Dr. MAHALINGAM
MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Technical Minds Estd. 1998
An Autonomous Institution
(Since 2011)

Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY

Affiliated to Anna University, Chennai; Approved by AICTE ; Accredited by NAAC with Grade 'A++'
Accredited by NBA - Tier1 (Mech, Auto, Civil, EEE, ECE, EIE and CSE)
(A Unit of NIA Educational Institutions)

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Founder Chairman

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MCET/IQAC/NAAC/Criterion I/1.1/1.1.1

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the Institution has developed and implemented the Curricula developed relevant to the local, national, regional and global developmental needs which is reflected in Programme outcomes (POs), Programme Specific Outcomes(PSOs) and Course Outcomes(COs) of the Programmes offered by the Institution from 2017-18 to 2021-22 pertaining to the Metric number 1.1.1.

We hereby enclosed the sample curricula offered by the Department of Mechanical Engineering for your kind reference.

Steering Committee Coordinator

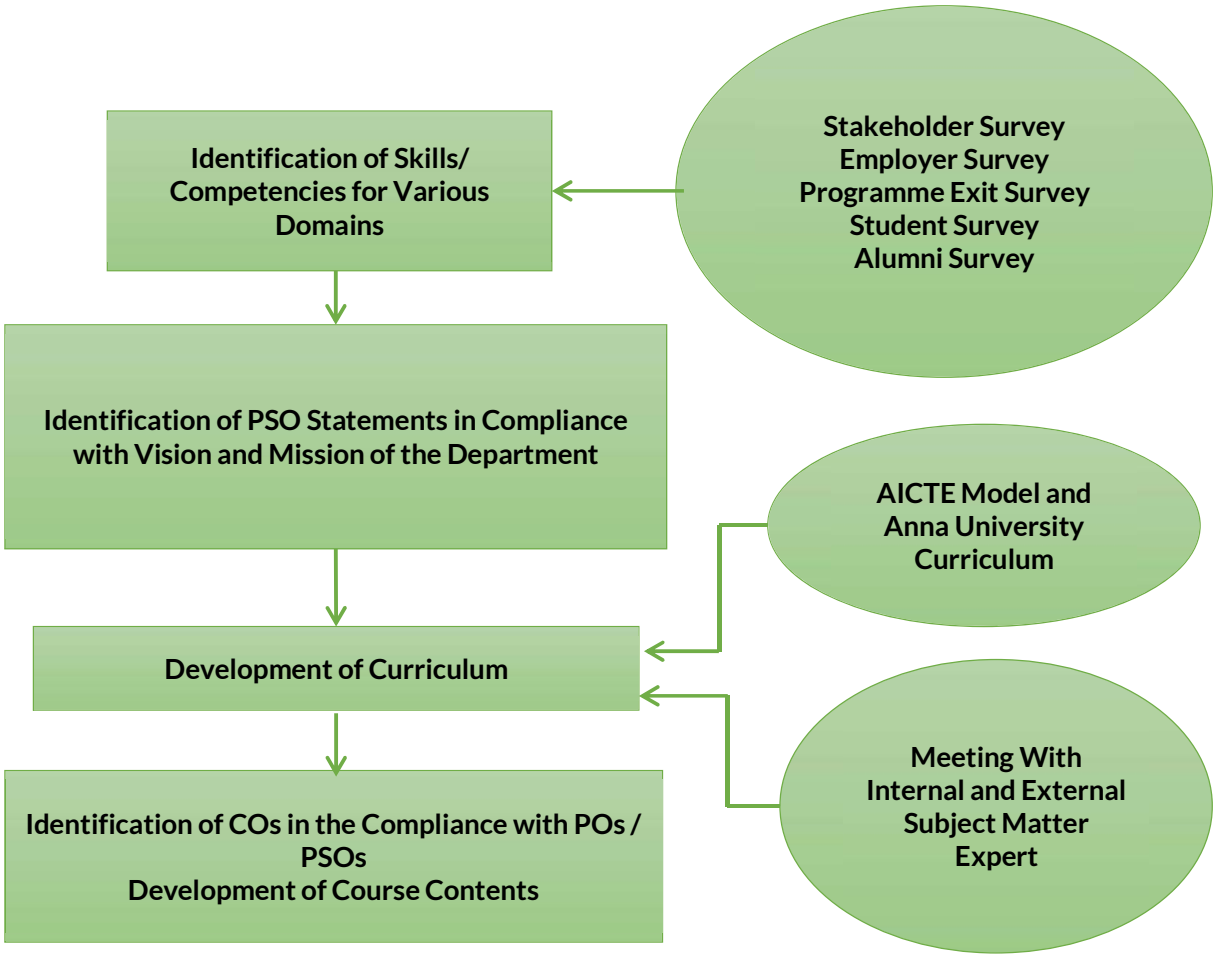
PRINCIPAL
PRINCIPAL
Dr. Mahalingam College of
Engineering and Technology
Pollachi - 642 003.

