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, E&I and CSE)
Udumalai Road, Pollachi - 642 003 Tel: 04259-236030/40/50 Fax: 04259-236070 www.mcet.in

Curriculum and Syllabi

B.E. MECHANICAL ENGINEERING

SEMESTER I to IV

Regulations 2019

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.

OBE Coordinator

Programme Coordinator

Head of the Department

Head - OBE

Dr. Mahalingam College of Engineering and Technology, Pollachi – 642003.
(An autonomous institution approved by AICTE and affiliated to Anna University)

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 by continuous 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 quality of 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.

OBE Coordinator

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Head of the Department

Head - OBE

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.

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.

OBE Coordinator

Programme Coordinator

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Programme: B.E Mechanical Engineering
2019 Regulations
Curriculum for Semesters I to II

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

Semester I (2019 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, ME, MC
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU, ME, MC, CS, IT, EC, EI
19PSHG3001	Wellness for Students	0	0	2	1	100	All
Total		**12**	**1**	**11**	**18.5**	**600**	

Semester II (2019 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1201	Ordinary Differential equation and Complex Variables	3	1	0	4	100	AU, CE, MC, ME, EC, EI, EE
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19CHBC2201	Chemistry for Mechanical Sciences	3	0	2	4	100	AU, ME, MC
19MESC2001	Introduction to Engineering	2	0	2	3	100	AU, MC, ME, EC, EI, EE
19MESC2201	Engineering Materials	2	0	2	3	100	AU, MC, ME
19MECC3201	Engineering Practices Laboratory	0	0	3	1.5	100	AU, ME, MC
19PSHG3002	Personal Effectiveness	0	0	2	1	100	All
19CHMG6201	Environmental Science	1	0	0	-	-	All
Total		**13**	**1**	**13**	**19.5**	**700**	

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

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, ME, MC
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 equation 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 Science	1	0	0	-	-	All
TOTAL		**13**	**1**	**13**	**19.5**	**700**	

Passed in Board of Studies meeting

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Approved in Academic Council meeting

BOS Chairman

* Annual Pattern

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**	**13**	**22.5**	**800**	

Course Code	Course Title	Duration	Credits	Marks
19MEPN6001	Internship or Skill Development*	2 Weeks	1	100

*Refer to clause:4.8 in UG academic regulations 2019

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BOS Chairman

Tentative Curriculum for Semesters V to VIII

Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Mechanical Design	3	1	0	4	100	-
	Applied Thermodynamics	3	1	0	4	100	-
	Electrical Engineering	3	0	2	4	100	-
	Professional Elective - I	3	0	0	3	100	-
	Professional Elective –II (Online)	3	0	0	3	100	
	Open elective - I	3	0	0	3	100	-
	Computer Aided Machine Drawing Laboratory	0	0	3	1.5	100	-
	Applied Thermodynamics Laboratory	0	0	3	1.5	100	-
	Employability skills	0	0	2	1	100	-
Total		**18**	**2**	**10**	**25**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Finite Element Methods	3	1	0	4	100	-
	Heat and Mass Transfer	3	1	0	4	100	-
	Professional Elective –III	3	0	0	3	100	-
	Professional Elective –IV (Online)	3	0	0	3	100	-
	Open Elective –II	3	0	0	3	100	-
	Simulation and Analysis Laboratory	0	0	3	1.5	100	-
	Heat and Mass Transfer Laboratory	0	0	3	1.5	100	
	Innovative and Creative Project	0	0	4	2	100	-
	Campus to Corporate	0	0	2	1	100	All
Total		**15**	**2**	**12**	**23**	**900**	

Course Code	Course Title	Duration	Credits	Marks
	Internship or Skill Development*	2 or 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			
	Mechatronics	3	0	2	4	100	-
	CNC Programming and Robotics	3	0	0	3	100	-
	CNC Programming and Robotics Laboratory	0	0	3	1.5	100	-
	Professional Elective –V	3	0	0	3	100	
	Professional Elective –VI	3	0	0	3	100	-
	Open Elective - III	3	0	0	3	100	
Total		**15**	**0**	**5**	**17.5**	**600**	

Semester VIII

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

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

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits (2019 Batch only): 164

Total Credits (2020 Batch onwards): 163

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PROFESSIONAL ELECTIVES

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
DESIGN STREAM							
	Design for Manufacture, Assembly and Environment	3	0	0	3	100	-
	Vibration and Noise Engineering	3	0	0	3	100	-
	Computational Fluid Dynamics	3	0	0	3	100	-
	Fatigue and Fracture Mechanics	3	0	0	3	100	-
	Design of Transmission system	3	0	0	3	100	-
	Industrial Tribology	3	0	0	3	100	-
	Injection Moulding and Mould Design	3	0	0	3	100	-
	Turbo-Machinery	3	0	0	3	100	-
	Automotive Engine and Its Systems	3	0	0	3	100	-
	Vehicle Design Engineering	3	0	0	3	100	-
	Vehicle Dynamics	3	0	0	3	100	-
	Motor Cycle Dynamics	3	0	0	3	100	-
	Design for Sheet Metal	3	0	0	3	100	-
	Design for Welding	3	0	0	3	100	-
MANUFACTURING AND MANAGEMENT STREAM							
	Micro and Nano Manufacturing	3	0	0	3	100	-
	Manufacture and Inspection of Gears	3	0	0	3	100	-
	Unconventional Machining Processes	3	0	0	3	100	-
	Theory of Metal Cutting and Forming	3	0	0	3	100	-
	Flexible Manufacturing Systems	3	0	0	3	100	-
	Computer Integrated Manufacturing	3	0	0	3	100	-
	Plant Layout and Material Handling	3	0	0	3	100	-
	Additive Manufacturing	3	0	0	3	100	-
	Supply Chain Management	3	0	0	3	100	-

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Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Industrial Robotics and Automation	3	0	0	3	100	-
	Engineering Economics and Cost Analysis	3	0	0	3	100	-
	Principles of Management	3	0	0	3	100	-
	Manufacturing of Automotive Electrical and Electronics Parts	3	0	0	3	100	-
QUALITY, TESTING AND THERMAL STREAM							
	Advanced Measurements & QC	3	0	0	3	100	-
	Non Destructive Testing Methods	3	0	0	3	100	-
	Precision Engineering and Manufacturing	3	0	0	3	100	-
	Design of Experiments	3	0	0	3	100	-
	Failure Analysis and Design	3	0	0	3	100	-
	Test standards and equipment	3	0	0	3	100	-
	Quality Engineering	3	0	0	3	100	-
	Quality Management Techniques	3	0	0	3	100	-
	Refrigeration and Air-Conditioning	3	0	0	3	100	-
	Solar and Wind Energy	3	0	0	3	100	-
	Industrial Safety	3	0	0	3	100	-
	Spark Ignition Engine	3	0	0	3	100	-
	Design of Spark Ignition Engine	3	0	0	3	100	-

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OPEN ELECTIVES

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Automation systems	3	0	0	3	100	-
	Industrial Automation and Robotics	3	0	0	3	100	-
	Entrepreneurship Development	3	0	0	3	100	-
	Total Quality Management	3	0	0	3	100	-

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2019 REGULATIONS

Detailed Syllabi for Semester I to IV

Course Code: 19SHMG6101	Course Title: Induction Program (common to all B.E/B.Tech programmes)
Course Category: Mandatory Non-Credit Course	Course Level: Introductory
Duration: 3 Weeks	Max. Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus
3. Explain the opportunity available for professional development
4. Build universal human values and bonding amongst all the inmates of the campus and society

List of Activities:

1. History of Institution and Management: Overview on NIA Education Institutions-Growth of MCET – Examination Process-OBE Practices – Code of Conduct – Centre of Excellence
2. Lectures by Eminent People, Motivational Talk – Alumni, Employer
3. Familiarization to Dept./Branch: HoD Interaction – Senior Interaction – Department Association
4. Universal Human Value Modules: Module 1, Module 2,Module 3 and Module 4
5. Orientation on Professional Skill Courses
6. Proficiency Modules – Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cell, Clubs and its events
8. Creative Arts: Painting, Music and Dance
9. Physical Activity: Games and Sports, Yoga and Gardening
10. Group Visits: Visit to Local areas and Campus Tour

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co-curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Work plan for future	50	Career plan developed consulting mentor
Total	**100**	

Non-letter Grades

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

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Course Code: 19MABC1101		Course Title: MATRICES AND CALCULUS (Common to AU, CE, MC, ME, EC, EI & EE)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Determine the canonical form of a Quadratic form using Orthogonal transformation
2. Use different testing methods to check the convergence of infinite series.
3. Apply differential and integral calculus to determine the evolute of a curve and improper integrals
4. Apply partial derivatives to find extreme values of functions of two variables.
5. Apply multiple integrals to find area of plane curves and volume of solids.

UNIT I Matrices **9+3 Hours**

Rank of a matrix, System of linear equations, Symmetric, Skew symmetric and orthogonal matrices-(Definitions and examples only), Eigenvalues and Eigenvectors, Diagonalization of symmetric matrices through orthogonal transformation, Cayley-Hamilton Theorem, Transformation of quadratic forms to canonical forms through orthogonal transformation.

UNIT II Sequences And Series **9+3 Hours**

Sequences- Definition and Examples, Series- Tests for convergence- Power series-series for exponential, trigonometric and logarithm functions - Comparison Test, IntegralTest, Cauchy's root test, D Alembert's ratio test, Alternating series- Leibnitz's test.

UNIT III Differential And Integral Calculus **9+3 Hours**

Curvature – Radius of curvature - Evolutes and Involutes, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties.

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UNIT IV **Multivariable Differentiation** **9+3 Hours**

Limit, continuity, Mean value theorems and partial derivatives, Taylor's series and Maclaurin's series, Jacobian, Maxima, Minima and saddle points, Method of Lagrange's multipliers.

UNIT V **Multivariable Integration** **9+3 Hours**

Multiple Integration: Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (cartesian to polar and cartesian to spherical), Triple integrals (Cartesian) Applications: areas and volumes.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Determine the canonical form of a Quadratic form using Orthogonal transformation	Apply
CO2: Use different testing methods to check the convergence of infinite series.	Apply
CO3: Determine the evolute of a curve and evaluate improper integrals using beta gamma functions	Apply
CO4: Apply partial derivatives to find extreme values of functions of two variables .	Apply
CO5: Apply multiple integrals to find area of plane curves and volume of solids	Apply

Text Book(s):

T1. Erwin kreyzig, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons, 2015.

T2. Veerarajan T., "Engineering Mathematics for First Year" , Tata McGraw-Hill, New Delhi, 2011.

T3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 1st edition, 2017.

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2010.

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R2. N.P.Bali and Manish Goyel, "A Text book of Engineering Mathematics", Laxmi Publication, 9th edition, 2010.

R3. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc16_ma05
2. https://nptel.ac.in/courses/122101003/2

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO1	3					1	1	2	1	2		2		
CO2	3					1	1	2	1	2		2		
CO3	3					1	1	2	1	2		2		
CO4	3					1	1	2	1	2		2		
CO5	3					1	1	2	1	2		2		

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

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Course Code: 19ENHG2101	Course Title: Communication Skills – I (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities		Course Level: Practice	
L:T:P (Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- The student should have undergone English as his/her first or second language in school.

Course Objectives:

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B1 of CEFR level.
2. Speak in simple sentences to convey their opinion and ideas on par with B1 of CEFR level.
3. Read and infer a given text on par with B1 of CEFR level.
4. Draft basic formal written communication on par with B1 of CEFR level.

