Analyze the characteristics of solar cells.	K4
CO3	Select the magnetic and super conducting materials for the desired application.	K4
CO4	Choose the method to synthesis a nanomaterial.	K5
CO5	Apply the advanced engineering materials in various fields.	K3

23PTM104	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	SEMESTER I

PREREQUISITES		L	T	P	C
NIL		3	0	0	3

Course Objectives	To study the basic concepts of electric circuits, electrical machines, analog and digital electronics, house wiring and electrical installations.

UNIT – I	ELECTRICAL CIRCUITS	9 Periods

Electrical circuit elements (R,L and C) - Voltage and Current sources – Ohm's Law – Kirchoff laws – Time domain analysis of First order RL and RC circuits – Representation of sinusoidal waveforms – Average, RMS and Peak values – Phasor representation – Real, Reactive, Apparent power and power factor.

UNIT – II	ELECTRICAL MACHINES AND MEASUREMENTS	9 Periods

Construction, Principle of Operation, basic equations and Types, Characteristics and Applications of DC generators, DC motors, Single phase Transformer, Single phase and Three phase Induction motor. Operating principles of Moving coil, Moving iron Instruments (Ammeter and Voltmeters).

UNIT – III	ANALOG AND DIGITAL ELECTRONICS	9 Periods

Analog Electronics: Semiconductor devices – P-N junction diode, Zener diode, BJT, Operational amplifier – principle of operation, Characteristics and applications. Digital Electronics: Introduction to numbers systems, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.

UNIT – IV	FUNDAMENTAL OF COMMUNICATION ENGINEERING	9 Periods

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations – Resistive, Inductive, capacitive Transducers- Introduction.

UNIT – V	ELECTRICAL INSTALLATIONS AND ENERGY CONSERVATION	9 Periods

Single phase and three phase system – phase, neutral and earth, basic house wiring -tools and components, different types of wiring - basic safety measures at home and industry – Energy efficient lamps - Energy billing. Introduction to UPS and SMPS.

Contact Periods:
Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

TEXT BOOK:

1	*R.Muthusubramaniam, R.Salivaganan, Muralidharan K.A., "Basic Electrical and Electronics Engineering" Tata McGraw Hill , Second Edition, 2010.*
2	*Mittle V.N and Aravind Mittal, "Basic Electrical Engineering", Tata McGraw Hill, Second Edition, New Delhi, 2005.*

REFERENCE BOOK:

1	*D.P.Kothari, I.J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.*
2	*Nagsarkar T.K and Sukhija M.S, "Basic Electrical Engineering", Oxford Press, 2005.*
3	*E.Hughes,"Electrical and Elecronics Technology", Pearson, 2010.*
4	*MohmoodNahvi and Joseph A.Edminister, "Electric Circuits", Shaum Outline series, McGraw Hill, Sixth edition, 2014.*
5	*Premkumar N and Gnanavadivel J, "Basic Electrical and Electronics Engineering", Anuradha Publishers, 4th Edition, 2008.*

COURSE OUTCOMES: On completion of the course, the students will be able to:		Bloom's Taxonomy Mapped
CO1	Analyze the DC and AC circuits	K4
CO2	Describe the operation and characteristics of electrical machines	K4
CO3	Classify and compare various semiconductor devices and digital electronics.	K3
CO4	Infer the concept of communication engineering and Transducers.	K2
CO5	Assemble and Implement electrical wiring and electrical installations	K6

22PTM105	APPLIED ENGINEERING MECHANICS	SEMESTER I

PREREQUISITES		L	T	P	C
NIL		3	0	0	3

Course Objectives	To study the forces and moments in various types of mechanical systems and to enable students to understand the relationship between processes, kinetics and kinematics.	
UNIT – I	**INTRODUCTION TO MECHANICS AND FORCE CONCEPTS**	**9 Periods**
Principles and Concepts – Laws of Mechanics – system of forces – resultant of a force system – resolution and composition of forces – Lami's theorem – moment of a force – physical significance of moment-Varignon's theorem – resolution of a force into force and couple – forces in space – addition of concurrent forces in space – equilibrium of a particle in space, Classification of beams based on supports.		
UNIT – II	**FRICTION**	**9 Periods**
Frictional resistance – classification of friction- laws of friction – coefficient of friction-angle of friction – angle of repose –– cone of friction – free body diagram-advantages-equilibrium of a body on a rough inclined plane – non-concurrent force system - ladder friction – rope friction – wedge friction.		
UNIT – III	**GEOMETRICAL PROPERTIES OF SECTION**	**9 Periods**
Centroids – Determination by integration – centroid of an area – simple figures - composite sections – bodies with cut parts - moment of inertia – theorems of moment of inertia – moment of inertia of composite sections – principal moment of inertia of plane areas - radius of gyration.		
UNIT – IV	**BASICS OF DYNAMICS**	**9 Periods**
Kinematics and kinetics – displacements, velocity and acceleration - Equations of motion – Rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves – motion under gravity – relative motion – curvilinear motion of particles – projectiles – angle of projection – range – time of flight and maximum height. Newton's second law of motion – linear momentum – D'Alembert's principle, Dynamics equilibrium –– work energy equation of particles– law of conservation of energy – principle of work and energy		
UNIT – V	**IMPULSE MOMENTUM AND IMPACT OF ELASTIC BODIES**	**9 Periods**
Principle of impulse and momentum – Equations of momentum – Laws of conservation of momentum. Impact – Time of compression, restitution, collision – Co-efficient of restitution – types of impact – collision of elastic bodies by direct central impact and oblique impact – collision of small body with a massive body – Kinetic energy of a particle.		

Contact Periods:
Lecture: 45 Periods   Tutorial: 0 Periods   Practical: 0 Periods   Total: 45 Periods

TEXT BOOK

1	*S.S. Bhavikatti and K.G. Rajasekarappa, "Engineering Mechanics" New Age International (P) Ltd., 1999.*
2	*S.C. Natesan, "Engineering Mechanics" Umesh Publications, 2005.*

REFERENCES :

1	*F.B. Beer and E.R. Johnson, "Vector Mechanics for Engineers", Tata McGraw Hill Pvt. Ltd, 10th Edition, 2013.*
2	*S. Timoshenko, D.H.Young, J.V.Rao and Sukumar Pati, "Engineering Mechanics", McGraw Hill Education, 5th Edition, 2017.*
3	*Irving Shames and Krishna Mohana Rao, "Engineering Mechanics", Prentice Hall of India Ltd, Delhi, 2006.*
4	*R.C. Hibbeller, "Engineering Mechanics", Prentice Hall of India Ltd, 13th Edition, 2013.*
5	*Vela Murali, "Engineering Mechanics", Oxford university Press, 1st Edition, 2010.*

COURSE OUTCOMES: On completion of the course, the students will be able to:		Bloom's Taxonomy Mapped
CO1	Know the concept of mechanics and system of forces and moments.	K5
CO2	Calculate the frictional properties at different bodies.	K5
CO3	Identify the locations of centre of gravity and moment of inertia for different sections.	K5
CO4	Understand the basics of dynamics of particles	K5
CO5	Know the impulse and momentum principle and impact of elastic bodies.	K5