Dr. Mahalingam College of Engineering and Technology Pollachi

Udumalai Road, Pollachi - 642 003, Tamil Nadu, India. Tel : +91 - 4259 - 236030 / 40 / 50, Fax : +91 - 4259 - 236070
Email : principal@drmcet.ac.in www.mcet.in

1.1 Curriculum Design and Development

Curriculum Design and Development Process chart



Department of Mechanical Engineering

Vision

To transform students from background into professional leaders of tomorrow in the field of mechanical engineering with strong sense of social commitment

Mission:

- To impart quality -engineering education leading to specialization in the energy areas of CAD/CAM/CAE, Energy Engineering and Materials Technology.
- To provide continually updated and intellectually stimulating environment to pursue research and consultancy activities.

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Programme: B.E. Mechanical Engineering

Programme Educational Objectives (PEOs) - Regulation 2019

B.E. Mechanical Engineering graduates will:

PEO1.Technical Expertise: Actively apply technical and professional skills in engineering practices towards the progress of the organization or the entrepreneurial venture in competitive and dynamic environment.

PEO2.Lifelong Learning: Own their professional and personal development bycontinuous learning and apply the learning at work to create new knowledge.

PEO3.Ethical Knowledge: Conduct themselves in a responsible, professional and ethical manner supporting sustainable economic development which enhances the qualityof life.

Programme Outcomes (POs) - Regulations 2019

On successful completion of B.E. Mechanical Engineering programme, graduating students/graduates will be able to:

PO1. Apply knowledge of basic sciences and engineering concepts to solve complex mechanical engineering problems.

PO2. Identify, formulate, and analyze engineering problems using scientific principles and concepts.

PO3. Design products, manufacturing processes and facilities that deliver the requirements of the target customers and desired quality functions.

PO4. Conduct experiments, analyze and interpret data to provide solutions for engineering problems.

PO5. Use appropriate tools and techniques to solve engineering problems.

PO6. Apply contextual knowledge to make informed decisions in societal, health, safety, legal, entrepreneurial and cultural issues.

PO7. Demonstrate the knowledge of need for sustainable development in providing engineering solutions in global, environmental and societal contexts.

PO8. Practice Ethical responsibility.

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PO9. Work effectively in teams and build/manage interpersonal relationships.

PO10. Communicate effectively through oral, non-verbal and written means.

PO11. Apply management principles to manage individual and team work for executing projects in a multidisciplinary environment.

PO12. Articulate and engage in pursuit of career and life goals through continuous Learning.

Programme Specific Outcomes (PSOs) - Regulations 2019

On successful completion of B.E. Mechanical Engineering programme, graduating students/graduates will be able to:

PSO 1: Demonstrate functional competencies for roles in design, manufacturing and service by learning through centers of excellence and industrial exposure.

PSO 2: Demonstrate behavioral competencies required for roles in design, manufacturing and service by learning through structured professional skills training.

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Udumalai Road, Pollachi - 642 003 Tel: 04259 236030/40/50 Fax: 04259 236070 www.mcet.in

Programme: Mechanical Engineering
2019 Regulations
Curriculum for Semesters I to VIII

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	-

Semester I (2020 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1101	Matrices and Calculus	3	1	0	4	100	AU, CE, MC, ME, EC, EI, EE
19ENHG2101	Communication Skills - I	2	0	2	3	100	All
19PHBC2101	Physics for Mechanical Sciences	3	0	2	4	100	AU, ME, MC
19CSSC2001	C Programming	3	0	2	4	100	AU, CE, MC, ME, EC, EI, EE
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU, ME, MC, CS, IT, EC, EI
19PSHG6001	Wellness for Students*	0	0	2	-	-	All
Total		**12**	**1**	**11**	**17.5**	**500**	