UNIT I Listening **15 Hours**

Importance of active listening –Physical condition needed for active listening-Identifying relevant points while taking notes.- Framing questions at different linguistic contexts - Listening for specific details of concrete monologues and dialogues –Listening to organize ideas - Developing ideas –Listening to compose paragraphs – Paraphrasing the aural input.

UNIT II Speaking **15 Hours**

Importance of note making to practice speaking - Traditional note making, developing Mind map - Collecting points from various sources - Identifying relevant ideas needed for the speech -Using mind-map to organize thought processing - Prioritizing the ideas - Types of sentences - Frequently used words (Institution, home and leisure) - Mother Tongue Influence - Expressing the thoughts in simple sentences - Tenses & Voices (Active & Passive) - Postures, gestures and eye contact - Intonation and Sentence stress - Express one's thoughts coherently.

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UNIT III Reading **15 Hours**

Reading strategies - Skimming -Scanning - Interpretation of visual data - Factual texts on subjects of relevance - Inferring texts –Reading to write a review –Checking the accuracy of reading while presenting the interpreted data – Reading to comprehend

UNIT IV Writing **15 Hours**

WritingSimple and short sentences - Writing E-mail, Memo, Note and Message - Letter Writing - Importance of punctuations -- Identifying the main points - Organising the main ideas - Writing a draft.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Listen actively and paraphrase simple messages and specific details of concrete monologues and dialogues.	Apply
CO2: Express one's views coherently in a simple manner.	Apply
CO3: Read and comprehend factual texts on subjects of relevance.	Understand
CO4: Write texts bearing direct meanings for different contexts maintaining an appropriate style.	Apply

Text Book(s):

T1. Whitby Norman, Business Benchmark Pre-intermediate to Intermediate Students' Book CUP Publications, 2nd Edition, 2014

T2. Wood Ian, Williams Anne, Cowper Anna, Pass Cambridge BEC Preliminary, Cengage Learning, 2nd Edition, 2015.

T3. Learners Book prepared by the Faculty members of Department of English.

Reference Book(s):

R1. BEC-Preliminary - Cambridge Handbook for Language Teachers, 2nd Edition, CUP 2000.

R2. Hewings Martin - Advanced Grammar in use - Upper-intermediate Proficiency, CUP, 3rd Edition, 2013.

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Approved in Academic Council meeting

BOS Chairman

Web References:

1. http://www.grammarinenglish.com
2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf
3. http://www.examenglish.com/BEC/BEC_Vantage.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	1					1	1	2		3		1		
CO2	1					1	1	2	2	3		1		
CO3	1					1	1	2	2	3		1		
CO4	1					1	1	2		3		1		
CO5	1					1	1	2		3		1		

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2,3,4	50	30
	CCET 2	1,2,3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	1,2,3,4	50	
	Tutorial	1,2	30	10
	Quiz			
	Assignment			
End Semester Examination	ESE	1,2,3,4	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19PHBC2101		Course Title: PHYSICS FOR MECHANICAL SCIENCES (Common to AU, ME, MC)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Determine the equilibrium condition of particles and rigid bodies.
2. Understand the motion of a particle.
3. Study the properties of acoustics and their applications.
4. Extend the knowledge of thermal properties to their applications.
5. Understand the basic principles of thermodynamics.

UNIT I Basics of Mechanics **9 Hours**

Review of fundamental laws of mechanics – Physical quantities – scalars, vectors – Newton's law of mechanics, Gravitational law. Particles and rigid body, Concept of force and its effect on rigid body system of forces-Free body diagram-principle of transmissibility-equilibrium conditions-equilibrium of particles subjected to coplanar and non-coplanar force system – equilibrium of particles subjected to coplanar system of forces - Triangle law, Parallelogram law and Lami's theorem.

UNIT II Kinematics and Kinetics of Particles **9 Hours**

Kinematic parameters – displacement, velocity, acceleration and time. Types of motion – uniform, non-uniform motion, motion of particles in a plane – Rectinlear and curvilinear motion of particles – normal and tangential component – motion of projectile – Relative motion – Dependent motion. Kinetics of particles – Force and acceleration - D'Alembert's principle – Work energy, and impulse momentum method.

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UNIT III Physics of Sound **9 Hours**

Classification of sound - decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination – factors affecting acoustics of buildings and their remedies. Methods of sound absorptions: absorbing materials, paints - noise and its measurements, sound insulation and its measurements, impact of noise in machineries.

UNIT IV Thermal Physics **9 Hours**

Thermal conductivity, Specific heat capacity, Thermal shock resistance, Thermal stability, Thermal Expansion, Thermal insulation and Heat resistance.

Conduction – Co-efficient of the thermal conductivity – Cylindrical flow of heat – determination of thermal conductivity of bad conductor – Lee's disc method: theory and experiment – Conduction through compound media (series and parallel)

UNIT V Elements of Thermodynamics **9 Hours**

Concept of temperature – heat – thermodynamics – work – heat in thermodynamics – comparison of heat and work – internal energy – first law of thermodynamics – applications of the first law– second law of thermodynamics – the Carnot cycle – heat engine – heat pump – refrigerators – third law of thermodynamics.

LIST OF EXPERIMENTS **30 Hours**

1. Determination of Thermal Conductivity of the insulator – Lee's Disc.
2. Determination of velocity and compressibility of the given liquid – Ultrasonic Interferometer.
3. Determination of Young's modulus – Cantilever bending.
4. Determination of Rigidity modulus of the metallic wire – Torsional Pendulum.
5. Determination of Wavelength of laser and determination of particle size using laser.
6. Verify the triangular law of forces – Lami's theorem.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Use the laws of mechanics to determine the equilibrium condition of particles and rigid bodies.	Understand
CO2: Explain the motion of a particle.	Understand
CO3: Explain the properties of acoustics and their applications.	Understand
CO4: Explain the thermal properties of materials.	Understand
CO5: Explain the principles of thermodynamics.	Understand

Text Book(s):

T1. R. C. Hibbeller, "Engineering Mechanics: Combined Static and Dynamics", Prentice Hall, 2010.

T2. V. Rajendran, "Engineering Physics", Tata McGraw Hill Publishing Company limited. New Delhi, 2017.

T3. M.N.Avadhanulu and P.G.Kshirsagar, "Text Book of Engineering Physics", S. Chand & Company Ltd., New Delhi, 2018.

Reference Book(s):

1. Balasubramaniam "Callister's Material Science and Engineering", John Wiley and Sons Inc., Second Edition, 2015.
2. Brijlal & N. Subramaniam, "Heat & Thermodynamics", S.Chand & Co., 2008.
3. A.Marikani, "Engineering Physics", PHI Learning Pvt. Ltd., 2013.

Web References:

1. **http://www.physicsclassroom.com/class/thermal**
2. **http://nptel.ac.in/course.php?disciplineId=115**

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BOS Chairman

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	1	-	-	-	-	1	1	3	3	3	1	3		
CO2	1	-	-	-	-	1	1	3	3	3	1	3		
CO3	1	-	-	-	-	1	1	3	3	3	1	3		
CO4	1	-	-	-	-	1	1	3	3	3	1	3		
CO5	1	-	-	-	-	1	1	3	3	3	1	3		

High-3; Medium-2;Low-1

Assessment pattern

	Component	CO .No.	Unit No.	Marks	Scaleto	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	1,2	50	20	40
	CCET 2	3,4	3,4	50		
	Retest	1,2,3,4	1,2,3,4	50		
	CCET 3	5	5	50		
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	1,2,3,4,5	20	20	
End Semester Examination	ESE	1,2,3,4,5	1,2,3,4,5	100	60	60
Total	100					

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19CSSC2001	Course Title: C PROGRAMMING (Common to AU, ME, MC)		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Explain about computer organization and problem solving techniques.
2. Write programs using appropriate programming constructs.
3. Develop programs using arrays, functions & strings.
4. Implement programs using pointers, structures & unions.
5. Write programs using files & preprocessor directives.

UNIT I Introduction **7 Hours**

Generation and Classification of Computers –Basic Organization of a Computer – Software development life cycle – Problem Solving Techniques , Algorithm, Pseudo code and Flow Chart.

UNIT II C Programming Basics **10 Hours**

Introduction to C programming – Structure of a C program – Keywords – Identifiers-Constants– Variables –Data Types– Operators and Expressions –Formatted & Unformatted I/O functions– Decision statements –Loop control statements.

UNIT III Arrays, Functions & Strings **10 Hours**

Arrays: Characteristics –One-dimensional and Two-dimensional arrays – Functions: Declaration & Definition of function –Built in function – User defined function –Types of functions –Call by value &reference– Strings: Formatting strings–String handling functions.

UNIT IV Pointers, Structures & Union

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9 Hours

Pointers: Features and Types of pointers – Arithmetic operations with pointers–Pointers and Arrays –Structures: Features– Operations on Structures–Array of structures – Unions.

UNIT V Files & Pre-Processor Directives **9 Hours**

Introduction to Files –Stream and File Types–File operations (Open, close, read, write) – Command line arguments–Pre-processor Directives: Macro Expansion, File Inclusion, Conditional Compilation.

LIST OF EXPERIMENTS **30 Hours**

1. Programs to process data types, operators and expression evaluation (any1).
    a. To find area of rectangle/circle/square.
    b. To find the simple interest and compound interest.
2. Programs using decision and looping statements(any 2).
    a. To find the maximum number among 3 given numbers.
    b. To check whether given year is leap year or not.
    c. To display the Fibonacci series.
    d. To find the factorial of a number.
3. Programs using Arrays.
    a. To search for particular number among N numbers(1D array).
    b. To compute matrix addition (2 D array).
4. Programs using Functions and Strings(any 2).
    a. To swap two numbers using call by reference.
    b. To find the cube of a number.
    c. To manipulate strings using string functions.
    d. To check whether the string is palindrome or not.
5. Programs using Pointer, Structure & Union
    a. To perform arithmetic operations using pointers.
    b. To display the information of N students using Structure.
    c. To display the employee details using Union.
6. Programs using Files (any 1)
    a. To read the contents of a text file
    b. To copy the contents from one file into another

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BOS Chairman

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain about computer organization and problem solving techniques	Understand
CO2: Write programs for the given scenario using appropriate programming constructs	Apply
CO3: Develop programs using arrays, functions & strings for the given scenario	Apply
CO4: Implement programs for given application using pointers, structures & unions	Apply
CO5: Write programs using files & preprocessor directives for simple problems	Apply

Text Book(s):

T1. Ashok N.Kamthane, Amit.N.Kamthane, "Programming in C", 3rd Edition, Pearson Education, 2015.

Reference Book(s):

R1. Ajay Mittal, "Programming in C-A Practical Approach", 3rd Edition, Pearson Education, 2010.

R2. Yashavant P.Kanetkar, "Let Us C", 16th Edition, BPB Publications, 2018.

R3. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press, 2013.

Web References:

1. **http://www.cprogramming.com/**
2. **http://www.c4learn.com/**

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	2	-	-	-	-	1	1	2	1	2	-	1		
CO2	2	-	-	-	-	1	1	2	1	2	-	1		
CO3	2	-	-	-	-	1	1	2	1	2	-	1		
CO4	2	-	-	-	-	1	1	2	1	2	-	1		
CO5	2	-	-	-	-	1	1	2	1	2	-	1		

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	20
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	10	20
	Final Assessment of Laboratory Experiments	1,2,3,4,5	10	
End Semester Examination	ESE	1,2,3,4	100	60
Total				100

Passed in Board of Studies meeting

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BOS Chairman

Course Code: 19MESC4001	Course Title: ENGINEERING DRAWING (Common to AU, ME, MC, CS, IT, EC & EI)		
Course Category: Engineering Science		Course Level: Practice	
L:T:P (Hours/Week) 1: 0: 3	Credits:2.5	Total Contact Hours:60	Max. Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Develop skills for communication of concepts and ideas.
2. Expose them to existing national standards related to technical drawings.

Unit I Orthographic Projection **12 Hours**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Projection of points, Projection of straight lines located in the first quadrant. Determination of true lengths and true inclinations. Visualization principles –conversion of pictorial into orthographic views.

Unit II Projection of Solids **12 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.

Unit III Projection of Sectioned Solids **12 Hours**

Sectioning of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by cutting planes inclined to one reference plane and perpendicular to the other – Orthographic views of sections of simple solids.

Unit IV Development of Surfaces **12 Hours**

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones.

12 Hours

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Unit V Isometric Projection

Principles of isometric projection – Isometric scale –Isometric projections of simple solids and truncated solids.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Sketch the orthographic projections of the given pictorial view of the object using first angle projection.	Apply
CO2: Sketch the projections of simple solids such as prism, pyramid, cylinder and cone using rotating object method.	Apply
CO3: Sketch the projections of simple sectioned solids with all necessary dimensions meeting the standards.	Apply
CO4: Sketch the lateral surface of simple solids using straight line and radial line development methods.	Apply
CO5: Sketch the isometric view of simple solids and truncated solids using principles of isometric projection.	Apply

Text Book(s):

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", Tata McGraw Hill India, New Delhi, 7th edition, 2017.

T2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, Gujarat, 53rd edition, 2015.

T3. K. V. Natrajan, "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 48th edition, 2018.

Reference Book(s):

R1. BasantAgarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill India, New Delhi, 2nd edition, 2013.

R2. John K.C., "Engineering Graphics", PHI Learning, Delhi, 1st edition, 2009.

R3. Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw India, New Delhi, 3rd edition, 2008.

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PUBLICATIONS OF BUREAU OF INDIAN STANDARDS

1. IS 10711 – 2001: Technical products Documentation – Size and lay out ofdrawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods. The mode of delivery is like practical.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. https://en.wikipedia.org/wiki/Engineering_drawing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	1	1	2	1					1					
CO2	1	1	2	1					1					
CO3	1	1	2	1					1					
CO4	1	1	2	1					1					
CO5	1	1	2	1					1					

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	Marks	Total Marks
Continuous comprehensive Evaluation	Each Lab Experiment	75	75
	Cycle Test 1	50	25
	Cycle Test 2	50	
	Total Marks		100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19PSHG3001	Course Title: WELLNESS FOR STUDENTS (Common to all B.E/B.Tech Programmes) (2019 Batch Only)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 0: 0: 2	Credits:1	Total Contact Hours:30	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Articulate the importance of wellness for success in life.
2. Understand the dimensions of wellbeing and relevant practices
3. Guide in adopting such practices to improve wellness
4. Reflect the impact of changes sensed on personal and social effectiveness

UNIT I Wellness - Importance And Dimensions

Values and aspirations – goals – SMART Goals – means for achieving goals – job Vs career – success in life – attributes of successful persons. Maslow's Hierarchy of needs motivation - Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success.

Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods – Guna – causes and impact - multiple dimensions of human structure (physical, astral, causal bodies) – human-panchabootha relationship.

UNIT II Practices for Physical Wellness through Yoga

Simplified Physical Exercises: Hand, Leg, Neuromuscular breathing, eye exercises, kapalabathy, makarasanam 1 & 2, body massage, 14-points acupressure – Suryanamaskar - relaxation. Simple asanas.

UNIT III Practices for Physical Wellness through Exercises

Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Exercises related ailment and injuries - safety and precautions - first aid.

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Fitness development: Muscular strength – exercises (calisthenics): pull-up, sit-up, push-up and weight training; Explosive power – exercises: vertical jump, long jump; Cardio respiratory endurance– exercises: walking, jogging, treadmill, stair climbing, bicycling, skipping; Flexibility – exercises: stretching.

Speed, agility, balance and coordination – exercises: sprint, cone drill, ladder drill, hurdle drill, ball throw - mental agility exercises.

UNIT IV Practices for Mental Wellness

Meditation: Mind and its functions - mind wave frequency - Agna, Thuriyam and Shanthi meditation – introspection: analysis of thoughts, moralization of desire, neutralization of anger and eradication of worries - simple mindfulness exercises.

UNIT V Practices for Social and Spiritual Wellness

Kayakalpa yoga - youthfulness and life force - cultural education – greatness of guru – universal compassion – fivefold culture. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the concept of wellness and its importance to be successful in career and life	**Understand**
CO2: Explain the dimensions of wellness and practices that can promote wellness	**Understand**
CO3: Demonstrate the practices that can promote wellness	**Understand**
CO4: Sense and improve the wellness periodically and its impact on personal effectiveness	**Understand**
CO5: Maintain harmony with self, family, peers, society and nature	**Understand**

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Text Book(s):

T1. Reading material and workbook prepared by PS team of the college.

Reference Book(s):

R1. Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar ,"Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, 1st Ed. 2010.

R2. Dr.R.Nagarathna, Dr.H.R.Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008.

R3. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

Course offering:

Orientation programme (3 days)	CO1 and CO2
Student practice (weekly review classes)	CO3
Student journal writing (interim reviews)	CO4 and CO5

Evaluation:

Continuous assessment: 75 marks

Yoga:

Physical Exercises, KayaKalpa	= 15 marks
Meditation	= 15 marks
Assessment of student's workbook	= 10 marks
Total	= 40 marks

Sports:

Physical Exercises, KayaKalpa	= 20 marks
Assessment of student's workbook	= 15 marks
Total	= 35 marks

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End Semester Examination (combined for yoga and sports):

Written test (MCQ and short answers)	= 30 marks
Physical exercises	= 50 marks
Viva-voce	= 20 marks
Total	= 100 marks

End semester mark out of 100 is reduced to 25 marks. The student should get a total of 50 marks put together for a pass.

Scheme of wellness measurement:

#	Wellbeing Dimensions	Sub-dimensions	Wt. in total score	Measurement	Sub-dim score
1	Physical Wellbeing (40%)	BMI	16	weight & height	16
		Flexibility	12	Sit & reach test	12
		Endurance (Energy)	12	12 min Cooper run test	12
2	Mental wellbeing (30%)	Attention/ Concentration	12	Stroop test	15
		Memory	9	Digit Forward and Backward Test.	15
3	Social wellbeing (20%)	Inter-personal	10	IDEA & General Health Questionnaire	10
		Emotional wellbeing	5	IDEA questionnaire	5
		Self concept	5	IDEA questionnaire	5
4	Spiritual Wellbeing (10%)	Guna	10	Guna Questionnaire	
		Total	100%		100

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Semester II

Course Code: 19MABC1201	Course Title: ORDINARY DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES (Common to AU, CE, MC, ME, EC, EI, EE)		
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Matrices and Calculus

Course Objectives:

The course is intended to:

1. Explain the concepts of vector differentiation and integration.
2. Construct analytic functions.
3. Use the concept of complex integration to evaluate definite integrals.
4. Determine the solution of second and higher order ordinary differential equations.
5. Apply Laplace transform techniques to solve ordinary differential equations.

UNIT I Vector Calculus **9+3 Hours**

Gradient, Divergence, Curl, Line integrals, Surface integrals, Volume integrals, Theorems of Green, Gauss and Stokes (without proof) , Simple applications involving cubes, spheres and rectangular parallelepipeds.

UNIT II Complex Variables (Differentiation) **9+3 Hours**

Cauchy-Riemann equations – Analytic functions – Properties – Harmonic functions – Finding harmonic conjugate – Conformal mapping (w=z+a, w= az, w=1/z) – Mobius transformation and their properties.

UNIT III Complex Variables (Integration) **9+3 Hours**

Contour integrals – Cauchy Integral formula (without proof) – Cauchy Integral theorem – Taylor's series – Singularities of analytic functions – Laurent's series–Residues – Cauchy Residue theorem (without proof) – Evaluation of real definite integrals around unit circle and semi circle (Excluding poles on the real axis).

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UNIT IV **Ordinary Differential Equations of Higher Orders** **9+3 Hours**

Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation–Legendre's equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations.

UNIT V **Laplace Transform** **9+3 Hours**

Laplace Transform – Properties of Laplace Transform – Laplace transform of integrals – Laplace transform of periodic functions -Inverse Laplace transforms - Convolution theorem – Solution of ordinary differential equations by Laplace Transform method– Applications on engineering problems.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the concepts of vector differentiation and integration.	Apply
CO2: Use the concept of complex variables to construct analytic functions	Apply
CO3: Use the concept of complex integration to evaluate definite integrals.	Apply
CO4: Determine the solution of second and higher order ordinary differential equations	Apply
CO5: Apply Laplace transform techniques to solve ordinary differential equations	Apply

Text Book(s):

T1. Erwin kreyzig, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons, 2015.

T2. Veerarajan T., "Engineering Mathematics for First Year" , Tata McGraw-Hill, New Delhi, 2011.

T3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 1st edition, 2017.

Passed in Board of Studies meeting

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Approved in Academic Council meeting

BOS Chairman

Reference Book(s):

R1. G.B.Thomas and R.L Finney, "Calculus and Analytic Geometry", 9th edition, Pearson, Reprint, 2010.

R2. N.P.Bali and Manish Goyel, "A Text book of Engineering Mathematics", Laxmi Publication, 9th edition, 2010.

R3. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc16_ma05
2. https://nptel.ac.in/courses/122101003/2

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	3					1	1	2	1	2		2		
CO2	3					1	1	2	1	2		2		
CO3	3					1	1	2	1	2		2		
CO4	3					1	1	2	1	2		2		
CO5	3					1	1	2	1	2		2		

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19ENHG2201		Course Title: COMMUNICATION SKILLS - II (Common to all B.E/B.Tech Programmes)	
Course Category: Humanities		Course Level: Practice	
L:T:P (Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Communication Skills - I

Course Objectives:

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B2 of CEFR level.
2. Speak in simple sentences to convey their opinion and ideas on par with B2 of CEFR level.
3. Read and infer a given text on par with B2 of CEFR level.
4. Draft basic formal written communication on par with B2 of CEFR level.

UNIT I Listening **15 Hours**

Importance and purpose of attentive listening - Importance and purpose of intensive listening - Body Language – active listening on complex and abstract themes- Correlating Ideas related to listening input – importance of empathetic- listening for main ideas – paraphrase – compound and complex sentences - Developing ideas - Compose paragraphs.

UNIT II Speaking **15 Hours**

Jotting down ideas collected from listening to speak – organising the ideas – Expressing one's view coherently – Understanding grammatical elements (Noun – Pronoun Antecedent) – Expressing ideas assertively – Answering questions during presentations – Understanding the use of discourse markers – word stress and sentence stress – voice modulation and pauses – Highlighting significant points – interpretation of visual data – Using verbal cues - Preparing simple hand - outs.

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UNIT III Reading **15 Hours**

Reading strategies - Scanning – Inferring - Barriers to reading – sub vocalisation, Eye fixation, Regression – Speed Reading Techniques - read different texts and their context with speed – Note making – Reading a review – Paraphrasing - Read and comprehend.

UNIT IV Writing **15 Hours**

Reported speech& Concord (Subject - verb Agreement) – structure of the report – Report writing- Proposal –Plagiarism –references –appendices – Techniques for report writing – Registers.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Listen actively and empathetically, and paraphrase discussions and presentations on complex and abstract themes and topics.	Apply
CO2: Express one's views coherently, fluently and confidently highlighting the significant points with supporting details.	Apply
CO3: Read and comprehend with speed, different texts and their contexts reasonably at moderate speed.	Understand
CO4: Write detailed reports on variety of subjects synthesizing information gathered during listening & reading citing appropriate references.	Apply

Text Book(s):

T1. Whitby Norman, Business Benchmark Upper Intermediate Students' Book CUP Publications, 2nd Edition, 2014.