Semester II (2020 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1201	Ordinary Differential equations and Complex Variables	3	1	0	4	100	AU, CE, MC, ME, PR, EC, EI, EE
19ENHG2201	Communication Skills - II	2	0	2	3	100	All
19CHBC2201	Chemistry for Mechanical Sciences	3	0	2	4	100	AU, CE, ME, MC, PR, EE
19MESC2001	Introduction to Engineering	2	0	2	3	100	AU, MC, ME, PR, EC, EI, EE
19MESC2201	Engineering Materials	2	0	2	3	100	AU, MC, ME,PR
19MECC3201	Engineering Practices Laboratory	0	0	3	1.5	100	AU, ME, MC, PR
19PSHG6001	Wellness for Students*	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	-	All
TOTAL		**13**	**1**	**13**	**19.5**	**700**	

*Annual Pattern

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Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1301	Numerical Methods	3	1	0	4	100	AU, ME
19MESC1301	Engineering Mechanics	3	1	0	4	100	AU, ME, MC
19MECC2301	Fluid Mechanics and Hydraulic Machinery	3	0	2	4	100	AU, ME, MC
19MECN2301	Metrology and Measurement	3	0	2	4	100	-
19MECN1301	Manufacturing Processes	3	0	0	3	100	-
19MECN3301	Computer Aided Modeling and Drafting Laboratory	0	0	3	1.5	100	-
19MECN3302	Manufacturing Processes Laboratory	0	0	3	1.5	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
Total		**15**	**2**	**12**	**23**	**800**	

Semester IV

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABG1401	Probability and Statistics	3	1	0	4	100	AU, ME, CS, IT, EC, EE,CE
19MECC2401	Strength of Materials	3	0	2	4	100	AU, ME, MC
19MECN2401	Theory of Machines	2	1	2	4	100	-
19MECN1401	Manufacturing Technology	3	0	0	3	100	-
19MECN3401	Manufacturing Technology Laboratory	0	0	3	1.5	100	-
19PSHG6002	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
19MEPN6401	Mini-Project	0	0	4	2	100	
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
Total		**13**	**3**	**9**	**22.5**	**700**	

Course Code	Course Title	Duration	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	2/4 Weeks	1	100

*Refer to clause:4.8 in UG academic regulations 2019

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Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MECC1501	Mechanical Design	3	1	0	4	100	MC,ME
19MECN2501	Applied Thermodynamics	3	0	2	4	100	-
19MECN2502	Electrical and Electronics Engineering	3	0	2	4	100	-
19MECC2501	Problem solving using PYTHON for Mechanical Sciences	2	0	2	3	100	AU, MC, ME
19MEEXXXXX	Professional Elective -I	3	0	0	3	100	-
19MEEXXXXX	Professional Elective -II (Online)	3	0	0	3	100	-
19MEOCXXXX	Open Elective - I	3	0	0	3	100	-
19MECN3501	Computer Aided Machine Drawing Laboratory	0	0	3	1.5	100	-
19PSHG6501	Employability Skills 1 : Teamness and Interpersonal Skills	0	0	2	1	100	All
Total		**20**	**1**	**11**	**26.5**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MECC1601	Finite Element Analysis	3	1	0	4	100	AU, ME
19MECN2601	Heat and Mass Transfer	2	1	2	4	100	-
19MECC1602	Data Science for Engineers	3	0	0	3	100	AU, MC, ME
19MEEXXXXX	Professional Elective -III	3	0	0	3	100	-
19MEEXXXXX	Professional Elective -IV (Online)	3	0	0	3	100	-
19MEOCXXXX	Open Elective -II	3	0	0	3	100	-
19PSHG6601	Employability Skills 2 : Campus to Corporate	0	0	2	1	100	All
19MEPN6601	Innovative and Creative Project	0	0	4	2	100	-
Total		**18**	**1**	**8**	**23**	**800**	

Course Code	Course Title	Duration	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	2/4 Weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

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Semester VII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MECN1701	Mechatronics	3	0	0	3	100	-
19MECC1701	Artificial Intelligence and Machine Learning	3	0	0	3	100	AU, MC, ME
19MECN1702	CNC Programming and Robotics	3	0	2	4	100	-
19MEEXXXXX	Professional Elective - V	3	0	0	3	100	-
19MEEXXXXX	Professional Elective - VI	3	0	0	3	100	-
19MEOCXXXX	Open Elective - III	3	0	0	3	100	-
19MECC3701	Simulation and Analysis Laboratory	0	0	3	1.5	100	MC, ME
19MECN3701	Mechatronics Laboratory	0	0	3	1.5	100	-
Total		**21**	**0**	**8**	**22**	**800**	