T2. Learners Book prepared by the Faculty members of Department of English.

Reference Book(s):

R1. Cambridge BEC Vantage - Practice Tests, Self-study Edition, Cambridge University Press, 2002.

R2. Hewings Martin - Advanced Grammar in use - Upper-intermediate Proficiency, CUP, Third Edition, 2013.

Web References:

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1. http://www.grammarinenglish.com
2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf
3. http://www.examenglish.com/BEC/BEC_Vantage.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	1					1	1	2		3		1		
CO2	1					1	1	2	2	3		1		
CO3	1					1	1	2	2	3		1		
CO4	1					1	1	2		3		1		
CO5	1					1	1	2		3		1		

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2,3,4	50	30
	CCET 2	1,2,3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	1,2,3,4	50	
	Tutorial	1,2	30	10
	Quiz			
	Assignment			
End Semester Examination	ESE	1,2,3,4	100	60
Total				100

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BOS Convener

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BOS Chairman

Course Code: 19CHBC2201	Course Title: CHEMISTRY FOR MECHANICAL SCIENCES (Common to AU, ME, MC)		
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max. Marks:100

Pre-requisites

- Higher Secondary Chemistry I and II

Course Objectives

The course is intended to:

1. Calculate hardness of water based on water quality parameters.
2. Explain batteries based on their characteristics, construction, working principle and applications.
3. Explain the mechanism of corrosion and its control techniques.
4. Identify a suitable plastic for a specific engineering application.
5. Describe the characteristics of fuel and lubricants.

UNIT I Water Technology **9 Hours**

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment - Desalination - Reverse Osmosis. Effluent discharge standards for Sewage Treatment Plants (STP) - pH, TSS, BOD, COD, NH_4-N, N-total and Fecal Coliform - Construction and working of a typical Sequential Batch Reactor STP.

UNIT II Electrochemistry and Batteries **9 Hours**

Cells – Types of cells – Galvanic and electrolytic cells – emf and its measurement – Nernst equation - Batteries – Characteristics and Classifications of batteries, Construction, working and applications - Dry cells, Alkaline battery, Lead –Acid battery, Nickel-Cadmium battery, Lithium ion battery, Hydrogen -Oxygen Fuel Cell.

UNIT III Corrosion and Its Control **9 Hours**

Corrosion – dry and wet corrosion – mechanism of electrochemical corrosion – galvanic corrosion and concentration cell corrosion - Factors influencing corrosion. Corrosion control methods – Cathodic protection methods, Metallic coating – Galvanizing - Tinning – Chrome plating - Electroless plating of plastics (Nickel plating) - Powder coating - Electrophoretic deposition.

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UNIT IV Polymers, Plastics and Composites **9 Hours**

Polymers – homo polymer and copolymer. Thermoplastics - thermosetting plastics - thermoplastic elastomers (TPE). Engineering plastics - PA, PC, PVC and Nylon 6, 6 – synthesis, properties and applications. Polymer Additives and Reinforcements-Thermal and light stabilizers, antioxidants, and flame retardants - Polymer composites – FRP and ceramic matrix composites.

UNIT V Fuels and Lubricants **9 Hours**

Automotive fuels - Petrol, Diesel, CNG, Blended fuels - composition, properties and uses. Gross calorific and Net calorific value. Knocking in petrol and diesel engines – octane number and cetane number. Lubricants - importance of lubrication - Classification of lubricants - properties of liquid lubricants and its significance - Total Acid number and Total Base Number. Greases – common grease types and properties. Components of grease - Base Oil, Additives and Thickener. NLGI consistency number.

LIST OF EXPERIMENTS

1. Estimation of Hardness of water by EDTA method.
2. Determination of corrosion rate by weight loss method.
3. Estimation of Fe^{2+} by potentiometric titration
4. Determination strength of acid by pH metry.
5. Conductometric titration of strong acid against strong base.
6. Determination of molecular weight of polymer by Viscometric method.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Calculate hardness of water based on water quality parameters associated with water conditioning methods.	Understand
CO2: Explain batteries based on their characteristics, construction, working principle and applications.	Understand
CO3: Explain the mechanism of corrosion and its control techniques.	Understand
CO4: Identify a suitable plastic for a specific engineering application.	Understand
CO5: Describe the characteristics of fuel and lubricants based on their composition and applications.	Understand

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Text Book(s):

T1. Jain &Jain, "Engineering Chemistry" 17th edition, Dhanpat Rai Publishing Compan Ltd, New Delhi, 2018.

T2. Wiley Engineering Chemistry, 2nd edition, Wiley India Pvt Ltd, New Delhi. 2011.

Reference Book(s):

R1. Dara S.S.,and Umare S.S., "A Text book of Engineering Chemistry" ,S.Chand & Co Ltd,New Delhi, 2014.

R2. V.R.Gowariker ,N.V.Viswanathan and Jayadev Sreedhar,"Polymer Science," New Age International (P) Ltd, Chennai, 2006.

R3. Renu Bapna and Renu Gupta, "Engineering Chemistry" ,Macmillan India Publisher Ltd, 2010.

R4. Jeffery G.H.,BassettJ.,Mendham J.and Denny R.C.,Vogel's "Text Book of Quantitative Chemical Analysis" ,Oxford, ELBS ,London, 2012.

R5. Shoemaker D.P. and C.W.Garland.," Experiments in Physical Chemistry", Tata McGraw-Hill Pub.Co.,Ltd., London, 2009.

Web References:

1. **http://nptel.ac.in/courses/122101001/downloads/lec.23.pdf**
2. **http://nptel.ac.in/courses/118104004/**
3. **http://nptel.ac.in/courses/104105039/**

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	2					1	1	3	3	3	1	3		
CO2	2					1	1	3	3	3	1	3		
CO3	2					1	1	3	3	3	1	3		
CO4	2					1	1	3	3	3	1	3		
CO5	2					1	1	3	3	3	1	3		

High-3; Medium-2;Low-1

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Assessment pattern

	Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	20
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	10	20
	Final Assessment of Laboratory Experiments	1,2,3,4,5	10	
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

Course Code: 19MESC2001		Course Title: INTRODUCTION TO ENGINEERING (Common to AU, MC, ME, EC, EI & EE)	
Course Category: Engineering Science		Course Level: Introductory	
L:T:P (Hours/Week) 2: 0: 2	Credits: 3	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Explain the career opportunities in engineering.
2. Explain how to acquire engineering competencies.
3. Explain how to remain, relevant and versatile as an engineer.
4. Observe engineering products and processes.
5. Take ownership for learning and development.
6. Identify and rectify unsafe conditions and acts.

UNIT I **Careers Opportunities In Engineering** **5 Hours**

Technicians, engineers and scientists, history of engineering. 17 sustainable development goals set by UNO, concept of small e to big E. career choices for an engineer, types of industries, academia and research as career choices, entrepreneurship as a career choice, various departments in engineering industries, roles available in engineering industries. innate skills, learnt skills (competencies), graduate attributes, roles of engineers and the corresponding competencies, career opportunities in engineering in terms of roles & competencies

UNIT II **Developing Specific Skills And Competencies** **5 Hours**

OBE Model, PEOs and POs, technical POs, professional POs, mapping with Graduate attributes, Classification of courses, resources available in the campus and e-resources, resources and facilities available to acquire specific competencies, on-campus and off-campus activities, the methods by which students can systematically involve in activities, significance of professional skill courses, plan for utilizing the resources and facilities to develop specific competencies.

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BOS Chairman

UNIT III **Staying Relevant Through Continuous Improvement /Environmental Versatility** **7 Hours**

Rate of change, technology life cycle (TLC), features of a dynamic and complex environment in which students operate or will operate, impact of globalization & technical advancements, importance of remaining, relevant and versatile in a dynamic and complex environment with the help of technology life cycle, activities/process to remain relevant and versatile, environmental scanning, Life- long learning.

UNIT IV **Observe Every Product And Processes With An Engineering Perspective And Inquisitiveness** **4 Hours**

Product -Need, purpose - primary and secondary function, various stages of manufacturing and its processes. Product - assembly of several simple engineering devices/systems. Product-Parts, principles and laws (mechanical, electrical and electronics), functional relationship between the parts, role of programming in engineering products. Significance of materials and their advancements in improvements in product.

UNIT V **Learning And Development Leveraging The Resources And Infrastructure** **6 Hours**

Process Of Learning, Situated Learning with Examples, Own Learning (Not Copying), Differences between Real Life and Simulated Environment, the Sprit Of Experimentation, Various Learning Enablers, Measure the performance against the plan.

UNIT VI **Unsafe Conditions And Acts And Follows Environment Friendly Practices** **3 Hours**

Safety-definition, importance of personal safety. Statistics of road accidents. Unsafe condition and unsafe act- definition, cause and effects, identification of the unsafe conditions and acts in home/hostel, labs, class rooms, public places. Importance of environment friendly practices.

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List of Experiments: **30 Hours**

1. Career opportunities with roles and responsibilities.
2. Observe every product and processes with an engineering perspective and inquisitiveness.
    a. Primary and Secondary functions of products and their equivalents.
    b. Primary and Secondary functions of parts of the products, their manufacturing processes and materials.
    c. Structural and functional relations of the product.
3. Safe and unsafe acts and conditions in day-to-day life and professional practices.
4. Skills for Hobby project (At least TWO)
    a. Soldering and de-soldering practices.
    b. Circuit and component testing using multi-meter & CRO.
    c. Battery operated circuit connections and testing.
    d. Simple switching circuits using relays and transistors.
    e. Adhesives used in part assembly.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Explain the career opportunities in engineering in terms of roles & competencies.	Understand
CO2. Explain how a student can acquire the competencies.	Understand
CO3. Explain how to remain, relevant and versatile in a dynamic and complex environment.	Understand
CO4. Observe every product and processes with an engineering perspective and inquisitiveness.	Apply
CO5. Choose to take ownership for his/her learning and development leveraging the resources and infrastructure.	Understand
CO6. Identify and rectify unsafe conditions and acts and follow environment friendly practices.	Understand

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Text Book(s):

T1. Worksheets and Handouts prepared by MCET team.

Reference Book(s):

R1. L. A Bloomfield, "How things work: The physics of everyday life", WILYS 5th Edition, 2013

R2. C. Mason, "How things work," Usborne Publishing Ltd 2009.

R3. D.K. Publishing, "How things work encyclopedia", 2009.

R4. R. J. Segalat, "How things work", Edito-Service Vol.I-IV, 1990.

Web References:

1. **https://en.wikibooks.org/General_Engineering_Introduction/Engineering_Science**
2. **https://science.howstuffworks.com/engineering-channel.html**

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,4	50	20
	CCET II	2,3	50	
	CCET III	5,6	50	
	Continuous Assessment – Practical	1,2,3,4,5,6	75	10
	Final Assessment – Practical	2,4	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

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BOS Chairman

Course Code: 19MESC2201	Course Title: ENGINEERING MATERIALS (Common to AU,MC, ME)		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Calculate the crystal parameters.
2. Analyze the phase diagram.
3. Choose an appropriate ferrous and nonferrous alloy.
4. Select an appropriate powder metallurgy technique.
5. Select an appropriate heat treatment process.

UNIT I Crystal Physics **9 Hours**

Introduction: Crystalline and Non crystalline materials. Single crystal , Polycrystalline materials Anisotrophic crystal parameters: Atomic radius, Number of atoms per unit cell, Coordination number, atomic packing factor for SC , BCC , FCC and HCP- Crystal planes: Miller indices, Braggs law . Interplanar distance- Polymorphism and allotrophy. Crystal imperfections: Point , line , surface and volume , grain boundary and its role in mechanical properties.

UNIT II Constitution of Alloys and Phase Diagrams **9 Hours**

Constitution of alloys- Solid solutions- Substitutional and Interstitial. Phase diagrams- Interpretation of Phase diagram, Lever rule, Gibbs phase rule. cooling curve for pure metal, binary solid solution and binary eutectic system. Iron – Iron Carbide equilibrium diagram. Micro constituents in Fe_3C diagram (Austenite, Ferrite, Cementite, Pearlite, Martensite, Bainite), Pearlite transformation.

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UNIT III **Ferrous and Nonferrous Alloy** **9 Hours**

Ferrous alloy: Effect of alloying elements on properties of steel (Mn, Si, Cr, Mg, V and W). Properties and applications of stainless steel and Tool steel.

Cast Iron-White, Malleable, Grey and Spheroidal Cast Iron-Properties and Applications

Non Ferrous alloy: Aluminium and its alloys, Copper and its alloys, Magnesium and its alloys, Titanium and its alloys, Nickel and its alloys- Composition, Properties and Applications.

Industrial standards for alloys and other materials - alloying elements and inclusion of ceramics materials.

UNIT IV **Powder Metallurgy** **9 Hours**

Need of powder metallurgy products-Advantages and limitation of P/M-Stages in P/M-Need for additives in P/M-secondary process of P/M products-mechanical-physical-chemical methods of powder production-compaction and sintering techniques of P/M-particle size analysis

UNIT V **Heat Treatment** **9 Hours**

Heat treatment process-purpose heat treatment – Process parameters. Bulk treatment: Annealing, Normalizing, Tempering, Quenching (Process parameter, application). Isothermal transformation Diagram (TTT Diagram). Cooling curves superimposed on TTT diagram.CCR. Harden ability- Definition. Method to determine Harden ability- Jominy end quench test.

Engineering Materials Lab **15 Hours**

1. Determine the hardness of the given specimen.
2. Determine the toughness of the given specimen.
3. Draw the microstructure of cast iron, steel and aluminum using Metallurgical microscope.
4. Prepare a specimen using mounting press for metallographic examination.
5. Microstructure characterization of the polished specimen.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the crystal parameters for different crystal structure and its influences on mechanical properties of bulk materials.	**Understand**
CO2: Analyze the phase diagram of an alloy by Gibbs phase rule and infer its property for a given composition.	**Understand**
CO3: Choose an appropriate Ferrous and Non ferrous nonferrous alloy for a suitable application.	**Understand**
CO4: Select an appropriate powder metallurgy technique, based on the functional requirement of the product.	**Understand**
CO5: Select an appropriate heat treatment process for the given ferrous alloy such as steel, cast iron for a suitable application.	**Understand**

Text Book(s):

T1. William D Callister "Material Science and Engineering", John Wiley and Sons, 2014.

T2. Sidney H Avner "Introduction to Physical Metallurgy", Tata McGRAW-Hill, 2017.

T3. Anup Goel, SS Sabharwal, "Engineering Materials and Metallurgy", Technical Publication, 2014.

Reference Book(s):

R1. Raghavan.V "Materials Science and Engineering", Prentice Hall of India Pvt., Ltd., 2015.

R2. Dieter G. E., "Mechanical Metallurgy", McGraw Hill Book Company, 2013.

R3. Kenneth G. Budinski. "Engineering Materials", Prentice Hall of India, New Delhi 2010.

R4. Y. Lakhtin, "Engineering Physical Metallurgy", CBS Publisher, New Delhi, 2012.

Web References:

1. **http://nptel.ac.in/courses/113106032/**
2. **http://www.nptel.ac.in/courses/112108150/**
3. **https://en.wikipedia.org/wiki/Materials_science**

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	2	1		2	2			3	2	3	1	3		
CO2	2	1		2	2			3	2	3	1	3		
CO3	3	2		3	3			3	2	3	1	3		
CO4	3	2		3	3			3	2	3	1	3		
CO5	2	1		2	2			3	2	3	1	3		

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,4	50	20
	CCET 2	2,3	50	
	Retest	1,2,3,4	50	
	CCET 3	5,6	50	
	Continuous Evaluation of Lab	1,2,3,4,5	20	20
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MECC3201	Course Title : ENGINEERING PRACTICES LABORATORY (Common to AU, ME, MC)		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Draw the basic symbols of electrical and electronic components and identify the elements.
2. Execute soldering practice for electrical and electronic circuits.
3. Demonstrate the basic carpentry, fitting, plumbing, sheet metal and welding operations.

List of Experiments:

[A] Electrical & Electronics :

1) Symbols of electrical and electronic components and study of electrical drawing.
2) Insulation Testing using Megger.
3) Soldering practice of simple circuit and testing.
4) Fluorescent tube, staircase and house wiring.
5) Verification of Kirchhoff's current and voltage law.

[B] Civil & Mechanical :

1) Make a wooden Tee joint to the required dimension.
2) Make a "V" filling to the required dimension using fitting tools.
3) Make a tray in sheet metal to the required dimension.
4) Assemble the pipeline connections with different joining components for the given layout.
5) Weld a butt joint using welding process to the required dimension.

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BOS Chairman

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Draw the basic symbols of electrical and electronic components from a given circuit.	Apply
CO2: Connect the electrical and electronic components andother house holding items as per the given circuit.	Apply
CO3: Verify the Kirchhoff's laws as per the given circuit.	Apply
CO4: Make a wooden 'T' joint, metal 'V' joint, sheet metal 'TRAY', pipeline with various joining components and a permanent joint using various workshop tools as per the given dimensions.	Apply
Reference(s):	
R1. Jeyachandran.K, Natarajan.S & Balasubramanian.S, "A Primer on Engineering Practices Laboratory", Anuradha Publications, TamilNadu (India), 2016. R2. 19EPL21 - Engineering practices laboratory Manual.	

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

Course Code: 19PSHG3002		Course Title: PERSONAL EFFECTIVENESS (Common to all B.E/B.Tech Programmes) (2019 Batch Only)	
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 0: 0: 2	Credits:1	Total Contact Hours:30	Max.Marks:100

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career and life.
2. Identify strength, weaknesses and opportunities.
3. Plan for achieving the goals.
4. Apply time management techniques.
5. Create time and pursue activities of self interest.

UNIT I The Importance of Envisioning

Importance of positive self-perception – Principle of dual creation (Everything gets created twice – Envisioning) - Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people – Importance of goal setting –Importance of planning and working to time.

UNIT II Fundamental Principles of Goal Setting and Working to Time

Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume.

UNIT III Goal Setting and Action Orientation

Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment – Importance of action orientation - Converting goals to actionable tasks – Establishing road map – Using Gantt chart for planning and progress.

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UNIT IV Time Management - Tools and Techniques

Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination.

UNIT V Putting into Practice

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes:

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

CO1: Identify the strengths, weaknesses and opportunities.

CO2: Set well-articulated goals for academics, career, and personal aspirations.

CO3: Establish the road map to realize the goals.

CO4: Apply time management techniques to complete planned tasks on time.

CO5: Create time and pursue activities of self-interest that add value.

Text book(s):

T1. Reading material, workbook and journal prepared by PS team of the college.

References:

R1. Stephen R Covey, "First things first", Simon & Schuster U.K, Aug 1997.

R2. Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster U.K, 2004.

Course offering:

Orientation programme (2 days)	CO1 and CO2
Student practice (weekly review classes)	CO3
Student journal writing (interim reviews)	CO4 and CO5

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19PSHG6001		Course Title: WELLNESS FOR STUDENTS (Common to all B.E/B.Tech Programmes) (2020 Batch Only)	
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 0: 0: 2	Credits:1	Total Contact Hours:30	Max.Marks:100

Course Objectives

The course is intended to

1. Set SMART goals for academic, career and life
2. Apply time management techniques
3. Articulate the importance of wellness for success in life.
4. Understand the dimensions of wellbeing and relevant practices
5. Demonstrate the practices that can promote wellness

Course content

UNIT I GOAL SETTING

Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

UNIT II TIME MANAGEMENT - TOOLS AND TECHNIQUES

Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

UNIT III PRACTICES FOR PHYSICAL WELLNESS

Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods

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BOS Chairman

Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

UNIT IV PRACTICES FOR MENTAL WELLNESS:

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas.

UNIT V PUTTING INTO PRACTICE

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Set well-articulated goals for academics, career, and personal aspirations	Understand
CO2: Apply time management techniques to complete planned tasks on time	Understand
CO3: Explain the concept of wellness and its importance to be successful in career and life	Understand
CO4: Explain the dimensions of wellness and practices that can promote wellness	Understand
CO5: Demonstrate the practices that can promote wellness	Understand

Text books

Reading material, workbook and journal prepared by PS team of the college.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Reference(s):

R1 Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.

R2 Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.

R3 Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, "Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, I Ed. (2010).

Course offering: (Annual Pattern)

CO1, CO2 and CO5	Can be conducted in Odd semester
CO3, CO4 and CO5	Can be conducted in Even semester
Student journal writing (interim reviews)	CO1 to CO5

Evaluation:

Continuous assessment: 75 marks

Personal Effectiveness = 35 marks (Odd Sem)

Yoga and physical Exercise (Even Sem)

Physical Exercises = 20 marks

Meditation = 10 marks

Assessment of student's workbook = 10 marks

End Semester Examination (combined for yoga and sports):

Written test (MCQ and short answers)	= 30 marks
Physical exercises	= 50 marks
Viva-voce	= 20 marks
Total	= 100 marks

End semester mark out of 100 is reduced to 25 marks.

The student should get a total of 50 marks put together for a pass.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19CHMG6201	Course Title: ENVIRONMENTAL SCIENCE (Common to all B.E/B.Tech Programmes)		
Course Category: Mandatory		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0: 0	Credits: 0	Total Contact Hours:15	Max. Marks: 0

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Create awareness for conservation and equitable use of natural resources.
2. Explain the measures of prevention of pollution and disaster management.
3. State the importance of environmental legislation in India.
4. Expose the general environmental issues relevant to human health.
5. Explain the innovative measures for day to day environmental issues.

UNIT I Natural Resoruces **2 Hours**

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT II Environmental Pollution And Disaster Management **2 Hours**

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

UNIT III Environmental Ethics And Legislations **2 Hours**

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

UNIT IV Environmental Issues And Public Awarness **2 Hours**

Public awareness - Environment and human health.

UNIT V Environmental Activities **7 Hours**

(a) Awareness Activities:

i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.

ii) Slogan making event.

iii) Poster making event.

(b) Actual Activities:

i) Plantation.

ii) Cleanliness drive.

iii) Drive for segregation of waste.

iv) To know about the different varieties of plants.

v) Shutting down the fans and ACs of the campus for an hour or so.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Create awareness for conservation and equitable use of natural resources.	**Understand**
CO2: Explain the measures of prevention of pollution and disaster management.	**Understand**
CO3: State the importance of environmental legislation in India.	**Understand**
CO4: Expose the general environmental issues relevant to human health.	**Understand**
CO5: Explain the innovative measures for day to day environmental issues.	**Understand**

TEXTBOOKS:

T1. Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T2. Mackenzie Davis and Susan Masten, "Principles of Environmental Engineering and science", Mc-Graw Hill, 3rd edition, 2014.

REFERENCES:

R1. Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.