Semester VIII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MEPN6801	Project	0	0	16	8	200	-
Total		**0**	**0**	**16**	**8**	**200**	-

Course Code	Course Title	Duration	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	8 /16 weeks	4	100

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits (2019 Batch only): 169

Total Credits (2020 Batch onwards):168

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PROFESSIONAL ELECTIVES

Course Code	Course Title	Hours / Week			Credits	Marks	Common to Programmes
		L	T	P			
DESIGN ELECTIVES							
19MEEC1001	Product Life Cycle Management	3	0	0	3	100	AU, MC, ME
19MEEC1002	Design for Manufacture, Assembly and Environment	3	0	0	3	100	AU, MC, ME
19MEEC1003	Vibration and Noise Engineering	3	0	0	3	100	MC, ME
19MEEC1004	Computational Fluid Dynamics	3	0	0	3	100	MC, ME
19MEEN1001	Mechanical System Design	3	0	0	3	100	-
19MEEC1005	Design of Transmission Systems	3	0	0	3	100	MC, ME
19MEEC1006	Automotive Engine and Its Systems	3	0	0	3	100	MC, ME
19MEEN1003	Motor Cycle Dynamics	3	0	0	3	100	-
19MEEC1007	Design for Sheet Metal	3	0	0	3	100	AU, ME
19MEEN1004	Design for Welding	3	0	0	3	100	-
19MEEC1008	Composite Materials	3	0	0	3	100	AU, MC, ME
19MEEN1020	Fluid Power System	3	0	0	3	100	-
19MEEC1023	Model Based Systems Engineering	3	0	0	3	100	AU, ME
19MEEC1024	New Product Development	3	0	0	3	100	AU, ME
MANUFACTURING ELECTIVES							
19MEEC1009	Additive Manufacturing	3	0	0	3	100	AU, MC, ME
19MEEN1005	Process Planning and Cost Estimation	3	0	0	3	100	-
19MEEN1006	Advanced Manufacturing Processes	3	0	0	3	100	-
19MEEC1010	Flexible Manufacturing Systems	3	0	0	3	100	MC, ME
19MEEC1011	Non Destructive Testing Methods	3	0	0	3	100	AU, MC, ME
19MEEN1007	Supply Chain Management	3	0	0	3	100	-
19MEEN1008	Nanomaterials Synthesis and Characterization	3	0	0	3	100	-
19MEEC1012	Lean Manufacturing	3	0	0	3	100	AU, ME
19MEEC1013	Logistics Engineering	3	0	0	3	100	AU, ME
19MEEN1010	Manufacturing Systems Engineering	3	0	0	3	100	-
19MEEC1014	Engineering Economics and Cost Analysis	3	0	0	3	100	AU, ME
19MEEN1022	Advanced Computer Integrated Manufacturing	3	0	0	3	100	-

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ELECTIVES

Course Code	Course Title	Hours /Week			Credits	Marks	Common to Programmes
		L	T	P			
THERMAL AND QUALITY ELECTIVES							
19MEEC1015	Principles of Management	3	0	0	3	100	MC, ME
19MEEN1011	Operations Research	3	0	0	3	100	-
19MEEC1016	Quality Engineering	3	0	0	3	100	AU, MC, ME
19MEEN1012	Total Productive Maintenance	3	0	0	3	100	-
19MEEC1017	Industrial Safety Management	3	0	0	3	100	AU, MC, ME
19MEEN1013	Power Plant Engineering	3	0	0	3	100	-
19MEEC1018	Automobile Engineering	3	0	0	3	100	MC, ME
19MEEN1014	Refrigeration and Air-Conditioning	3	0	0	3	100	-
19MEEN1015	Solar and Wind Energy Engineering	3	0	0	3	100	-
19MEEN1016	Battery System for Electric Vehicles	3	0	0	3	100	-
19MEEC1020	Systems Approach for Engineers	3	0	0	3	100	EE, ME
19MEEC1025	Systems Engineering	3	0	0	3	100	AU, ME
EMERGING TECHNOLOGY & PROGRAMMING ELECTIVES							
19MEEC1019	Industrial IoT	3	0	0	3	100	AU, MC, ME
19AUEC1002	Fleet Management	3	0	0	3	100	AU, ME
19AUEC1003	In-Vehicular Networks	3	0	0	3	100	AU, ME
19AUEC1004	Automotive Infotronics	3	0	0	3	100	AU, ME
19MEEN1017	Embedded System for Automobiles	3	0	0	3	100	-
19MEEC1021	Java Programming For Mechanical Sciences	3	0	0	3	100	AU, ME
19MEEC1022	Data Structures and Object Oriented Programming with C++	3	0	0	3	100	AU, ME
INDUSTRY ORIENTED ELECTIVES							
	Embedded System Design and Development	3	0	0	3	100	ME,CS,EE,EC, MC
	Prototype Development	3	0	0	3	100	ME,CS,EE,EC, MC