R2. Cunningham, W.P.Cooper., T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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	2	1	1					1	1	1	1	1		
CO2	2	1	1					1	1	1	1	1		
CO3	2	1	1					1	1	1	1	1		
CO4	2	1	1					1	1	1	1	1		
CO5	2	1	1					1	1	1	1	1		

ASSESSMENT PATTERN

- Attendance : 10 Marks
- Knowledge Test : 40 Marks
- Activity(ies) : 50 Marks

Total Marks : 100

RUBRICS FOR ATTENDANCE

Component	Marks	Details
Attendance	10	Minimum 80%, 1 mark for each 5% observed
Knowledge Test	40	40 objective type questions from Induction Program
Activity(ies)	50	Rubrics based assessment

NON-LETTER GRADES

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

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BOS Convener

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BOS Chairman

Semester III

Course Code: 19MABC1301		Course Title: NUMERICAL METHODS (Common to AU & ME)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Matrices and Calculus

Course Objectives:

The course is intended to:

1. Solve the system of linear equations and calculate dominant Eigen value.
2. Solve the non-linear equations and apply the principle of least squares to fit a curve to the given data.
3. Interpolate the given data and calculate the numerical derivatives and integration.
4. Solve the initial value problems using numerical techniques.
5. Solve the boundary value problems using numerical techniques.

UNIT I Solution of System of Linear Equations and Eigen value 9+3 Hours

Solution of system of linear equations – Gauss elimination method – Crout's method – Iterative methods of Gauss Jacobi and Gauss Seidal method – Eigen values of matrix by Power method.

UNIT II Solution of Non-Linear Equations and Curve Fitting 9+3 Hours

Solution of non-linear equations: Method of false position - Newton Raphson method – Order of convergence. Curve fitting: Method of least square – Fit a straight line – Fitting a curve.

UNIT III Interpolation, Polynomial Approximation and Numerical Integration 9+3 Hours

Interpolation with equal intervals – Newton's forward and backward difference formulae – Interpolation with unequal interval – Lagrange's interpolation – Numerical differentiation – Numerical integration – Trapezoidal rule, Simpson's rule – Double integration using Trapezoidal rule.

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BOS Chairman

UNIT IV **Initial Value Problem for Ordinary Differential Equations** **9+3 Hours**

Single step methods – Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's and Adams method.

UNIT V **Boundary Value Problems in Ordinary and Partial Differential Equations** **9+3 Hours**

Solution of two dimensional Laplace's and Poisson's equations – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Determine the solution of system of linear equations and also calculate the dominant Eigen value of a matrix.	Apply
CO2: Determine the solution of non-linear equations using numerical techniques.	Apply
CO3: Interpolate the given data and obtain the derivatives and integral at the required points.	Apply
CO4: Determine the solution of initial value problems using numerical techniques.	Apply
CO5: Determine the solution of boundary value problems using numerical techniques.	Apply

Text Book(s):

T1. Erwin kreyzig, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons, 2015.

T2. Veerarajan T., "Engineering Mathematics for First Year" , Tata McGraw-Hill, New Delhi, 2011.

T3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 1st edition, 2017.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Reference Book(s):

R1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2010.

R2. N.P.Bali and Manish Goyel, "A Text book of Engineering Mathematics", Laxmi Publication, 9th edition, 2010.

R3. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc16_ma05
2. https://nptel.ac.in/courses/122101003/2

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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 Hours

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 Hours

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 Hours

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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BOS Convener

Approved in Academic Council meeting

BOS Chairman

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

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 Hours**

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.

Reference Book(s):

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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

High-3; Medium-2; Low-1

Assessment pattern:

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial	-	30	10
	Quiz	1,2,3,4,5		
	Assignment	1,2,3,4,5		
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MECC2301	Course Title: FLUID MECHANICS AND HYDRAULIC MACHINERY (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

Prerequisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

1. Apply mathematical knowledge to predict the properties and characteristics of a fluid.
2. Analyze and calculate major and minor losses associated with pipe flow.
3. Mathematically predict the nature of physical quantities.
4. Select a suitable hydraulic pump for the customer provided site conditions.
5. Select a suitable hydraulic turbine for the given rated parameters.

UNIT I Fluid Properties and Flow Characteristics 9 Hours

Fluid: definition, classification of fluids, units and dimensions. Properties of fluids: density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, capillarity and surface tension.

Flow characteristics, Continuity equation and Bernoulli's equation in 1-D, Hydraulic and energy gradient. Application of Bernoulli's equation to flow through pipes, venturi meters, orifice meters and Pitot tube.

UNIT II Flow Through Circular Conduits 9 Hours

Laminar and Turbulent flow though circular conduits, boundary layer concepts, boundary layer thickness. Darcy-Weisbach equation, Friction factor and Moody diagram, Minor and Major losses, Flow though pipes in series and in parallel.

UNIT III Dimensional Analysis 9 Hours

Need for dimensional analysis, methods of dimensional analysis, Buckingham's π theorem. Similitude, types of similitude, Dimensionless parameters, application of dimensionless parameters, Model analysis.

Passed in Board of Studies meeting

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BOS Chairman

UNIT IV Pumps **9 Hours**

Centrifugal pump: working principle and working principle, velocity triangles, Euler pump equation, various efficiencies and performance curves.

Reciprocating pump: classification, working principle, indicator diagram, work saved by air vessels - performance curves.

UNIT V Hydraulic Turbines **9 Hours**

Classification of turbines, heads and efficiencies, velocity triangles, Euler turbine equation. Pelton, Francis and Kaplan turbines, working principle and construction, work done by water on the runner, draft tube, performance curves, governing of turbines.

List of Experiments **30 Hours**

1. Determination of coefficient of discharge of given Orifice meter.
2. Determination of coefficient of discharge of given Venturimeter.
3. Determination of friction factor of given set of pipes.
4. Performance study of Centrifugal pumps
5. Performance study of reciprocating pumps.
6. Performance characteristics of a Pelton wheel.
7. Performance test on a Francis Turbine.
8. Performance test on a Kaplan Turbine

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply mathematical knowledge to predict the properties and characteristics of a fluid.	Apply
CO2: Analyze and calculate major and minor losses associated with pipe flow in piping networks.	Apply
CO3: Mathematically predict the nature of physical quantities.	Apply
CO4: Select a suitable hydraulic pump for the customer provided site conditions.	Apply
CO5: Select a suitable hydraulic turbine for the given rated parameters.	Apply

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Text Book(s):

T1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 5th edition, Laxmi Publications (P) Ltd., New Delhi, 2014.

T2. Vasandani, V.P., "Hydraulic Machines - Theory and Design", 4th edition Khanna Publishers, 2014.

Reference Book(s):

R1. White, F.M., "Fluid Mechanics", 5th Edition Tata McGraw-Hill,New Delhi, 2013

R2. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", 9th Edition McGraw-Hill education, 2017.

R3. Kumar, K.L., "Engineering Fluid Mechanics", 7th edition Eurasia Publishing House (P) Ltd., New Delhi, 2014.

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	Retest	1,2,3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MECN2301		Course Title: METROLOGY AND MEASUREMENTS	
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

- Engineering Drawing

Course Objectives

The course is intended to:

1. Explain tolerances and fits for parts and their assembly.
2. Select appropriate measuring instruments for given application.
3. Conduct measurement system analysis.
4. Explain physical measuring instruments.
5. Explain advanced measuring instruments.

UNIT I Fits and Tolerance 9 Hours

Definition of metrology – Types –requirements of metrology-Part tolerance: Nominal size-upper and lower specification-fundamental deviation-types of tolerance- importance of tolerance – selection of tolerance- tolerance grade- purpose of limits-types-importance of limits - Assembly tolerance: system and subsystem-importance of assembly tolerance-GD&T Symbols-datum-datum reference- Fits-Types-importance of fits-system of fit-selection of fit-application of fits.

UNIT II Measuring Instruments 9 Hours

Measuring instruments- types of measurements-variable-attributes, Linear measurements-Steel rule, Vernier caliper and its types, micrometer and its types, Height Vernier, Bore dial, Depth Vernier/ Micrometer, gauges -types , snap gauge, ring gauge ,plug gauge, thread gauge, types of comparators, mechanical, electrical, pneumatic comparator, Angular measuring instruments-Sine bar, Bevel protractor, Autocollimator, Angle dekkor, Form Measurements-Floating carriage micrometer, gear tooth Vernier caliper, surface roughness measurements, types of dimensions-functional –non-functional, different shapes of part- circular- prismatic component.

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BOS Chairman

UNIT III Measurement System Analysis 9 Hours

Static characteristics of measuring instruments- Accuracy, precision, sensitivity Threshold, Resolution, Repeatability, Reproducibility, Dead zone, backlash, hysteresis, Dynamic characteristics of an instrument- Speed of response, Fidelity, Lag, Dynamic error, Error, Classification of errors, Error Analysis, Calibration of an instrument.

UNIT IV Measuring Instruments for physical parameters 9 Hours

Flow and pressure measurement - Rotameter – Viscometer – pressure gauge. Vibration Measurement – Accelerometer. Speed measurement - Speedometer - Tachometer. Infrared thermometer - Principle and working. Electrical measurement instruments - Multimeter - Clampmeter. Light Measurement - Lux meter. Sound measurement - Sound meter.

UNIT V Advanced Measuring Instruments 9 Hours

Introduction - Mechanical Measuring Instruments - Coordinate Measuring Machine (CMM) - Importance - Types - Application. Roundness test - Importance - 3 Point Method - Rotational drum method. Roughness test - Terms of surface texture - Importance - Roughness tester. 2D Microhite – Applications. Metallurgical Instruments – Spectrometer. Laser interferometer - Laser metrology - Laser interferometer.

List of Experiments 30 Hours

1. Measure the dimension of the given component using Vernier caliper
2. Determine the diameter of a cylindrical component of accuracy 0.01 mm using micrometer
3. Measure the thickness of gear tooth using gear tooth Vernier
4. Measure the height of the given component using Vernier height gauge
5. Measure thread parameter using profile projector.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain tolerances and fits required to specify parts and their assembly.	Understand
CO2: Select appropriate measuring instruments for the given parts, dimensions and tolerance.	Understand
CO3: Conduct measurement system analysis for the chosen measuring instruments.	Understand
CO4: Explain general measuring instruments for physical parameters.	Understand

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

CO5: Explain advanced measuring instruments based on the application.	Understand

Text Book(s):

T1.Jain R.K., "Engineering Metrology", 21st Edition, Khanna Publishers, 2018.

T2. Bewoor, Vinay A Kulkarni, "Metrology and Measurements", 1st Edition, Mc Graw Hill, 2009.

T3.K.R.Gopalakrishna, "Machine Drawing" Subhas Publication, 2007.

Reference Book(s):

R1.P.S. Gill "Geometric Dimensioning and Tolerancing", 2nd Edition, S.K. Kataria & Sons 2019.

R2.Gupta S.C, "Engineering Metrology", 21st Edition, Dhanpat rai Publications, 2017.

R3.Beckwith, Marangoni, Lienhard, "Mechanical Measurements", 2nd Edition, Pearson Education, 2006.

Web References:

1. https://nptel.ac.in/courses/112106179/
2. https://www.engineersedge.com/video/Geometric_Dimensioning_and_Tolerancing/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	Retest	1,2,3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5.	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MECN1301	Course Title: MANUFACTURING PROCESSES		
Course Category: Practionary Courses		Course Level: Professional Core	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites:

- Physics for Mechanical Sciences
- Chemistry for Mechanical Sciences
- Engineering Practice Laboratory

Course Objectives:

The course is intended to:

1. Explain the metal casting and forging processes.
2. Explain the Plastic Moulding Processes.
3. Explain the metal forming and joining processes.
4. Explain the metal cutting processes.
5. Explain the metal Finishing processes.