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OPEN ELECTIVES

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
19MEOC1001	Automation systems	3	0	0	3	100
19MEOC1002	Entrepreneurship Development	3	0	0	3	100
19MEOC1003	Telematics for Transport	3	0	0	3	100
19MEOC1004	Industrial Automation and Robotics	3	0	0	3	100
19MEOC1005	Vehicular Communication Electronics	3	0	0	3	100
19MEOC1006	Total Quality Management	3	0	0	3	100
19MEOC1007	Industrial Safety Engineering	3	0	0	3	100
19MEOC1008	Industrial Engineering	3	0	0	3	100
19MEOC1009	Renewable Sources of Energy	3	0	0	3	100

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Course Code: 19MESC1301	Course Title: ENGINEERING MECHANICS (Common to AU,ME & MC)		
Course Category: Engineering Science		Course Level: Practice	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

1. Draw the free body diagram.
2. Determine the magnitude of unknown forces in a given system.
3. Determine the geometric properties of bodies.
4. Determine the degrees of freedom.
5. Determine the kinetic parameters of rigid bodies

UNIT I **Free body Diagram** **9+3**

Fundamental laws of mechanics (Review) - Freebody diagram - Statics - Particles and Rigid body (Beams, Frames and Machines) - Types of forces - Action (Point, UDL, UVL and couples) - Reaction (Supports, Friction) - Dynamics - Particles and Rigid body - Linear and Circular planar motions.

UNIT II **Force Analysis of Beams, Frames and Machines** **9+3**

Governing equations of equilibrium - Equivalent force and couple moment - Types of beams - Determining reactions in statically determinate beams - Bending moment diagram and Shear force diagram of cantilever, simply supported beam and over hanging beams - Analysis of frames - Machines - Laws of dry friction - ladder, belt, wedge and screw frictions.

UNIT III **Geometric Properties of Lamina and Bodies** **9+3**

Properties of surfaces – centroid of composite planes such as L, I and T – Moment of Inertia (MI) – Parallel and perpendicular axis theorem – MI of composite sections involving simple geometries such as rectangle, circle and triangle – Centre of gravity and mass moment of inertia of composite solids involving block, cylinder, cone and sphere.

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UNIT IV **Introduction to Mechanisms** **9+3**

Mechanism and structure - links - pairs - chains - four bar and slider crank mechanisms - degrees of freedom of linkages - Gruebler"s criterion - Grashof"s condition of rotatability - transmission angle and mechanical advantage - special lower pair mechanisms: Peaucellier straight line mechanism, Ackermann steering mechanism, pantograph, Geneva mechanism.

UNIT V **Kinetics of Rigid Body** **9+3**

Dynamic equilibrium of rigid bodies - Planar kinetics of rigid body - Force and Acceleration, Work and energy, Impulse and momentum.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Develop the free body diagram of particles and rigid bodies such as beams, frames and machines under static and dynamic conditions.	Apply
CO2: Determine various forces on rigid bodies such as beams, frames and machines under static conditions.	Apply
CO3: Calculate centroid, center of gravity and moment of inertia of simple shapes.	Apply
CO4: Determine the degrees of freedom of given mechanism.	Apply
CO5: Calculate the kinetic parameters of rigid bodies for dynamic equilibrium.	Apply

Text Book(s):

T1 R C Hibbeler, "Engineering mechanics - Statics and Dynamics", 14th Edition, Pearson, New Delhi, 2017.

T2 F.P. Beer and Jr. E.R. Johnston, "Vector Mechanics for Engineers - Statics and Dynamics", 10th Edition Tata McGraw Hill publishing company, New Delhi, 2017.