UNIT I Metal Casting and Forging processes **10 Hours**

Introduction to metal casting processes, Pattern and its types, allowances for pattern, Sand casting process, Centrifugal casting process, Die Casting process, Furnace and its types, Defects in castings processes.

Introduction to Forging processes, Forging operations, Types of forging, forging machines, Defects in forgings processes, Rolling process and defects, Extrusion process, Wire and Rod drawing.

UNIT II Plastic Moulding Processes **8 Hours**

Introduction to plastic moulding process, Thermoplastics and thermosetting plastics, Compression moulding, Transfer moulding, Injection moulding, Blow Moulding, Moulding faults, causes and remedies.

UNIT III Metal Forming and Joining Processes **10 Hours**

Introduction to sheet metal process, Sheet metal forming process – Bending, Drawing, Blanking Coining, Embossing, Flanging, Rolling Processes - Sheet metal cutting process – Piercing, Trimming, Shaving process. Tubular forming and tubular cutting processes with applications, Types of dies, Defects in sheet metal forming process.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Introduction to welding process, Nomenclature of weld bead, Classification of welding, Types of welding joints, symbols and Positions, Types of welding - SMAW, GMAW (MIG / MAG), SAW and TIG, Electric resistance welding process - Spot, seam and projection welding, Gas welding process, Soldering and Brazing, Defects of welding with causes and remedies.

UNIT IV Metal Cutting Process **10 Hours**

Introduction to metal cutting processes, Cutting tool and its types, Types of Tool wear, Merchant's Circle, Lathe and its operations, Drilling machine – Types and operations, milling machine – Types and operations, Cutting fluids and its application.

UNIT V Metal Finishing Processes **7 Hours**

Introduction to Metal Finishing Processes, Grinding process - Cylindrical grinding, Surface grinding, Centre less grinding, Grinding wheel specifications, Super finishing processes - Need and its types with applications, Lapping, Honing, Burnishing, Buffing and Sandblasting processes.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Explain various types of metal casting and forging processes.	Understand
CO2: Explain various types of Plastic Moulding Processes.	Understand
CO3: Explain various types of metal forming and joining processes.	Understand
CO4: Explain various types of metal cutting processes.	Understand
CO5: Explain various types of metal Finishing processes.	Understand

Text Book(s):

T1. Serope Kalpakjian, "Manufacturing engineering and Technology", 7th Edition, Pearson Publishers, 2018.

T2. Chapman, W.A.J., "Workshop Technology, Vol – II", 4th Edition, Oxford & IBH Publishing Co. Ltd., 2007.

T3. Choudhry, S.K.H., "Elements of Work Shop Technology, VoL II", 15th Edition Media Promoters & Publishers, 2010.

T4. Allen; W. S. and Baker; P. N., "Hand Book of Plastic Technology, Volume-1, Plastic Processing Operations [Injection, Compression, Transfer, Blow Molding]", 1st Edition, CBS Publishers and Distributors, New Delhi, 2004.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Reference Book(s):

R1. Production Technology by HMT, Tata McGraw Hill Education ,2017.

R2. Er.R.K.Rajput, "A Textbook of Manufacturing Technology (Manufacturing Process)", 2nd Edition, Laxmi Publications, 2017.

R3. William F. Hosford & Robert M. Caddel, "Metal forming (Mechanics & Metallurgy)", 4th Edition, Prentice Hall Publishing Co., 2014.

R4. Micheli, Walter, "Plastics Processing: An Introduction", 1st Edition, Hanser Publishers, Munich, 1995.

Web References:

1. http://www.efunda.com/home.cfm
2. https://www.magicmarks.in/
3. https://www.accessengineeringlibrary.com/front
4. https://nptel.ac.in/courses/112105127/

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Passed in Board of Studies meeting

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Approved in Academic Council meeting

BOS Chairman

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MECN3301	Course Title: COMPUTER AIDED MODELING AND DRAFTING LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L:T:P: 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

- Engineering Drawing

Course Objectives

The course is intended to:

1. Create a CAD model as per the given part/assembly drawing.

LIST OF EXPERIMENTS

1. Construction of 2D sketches using AutoCAD.
2. Construction of 2D sketches with dimensions using AutoCAD.
3. Construction of simple 3D models with basic features using a CAD tool.
4. Construction of 3D models with advanced features such as holes, pattern, swept, and etc. using a CAD tool.
5. Develop the part drawing of 3D models using a CAD tool.
6. Develop the production drawing of given machine component using a CAD tool.
7. Develop the assembly drawing of given machine component using a CAD tool.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Create a CAD model as per the given part/assembly drawing with appropriate dimensions and tolerance using appropriate template.	Apply

Text Book(s):

T1. Cencil Jensen, Jay D.Helsel and Dennis R. Short, " Engineering Drawing and Design", Tata McGraw Hill India, New Delhi, 7th Edition, 2017.

T2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, Gujarat, 53rd edition, 2015.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

T3. K. V. Natrajan, "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 48th edition, 2018.

Reference Book(s):

R1 Louis Gary Lamit, "PTC Creo Parametric 3.0", Global engineering, Cengage learning, USA.

R2 John K.C., "Engineering Graphics", PHI Learning, Delhi, 1st edition, 2009.

R3 Dhananjay A. Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw India, New Delhi, 3rd edition, 2008.

Web References:

1. https://en.wikipedia.org/wiki/Engineering_drawing

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		2	2				2	2		1		

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	Marks	Total Marks
Continuous comprehensive Evaluation	Each Lab Experiment	75	100
	Cycle Test 1	50	
	Cycle Test 2	50	

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BOS Chairman

Course Code: 19MECN3302	Course Title: MANUFACTURING PROCESSES LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L:T:P: 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Course Objectives

The course is intended to:

1. Make a cast component
2. Machine a given workpiece
3. Make a forged component
4. Make a sheet metal component

LIST OF EXPERIMENTS

1. Preparation of sand mould using single piece / double piece pattern
2. Forging of round rod to square rod
3. Forming of cup using hydraulic press
4. Exercise on Turning of Shaft
5. Exercise on Key Way Milling of Shaft
6. Exercise on Gear Milling / Gear Shaping
7. Exercise on Grinding of Cylindrical Shaft
8. Exercise on Key Way Slotting in Gear
9. Exercise on Surface Grinding
10. Exercise on Drilling and Tapping
11. Exercise on Machining a Bolt using Capstan & Turret lathe

Course Outcomes

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Make a cast component using single piece / double piece pattern for the given design requirement.	Apply
CO2: Machine the given work piece using lathe, milling and drilling based on given drawing.	Apply
CO3: Make a forged component by hand forging process for the given design requirement.	Apply

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CO4: Make a sheet metal component by forming process for the given design requirement.	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	Marks	Total Marks
Continuous comprehensive Evaluation	Each Lab Experiment	75	100
	Cycle Test 1	50	
	Cycle Test 2	50	

End of Semester III

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Semester IV

Course Code: 19MABG1401	Course Title: PROBABILITY AND STATISTICS (Common to EE,EC,AU,CS,ME,IT & CE)		
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

- Nil

Course Objectives

The course is intended to:

1. Calculate expectations and variances of random variables
2. Apply the concepts of standard distributions to solve practical problems
3. Calculate the correlation and regression for two variables
4. Test the samples based on hypothesis
5. Analyze the samples based on variance

Unit I Probability and Random Variables 9+3 Hours

Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties.

Unit II Standard Distributions 9+3Hours

Binomial- Poisson- Uniform –Exponential- Normal Distributions and their properties-Functions of a random variable.

Unit III Two Dimensional Random Variables 9+3Hours

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables.

Unit IV Testing of Hypotheses 9+3Hours

Sampling Distributions- Testing of hypotheses for mean, variance, proportions and differences using Normal, t, Chi-Square and F distributions – Tests for independence of attributes and Goodness of fit.

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UNIT V Design of Experiments **9+3 Hours**

Analysis of Variance (ANOVA)- One way Classification – Completely Randomized Design(CRD) – Two way Classification – Randomized Block Design (RBD) – Latin square.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Calculate expectations and variances of random variables	Apply
CO2: Apply the concepts of standard distributions to solve practical problems	Apply
CO3: Calculate the correlation and regression for two variables	Apply
CO4: Test the samples based on hypothesis	Apply
CO5: Analyze the samples based on variance	Apply

Text Book(s):

T1. Veerajan T, "Probability, Statistics and Random process", 3rd Edition, Tata McGraw-Hill, New Delhi, 2017.

T2. Dr.J.Ravichandran, "Probability and Statistics for Engineers", 1stEdition, Wiley India Pvt.Ltd.,2010.

Reference Book(s):

R1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition Pearson Education, Asia, 2013.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 4th Edition Tata McGraw Hill edition, 2012.

R3. Morris DeGroot, Mark Schervish, "Probability and Statistics", Pearson Educational Ltd, 4th Edition, 2014.

Web References:

1. **https://onlinecourses.nptel.ac.in/111105041/**
2. **https://nptel.ac.in/downloads/111105041/**
3. **https://nptel.ac.in/courses/111105090/**

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Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern:

	Assessment Component	CO .No.	Marks	Total
Continuous Assessment	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial / Quiz / Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

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 Hours**

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 Hours**

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 Hours**

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 Hours**

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 Hours**

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 Hours**

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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BOS Chairman

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/

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	Retest	1,2,3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

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BOS Chairman

Course Code: 19MECN2401	Course Title: THEORY OF MACHINES		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 2: 1: 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. Calculate kinematic parameters of simple mechanisms.
2. Calculate static and dynamic forces for the given mechanism.
3. Calculate the balance masses required in revolving & reciprocating applications.
4. Calculate the kinematic parameters of spur gear and gear trains.
5. Analyze single degree of freedom free and forced vibration system.

Unit I Mechanism Analysis **6+3 Hours**

Relative and absolute velocities and acceleration in linkages - Vector loop representation - position, velocity and acceleration analyses of four bar and slider crank mechanisms using graphical method. Instantaneous centres of rotation – Kennedy's theorem – procedure for locating instantaneous centres of four bar and slider crank mechanisms. Synthesis of four bar mechanisms.

Unit II Force analysis in mechanisms **6+3 Hours**

Applied and constrained forces, Static equilibrium conditions of two and three force members, Problems in static force analysis of four bar mechanism. D'Alembert's principle, Dynamic force analysis in reciprocating engine- Gas forces, Bearing loads, Crank shaft Torque. Turning moment diagrams, Flywheels, Coefficient of fluctuation of Energy and speed, mass of flywheel required.

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Unit III **Balancing of rotating and reciprocating masses** **6+3 Hours**

Static and dynamic balancing - balancing of rotating masses - balancing of single rotating mass by a single mass in the same plane. Balancing of single rotating mass by two masses in different plane and balancing of several rotating masses in the same plane, balancing of several masses in different planes - balancing of reciprocating masses-balancing of primary and secondary unbalanced forces of reciprocating masses. Partial balancing in IC engines.

Unit IV **Kinematics of spur gear and gear trains** **6+3 Hours**

Types of gears – spur gear terminology – law of gearing - conjugate profile – cycloidal and involute tooth profile – length of path of contact – length of arc of contact – contact ratio – interference – number of teeth on pinion to avoid interference.

Classification of gear trains – calculation of velocity ratio of simple, compound and epicyclic (tabular column method) gear trains.

Unit V **Longitudinal vibrations** **6+3 Hours**

Types of vibrations – basic elements of vibrating system – Degrees of Freedom – free longitudinal vibration of Single Degree of Freedom (SDOF) system: governing equation and natural frequency using equilibrium method and energy method – equivalent springs and dampers – free damped vibration of SDOF system: governing equation – under damped, critical damped and over damped systems – damping ratio – logarithmic decrement – force damped vibration – magnification factor – vibration isolation and transmissibility.

List of Experiments: **30 Hours**

1. Balancing of reciprocating masses and rotating masses.
2. Compound gear train.
3. i)Single degree of freedom system- spring mass system.
   ii) Vibration table.
4. Whirling of the shaft.
5. Torsional vibration - two rotor system.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Calculate position, velocity and acceleration of four bar and slider crank mechanisms using algebraic method and graphical method.	Apply
CO2: Calculate the static and dynamic forces for equilibrium of the given a slider crank or a four bar mechanism.	Apply
CO3: Calculate the balance masses required and its location in revolving & reciprocating applications	Apply
CO4: Calculate the kinematic parameters of spur gear and velocity ratio of simple, compound and epicyclic gear trains.	Apply
CO5: Analyze single degree of freedom longitudinally vibrating systems for free and forced vibrations with undamped and damped conditions.	Apply

Text Book(s):

T1 S.S. Rattan, "Theory of Machines", McGraw Hill Education, 4th Edition. 2017.

T2 Norton, R.L., "Kinematics and Dynamics of Machinery", Tata McGrawHill Education Pvt. Ltd., New Delhi, SI Edition 2014.

Reference Book(s):

R1 Gordon R. Pennock & Joseph E. Shigley John J. Uicker, "Theory Of Machine And Mechanisms Si Edition", Oxford University Press, 4th Edition 2014.

R2 Sadhu Singh, "Theory of Machines: Kinematics and Dynamics", Pearson Education India; 3rd Edition 2011.

R3 R.S. Khurmi, J.K. Gupta, "Theory of Machines", S.Chand, 14th Edition. 2005.

Web References:

1. **https://nptel.ac.in/courses/112104121/**
2. **https://nptel.ac.in/courses/112101096/**

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BOS Convener

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Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	Retest	1,2,3,4	50	
	CCET III	5	50	
	Continuous Assessment – Practical	1,2,3,4,5	75	10
	Final Assessment – Practical	1,2,3,4,5	50	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Passed in Board of Studies meeting

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BOS Chairman

Course Code: 19MECN1401	Course Title: MANUFACTURING TECHNOLOGY		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites:

- Physics for Mechanical Sciences
- Chemistry for Mechanical Sciences
- Engineering Practice Laboratory

Course Objectives:

The course is intended to:

1. Select appropriate manufacturing methods.
2. Understand the feasibility and economics.
3. Impart basic knowledge about the process planning.
4. Understand the concept of inspection procedure and corrective actions.
5. Explain advances in manufacturing technology.

UNIT I Selection of manufacturing processes **9 Hours**

Physical, mechanical and metallurgical properties of parts produced by different manufacturing processes, Selection of manufacturing process based on size, geometry, process complexity, functionality of parts and types of loads acting on parts. Selection of tools, tool holding devices and work holding devices. Selection of manufacturing process for general engineering applications – Case studies.

UNIT II Economics in the manufacturing process **9 Hours**

Inhouse manufacturing technology - Concept of Production volume, Delivery schedule. Cost and delivery time analysis- Cost calculation procedure for machining & welding process. Parameters and calculation of forces during forging processes. Calculation of cutting speed, feed, depth of cut, machining time and Material removal rate for machining operation. Parameters and calculation of forces during forming and rolling processes.

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UNIT III **Process Planning** **9 Hours**

Process planning, Factors affecting process planning, Role of process planning in the production cycle, Route sheet and operations sheet, Contents of a process planning sheet, Preparation of a process planning sheet, Assembly practice – Manufacturing and assembly, Selective assembly, Process planning in assembly, Handling and transportation of assembly.

UNIT IV **Product Inspection Procedure and Corrective actions** **9 Hours**

Raw material Inspection procedure - Physical distortions (bending, twisting, scratch, surface corrosion). Chemical composition, Physical verification procedure - parts, sub assembly and assembly. Functional inspection - Testing procedure of sub-assembly with corrective action, Case studies on development of various new products based on the need of customer.

UNIT V **Advances in Manufacturing Technology** **9 Hours**

Unconventional machining processes – Classification, Working principle of AWJM, EDM, LBM and application. Additive manufacturing - Classification, Working principle of SLS, SLA and FDM, Application with case studies. Introduction on MEMS,NEMS, Electronics manufacturing technology and IIoT.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Choose appropriate manufacturing methods for given parts based on part functions, applications, geometry, and materials.	Apply
CO2: Evaluate the manufacturing process based on feasibility and economics to achieve part specification.	Apply
CO3: Prepare process planning sheet for given parts.	Apply
CO4: Analyze the deviation on the parts and decide the corrective action.	Apply
CO5: Explain various advanced technologies for current manufacturing scenario	Understand

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BOS Chairman

Text Book(s):

T1. Serope Kalpakjian, "Manufacturing engineering and Technology", 7th Edition, Pearson Publishers, 2018.

T2. Mikell P. Groover, "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", 7th edition, Wiley Publishers, 2019

T3. Rao P N, "Manufacturing Technology, Vol 2, Metal Cutting and Machine Tools", 2nd Edition, Tata McGraw Hill, New Delhi, 13th reprint 2012.

Reference Book(s):

R1. Kapil Gupta, "Advanced Manufacturing Technologies: Modern Machining, Advanced joining and sustainable Manufacturing" Springer Publisher, 2017.

R2. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 2016

R3. Prasad R., "Surface Mount Technology – Principles and practice", 2nd Edition, Chapman and Hall, 1997,

Web References:

1. http://www.efunda.com/home.cfm
2. https://www.magicmarks.in/
3. https://www.accessengineeringlibrary.com/front
4. https://nptel.ac.in/courses/112105127/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	1		2	2			2	1	2		1		
CO2	2	1		2	2			2	1	2		1		
CO3	2	1		2	2			2	1	2		1		
CO4	2	1		2	2			2	1	2		1		
CO5	1	1		1	1			2	1	2		1		

High-3; Medium-2; Low-1

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET 1	1,2	50	30
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code:19MECN3401	Course Title: MANUFACTURING TECHNOLOGY LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L:T:P: 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

- Manufacturing Processes Laboratory

Course Objectives

The course is intended to:

1. Develop a process plan for manufacturing of components.
2. Use various manufacturing process to complete the given components/assembly.

LIST OF EXPERIMENTS

1. Prepare a process plan for the selected product from the product bank.
2. Calculate different process parameters, forces and levels for manufacturing the component.
3. Manufacture the components of the product using various manufacturing processes.
4. Prepare an inspection sheet for the component.
5. Analyze the deviation and perform the corrective action.

Course Outcomes

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop a process plan to manufacture the components of selected product.	Apply
CO2: Use Lathe, Drilling, Milling, Slotting and grinding machines to manufacture a component.	Apply

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	2	1		2	2				2	2		1		
CO2	2	1		2	2				2	2		1		

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	**Marks**	**Total Marks**
Continuous comprehensive Evaluation	Each Lab Experiment	75	100
	Cycle Test 1	50	
	Cycle Test 2	50	

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Course Code: 19PSHG6002	Course Title: UNIVERSAL HUMAN VALUES 2 :UNDERSTANDING HARMONY (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities		Course Level: Practice	
L:T:P (Hours/Week) 2: 1: 0	Credits:3	Total Contact Hours:45	Max. Marks:100

Pre-requisites

- 19SHMG6101- Induction Program (UHV1)

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act

Unit I Introduction to Value Education **6+3**

Need for the Value Education;. Self -exploration as the process for value education ; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities ; Happiness and Prosperity: current scenario ; Method to fulfill the Basic human aspirations

Unit II Harmony in Human Being **6+3**

Human being as a co-existence of self ('I') and the material 'Body'; needs of Self ('I') and 'Body'; The Body as an instrument of 'I' ; Harmony in the self('I'); Harmony of the self('I') with body ;Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III Harmony in the Family and Society **6+3**

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmony in the society (society being an extension of family); Vision for the universal human order

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Unit IV Harmony in the Nature 6+3

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

Unit V Harmony on Professional Ethics 6+3

Natural acceptance of human values ;Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics ;Case study: holistic technologies, management models and production systems ;Strategy for transition towards value based life and profession

Course Outcomes	Affective Level
At the end of this course, students will be able to:	
CO1. Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO2. Appraise physical, mental and social well being of self and practice techniques to promote well being.	Responding
CO3. Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO4. Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO5. Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Text Book(s):

T1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

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Web References:

- https://aktu.ac.in/hvpe/ResourceVideo.aspx
- http://hvpenotes.blogspot.com/
- https://nptel.ac.in/courses/109/104/109104068/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

As per AICTE guidelines, the following are the assessment pattern prescribed:

1. **Socially relevant project/Group Activities/ Assignments:** **20 marks**
   a. One assignment per Module with 20 marks each
   b. Average of all assignments
2. **Assessment by faculty mentor:** **10 marks**
   a. Based on attendance and engagement
3. **Self-assessment:**
   10 marks
   a. Based on individual behavioural change: Case study of their own
4. **Assessment by peers:**
   10 marks
   a. Based on 2 friends about their behavioural change
5. **Semester End Examination: (3 hours)**
   50 marks
   a. Part A – Objective type – 20x 1 = 20 marks
   b. Part B – Short answer questions – 15x 2 = 30 marks

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Assessment Pattern

	Assessment component	CO No.	Marks	Total marks weightage
Continuous assessment	Socially relevant project/Group Activities/ Assignments	1,2,3,4,5	20	75%
	Assessment by faculty mentor		10	
	Self-assessment		10	
	Assessment by peers		10	
End Semester Examination	Part A – Objective type – 20x1=20 marks Part B – Short answer questions – 15x 2 = 30 marks Part C – Descriptive Type Questions (Either or Pattern) – 5 x 10 = 50 marks	1,2,3,4,5	100	25%
			Total	100%

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Course Code: 19MEPN6401		Course Title: MINI - PROJECT	
Course Category: Project		Course Level: Practice	
L:T:P (Hours/Week) 0: 0: 4	Credits: 2	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Take up any challenging practical problems and find solution by formulating proper methodology.
2. Work collaboratively on a team to successfully complete a design project
3. Effectively communicate the results of projects in a written and oral format

The objective of Project I is to enable the student to take up investigative study in the broad field of Mechanical Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

1. Survey and study of published literature on the assigned topic.
2. Working out a preliminary Approach to the Problem relating to the assigned topic.
3. Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility.
4. Preparing a Written Report on the Study conducted for presentation to the Department.
5. Final Seminar, as oral Presentation before a departmental committee.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Take up any challenging practical problems and find solution by formulating proper methodology.	Apply
CO2: Work collaboratively on a team to successfully complete a design project	Apply
CO3: Effectively communicate the results of projects in a written and oral format	Apply

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Course Code: 19MEPN6001		Course Title: INTERNSHIP OR SKILL DEVELOPMENT	
Course Category: Project		Course Level: Practice	
L:T:P (Hours/Week) 2 Weeks	Credits: 1	Total Contact Hours: Nil	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Understand industry-specific terminology and practices
2. Solve simple industrial problems
3. Work collaboratively on a team
4. Effectively communicate the activities of internship in a written and oral format

Minimum of two weeks in an Industry in the area of Mechanical Engineering. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her. The outcome of the internship should be presented in the form of a report.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Understand industry-specific terminology and practices	Apply
CO2: Solve simple industrial problems	Understand
CO3: Work collaboratively on a team	Apply
CO4: Effectively communicate the activities of internship in a written and oral format	Understand

End of Semester IV

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