T3 S.S. Rattan, "Theory of Machines", McGraw Hill Education, 4th Edition. 2017.

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Reference Book(s):

R1. James L. Meriam and L. Glenn Kraige, "Engineering mechanics (Statics and Dynamics)" 8th Edition. John Wiley & Sons, 2016.

R2. R.S. Khurmi, J.K. Gupta, "Theory of Machines", S.Chand, 14th Edition. 2005.

R3. Irving H. Shames, "Engineering mechanics - Statics and Dynamics", 14th Edition, Pearson, New Delhi, 2014.

Web References:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
2. https://nptel.ac.in/courses/122104015/

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO2	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO3	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO4	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO5	3	2	1	1	-	-	-	1	-	1	-	1	-	-

High-3; Medium-2; Low-1

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Course Code: 19MECC2401	Course Title: STRENGTH OF MATERIALS (Common to AU, ME & MC)		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours:75	Max Marks:100

Pre-requisites

- Physics for Mechanical Sciences
- Engineering Mechanics

Course Objectives

The course is intended to:

1. Characterize materials and determine the axial stresses and strains developed
2. Calculate the principal stresses and planes for 2-D state of stress in bars and thin walled pressure vessels.
3. Compute the stress distribution and slope-deflection in beams.
4. Calculate the shear stress distribution in solid and hollow shafts and design helical springs and leaf springs.
5. Compute the diameter of shafts subjected to combined bending, twisting and axial loads.

Unit I Deformation of Solids 9

Mechanical properties of metals - Rigid and deformable bodies. Stress and Strain - tensile, compressive and shear, stress-strain diagram - Hooke's law - Factor of Safety - Poisson's ratio - relationship between elastic constants. Deformation of simple and compound bars under axial load. Strain energy - resilience, proof resilience and modulus of resilience - Strain energy due to axial load. Stresses due to gradual load, sudden load and impact load. Thermal stresses.

Unit II Bi-axial State of Stress 9

Biaxial state of stresses - Principal planes and stresses - Maximum shear stress and planes of maximum shear stress - Mohr"s circle for biaxial stresses. Stresses in thin walled pressure vessels.

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Unit III **Flexure In Beams and Deflection of Beams** 9

Theory of simple bending – Bending stress and Shear stress variation in beams of standard section like 'I', 'L' and 'T'.

Evaluation of beam deflection and slope for cantilever and simply supported beams- Macaulay and Moment-area methods.

Unit IV **Torsion of Shafts and Springs** 9

Theory of torsion and assumptions - torsion equation- polar moment of inertia and polar modulus - Shear stress distribution in solid and hollow circular shafts.

Helical compression springs - terminology, styles of end - stress and deflection equation. Multi-Leaf springs - terminology - stress and deflection equation - Nipping of leaf springs

Unit V **Theories of failure** 9

Introduction to theories of failure - Maximum Principal Stress theory - Maximum Principal Strain theory - Maximum Strain Energy Theory - Maximum Distortion Energy theory - Maximum Shear Stress theory. Stresses in circular shaft with combined bending, axial loading and torsion. Equivalent bending moment and equivalent twisting moment.

List of Experiments: 30

1. Conduct tensile test on Mild Steel rod.
2. Conduct shear test on Mild steel and Aluminum rods by Double shear.
3. Calculate the modulus of rigidity of mild steel rod by Torsion test.
4. Determine the toughness of the given mild steel specimen using IZOD and CHARPY impact test.
5. Determine the Hardness Number of metals by Brinell and Rockwell Hardness tester after the Heat Treatment.
6. Estimate the stiffness and modulus of rigidity of the helical spring by Compression test.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Characterize materials and determine the axial stresses and strains developed due to mechanical and thermal effects	Apply
CO2: Calculate the principal stresses and planes for 2-D state of stress in bars and thin walled pressure vessels using analytical and graphical methods.	Apply
CO3: Compute the stress distribution and slope-deflection in beams subjected to static loads.	Apply
CO4: Calculate the shear stress distribution in solid and hollow shafts subject to pure torsion and design helical springs and leaf springs subject to compressive loads.	Apply
CO5: Compute the diameter of shafts subjected to combined bending, twisting and axial loads using various theories of failure.	Apply

Text Book(s):

T1. Hibbeller RC, "Mechanics of Materials", 9th Edition Prentice-Hall of India, New Delhi, 2013.

T2. James M Gere, "Mechanics of Materials", 9th Edition Cengage Learning, India, 2019.

Reference Book(s):

R1. Rattan SS "Strength of Materials" 3rd Edition Tata McGraw-Hill Education Pvt Ltd., New Delhi, 2017.

R2. Beer F. P. and Johnston R," Mechanics of Materials", 7th Edition McGraw-Hill Book Co, Third Edition, 2017.

R3. Egor P.Popov," Mechanics of Materials", 2nd Edition, Pearson Co, 2015.

Web References:

1. http://nptel.ac.in/courses/112107147/

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	-	1	3	1	-	2	-	-
CO2	3	2	1	1	-	-	-	1	3	1	-	2	-	-
CO3	3	2	1	1	-	-	-	1	3	1	-	2	-	-
CO4	3	2	1	1	-	-	-	1	3	1	-	2	-	-
CO5	3	2	1	1	-	-	-	1	3	1	-	2	-	-

High-3; Medium-2; Low-1

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Course Code: 19MECC1501	Course Title: MECHANICAL DESIGN (Common to MC & ME)		
Course Category: Professional Core		Course Level: Mastery	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours: 60	Max Marks:100

Pre-requisites

- Strength of Materials

Course Objectives

The course is intended to:

1. Design the machine elements subjected to static loads.
2. Design the machine elements against fluctuating and impact loads.
3. Calculate the design parameters for power transmitting element.
4. Determine the design parameters of helical and leaf spring.
5. Design/Select a suitable bearing.

UNIT I DESIGN FOR STATIC LOAD OR STEADY STRESSES 9+3

Design Processes and its types, factor of safety - selection. Preferred numbers, Selection of materials and its properties, Fits and Tolerances - eccentric loading-stress due to eccentric loading, curved beams - problems.

UNIT II DESIGN FOR FLUCTUATING AND IMPACT LOADS 9+3

Fatigue, types, Endurance limit, modifying factors, relation between endurance limit, ultimate tensile strength and yield strength, problems on different fatigue loading conditions. Stress concentration, stress concentration factor, causes of stress concentration, method of reducing stress concentration, stress concentration factor for different material configuration. Notch sensitivity, factors affecting of notch sensitivity. Impact loading, shock loading, simple problems.

9+3

UNIT III DESIGN OF SHAFTS, KEYS, AND COUPLINGS

Difference between shaft, axle and spindle, Shaft materials, criteria of shaft design, different transmitting elements on a shaft, shaft design against static loading for given application.

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Shaft design for fatigue loading. Keys, types of keys, stresses developed in the key. Spline, stresses in spline shaft, design of shunk key and spline.

Couplings, types of coupling, design of coupling based on given speed and load conditions. Design of flexible coupling based on given speed and load conditions.

UNIT IV DESIGN OF SPRINGS **9+3**

Springs, types of springs, applications, spring terminology. Stresses in helical springs, Design of helical and concentric spring for given loading. Leaf springs, NIP in leaf springs Design of leaf spring for given application.

UNIT V DESIGN OF BEARING **9+3**

Bearings, bearing types, Parts of the bearing, rolling contact bearing, its applications. Load carrying capacity, equivalent load, Life of bearing, Load life relationship, Problems. Selection of ball bearings from manufacturing catalogue. Sliding contact bearings, types and Nomenclature. Hydrodynamic bearing, load carrying capacity, lubrication, selection of lubricant, equivalent load, minimum oil film thickness- length to diameter ratio- bearing pressure, radial clearance. Mckees equation, Somerfield equations - Bearing characteristic number problems.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Design the machine selements subjected to simple and combined static loads.	Apply
CO2: Design the machine elements against fluctuating loads and impact loads.	Apply
CO3: Calculate the design parameters for power transmitting element such as shaft, key, and coupling.	Apply
CO4: Determine the design parameters of helical and leaf spring for given application.	Apply
CO5: Design/Select a suitable bearing for the given application.	Apply

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Text Book(s):

T1.V.B. Bhandari. "Design of Machine Elements" Tata McGraw Hills Education, 5th edition, 2020.

T2.Shigley J.E and Mischke C.R., "Mechanical Engineering Design", Sixth Edition, Tata McGraw Hill, 2012.

Reference Book(s):

R1. P. C Sharma and A. K Agarwal. "Machine Design" (SI units). S.K. Kataria& Sons, Reprint 2013.

R2. Ugural A.C, "Mechanical Design - An Integral Approach", McGraw-Hill Book Co., 2010.

R3. Spotts M.F., Shoup T.E "Design and Machine Elements" Pearson Education, 2012

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	-	-	1	-	1	-	2	-	-
CO2	3	2	1	1	1	-	-	1	-	1	-	2	-	-
CO3	3	2	1	1	1	-	-	1	-	1	-	2	-	-
CO4	3	2	1	1	1	-	-	1	-	1	-	2	-	-
CO5	3	2	1	1	1	-	-	1	-	1	-	2	-	-

High-3; Medium-2; Low-1

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Course Code: 19MECN1701	Course Title: MECHATRONICS		
Course Category: Professional Core		Course Level: Mastery	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours: 45	Max Marks:100

Prerequisites

The student should have undergone the courses:

- Electrical and Electronics Engineering

Course Objective

The course is intended to

1. Explain the fundamentals of mechatronics systems
2. Select sensors for various measurements
3. Write logic programs
4. Design Virtual Instruments for signal acquisition
5. Explain the application of mechatronics systems

UNIT IINTRODUCTION 9

Introduction to Mechatronics- Systems- Concepts of Mechatronics approach-Need for Mechatronics- Emerging area of Mechatronics- Classification of Mechatronics - Control system- Open Loop and Feedback Control -PID Control.

UNIT II SENSORS AND SIGNAL CONDITIONING 9

Introduction - Performance Terminology- Potentiometers-LVDT- Capacitance sensors-Strain gauges- Eddy current sensor-Hall effect sensor- Temperature sensors-Pressure sensors-Flow sensors- Light sensors- Selection of sensors- Signal processing.

UNIT III PROGRAMMABLE LOGIC CONTROLLERS 9

Introduction- Basic structure- Input and output processing- PLC Programming - Timers, Counters and internal relays- Data handling and manipulation – subroutine – Master control reset- Selection of PLC, HMI

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UNIT IV SYTEM DESIGN USING VIRTUAL INSTRUMENTATION 9

Front Panel and Block Diagram – Tools, Controls and Functions palette. Modular programming – SubVI. Structures – FOR, WHILE Loops, Case, Sequence, event structures, Formula node. DAQ hardware – AI, AO, DIO. DAQ Assistant and configuration Applications - Speed, Vibration, strain & temperature Measurement

UNIT V DESIGN OF MECHATRONICS SYSTEMS 9

Pick and place Robot- Autonomous mobile robot-Wireless surveillance balloon- Engine Management system- Automatic car park barrier.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the fundamentals of mechatronics systems such as the components and control schemes with block diagrams	Understand
CO2: Select sensors for various measurements including pressure, temperature, flow, level and light used in different systems	Apply
CO3: Write logic programs for real time applications such as home automation, machine tool control, process control using PLC	Apply
CO4: Design user interface for arithmetic, logical, sequencing data acquisition operations in analog and digital modes using virtual instrumentation.	Apply
CO5: Explain the different mechatronics systems used in various applications	Understand

Text Book(s):

T1 Bolton,W, "Mechatronics" , Pearson Education, 6th edition, 2019.

T2 Jovitha Jerome, „Virtual Instrumentation using Lab VIEW", PHI Learning Private Limited, New Delhi, Second Printing, 2011.

Reference(s):

R1. Godfrey C. Onwubolu, "Mechatronics Principles and Applications", Elsevier,

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R2. Devadas Shetty and Richard A.Kolk, "Mechatronics systems design", PWS Publishing company 2007.

R3. Nitaigour Premchand Mahalik, "Mechatronics Principles, Concepts and Applications" Tata McGraw-Hill Publishing company Limited, 2017.

Web References

1. https://en.wikipedia.org/wiki/Mechatronics
2. http://www.cedrat.com/en/publications/categories/devicesystems/systems/mechatronics.html
3. http://nptel.ac.in/courses/112103174/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	1	-	1	-	1	1	-
CO2	3	2	1	1	-	-	-	1	-	1	-	1	1	-
CO3	3	2	1	1	-	-	-	1	-	1	-	1	1	-
CO4	3	2	1	1	-	-	-	1	-	1	-	1	1	-
CO5	2	1	-	-	-	-	-	1	-	1	-	1	1	-

High-3; Medium-2;Low-1

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