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. Mechatronics Engineering

Semesters I to IV

Regulations 2019

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

Department of Mechatronics Engineering

Vision

To develop competent Mechatronics Engineers and Entrepreneurs with the social and environmental awareness

Mission

- To impart high quality inter disciplinary knowledge of Mechatronics Engineering through excellence in teaching, research and entrepreneurship.
- Develop Mechanical and Electronic design and test skills of the graduates to fulfill the industrial requirements.
- Create awareness among students for global needs of society and innovate machinery according to engineering needs.
- Enhance the Communication, learning and administrative skills of the graduates to become socially responsible engineers and entrepreneurs.

OBE Coordinator | Programme Coordinator | Head of the Department

Head - OBE

Dr. Mahalingam College of Engineering and Technology, Pollachi – 642003.
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Programme: B.E. Mechatronics Engineering

Programme Educational Objectives (PEOs) - Regulations 2019

B.E. Mechatronics Engineering graduates will:

PEO1. Develop innovative and sustainable products with multidisciplinary Engineering expertise.

PEO2. Solve complex engineering problems by applying mechanical, electrical and computer knowledge and engage in lifelong learning in their profession.

PEO3. Work or pursue higher education in multicultural, multilingual and multinational environment with competent oral and written communication.

PEO4. Lead and contribute in a team entrusted with professional, social and ethical responsibilities.

Programme Outcomes (POs) - Regulations 2019

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

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design and development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

OBE Coordinator | Programme Coordinator | Head of the Department

Head - OBE

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

OBE Coordinator | Programme Coordinator | Head of the Department

Head - OBE

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Programme Specific Outcomes (PSOs) - Regulations 2019

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

PSO1. Design and develop Mechatronics systems to solve the complex engineering problem by integrating electronics, mechanical and control systems.

PSO2. Apply the engineering knowledge to conduct investigations of complex engineering problem related to instrumentation, control, automation, robotics and provide solutions.

OBE Coordinator

Programme Coordinator

Head of the Department

Head - OBE

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

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Programme: B.E Mechatronics 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, PR, EC, EI, EE
19ENHG2101	Communication Skills - I	2	0	2	3	100	All
19PHBC2101	Physics for Mechanical Sciences	3	0	2	4	100	AU, CE, ME, MC, PR, EE
19CSSC2001	C Programming	3	0	2	4	100	AU, ME, MC, PR
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU, ME, MC, PR, CS, IT, EC, EI
19PSHG3001	Wellness for Students	0	0	2	1	100	All
Total		**13**	**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, 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	ME,PR,AU,MC
19MECC3201	Engineering Practices Laboratory	0	0	3	1.5	100	AU, ME, MC, PR
19PSHG3002	Personal Effectiveness	0	0	2	1	100	All
19CHMG1201	Environmental Science	1	0	0	0		All
Total		**13**	**1**	**16**	**19.5**	**700**	

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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Programme: B.E Mechatronics Engineering
2019 Regulations
Curriculum for Semesters I to IV

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

Semester I (2020Batch)

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, PR, EC, EI, EE
19ENHG2101	Communication Skills - I	2	0	2	3	100	All
19PHBC2101	Physics for Mechanical Sciences	3	0	2	4	100	AU, CE, ME, MC, PR, EE
19CSSC2001	C Programming	3	0	2	4	100	AU, ME, MC, PR
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU, ME, MC, PR, CS, IT, EC, EI
19PSHG6001	Wellness for Students*	0	0	2	-	-	All
Total		**12**	**1**	**12**	**17.5**	**500**	

Semester II (2020Batch)

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	ME,PR,AU,MC
19MECC3201	Engineering Practices Laboratory	0	0	3	1.5	100	AU, ME, MC, PR
19PSHG6001	Wellness for Students*	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	-	All
Total		**13**	**1**	**13**	**19.5**	**700**	

*Annual Pattern

Passed in Board of Studies meeting

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BOS Chairman

Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1302	Numerical Methods and Linear Algebra	3	1	0	4	100	EE, EC, EI,MC
19MESC2301	Fluid Mechanics and Hydraulic Machinery	3	0	2	4	100	AU,ME,MC
19MCSN1301	Basics of Electrical and Electronics Engineering	3	0	0	3	100	MC
19MCCN1301	Sensors and Instrumentation	3	0	0	3	100	MC
19MESC1301	Engineering Mechanics	3	1	0	4	100	AU, ME,MC
19MCCN3301	Computer Aided Machine Drawing Laboratory for Mechatronics	0	0	3	1.5	100	MC
19MCSN3301	Basics of Electrical and Electronics, Instrumentation Laboratory	0	0	3	1.5	100	MC
XXXXXXXXXX	One Credit Course	0	0	2	1	100	AU,ME,MC
Total		**15**	**2**	**10**	**22**	**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,MC,CS,IT, EC,EE
19MESC2401	Strength of Materials	3	0	2	4	100	AU,ME,MC
19MCCN1401	Theory of Machines	3	1	0	4	100	MC
19MCCN2401	Electrical Drives and Control	3	0	2	4	100	MC
19MCCN3401	Theory of Machines Laboratory For Mechatronics	0	0	3	1.5	100	MC
19PSHG6002	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
19MCPN6401	Mini – Project	0	0	4	2	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
Total		**15**	**2**	**11**	**23.5**	**800**	

Course Code	Course Title	Duration	Credits	Marks
19MCPN6001	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			
	Microprocessor and Microcontroller Applications	3	0	2	4	100	MC
	Artificial Intelligence and Machine Learning	4	0	0	4	100	MC
	Control Systems	3	1	0	4	100	MC,EE,EI
	Manufacturing Technology	3	0	0	3	100	MC
	Professional Elective – I	3	0	0	3	100	MC
	Professional Elective –II (Online)	3	0	0	3	100	MC
	Open Elective – I	3	0	0	3	100	All
	CAM Laboratory	0	0	3	1.5	100	MC
	Employability Skills	0	0	2	1	100	All
Total		**22**	**1**	**7**	**26.5**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Industrial Automation	3	0	2	4	100	MC
	Design of Machine Elements	4	0	0	4	100	MC
	Professional Elective – III	3	0	0	3	100	MC
	Professional Elective –IV (Online)	3	0	0	3	100	MC
	Open Elective – II	3	0	0	3	100	-
	Fluid Power Laboratory	0	0	3	1.5	100	MC
	Campus to Corporate	0	0	2	1	100	ALL
	Innovative and Creative Project	0	0	4	2	100	-
Total		**16**	**0**	**11**	**21.5**	**800**	

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			
	Robotics and Machine Vision System	4	0	0	4	100	MC
	Data Science	4	0	0	4	100	MC
	Internet of Things	4	0	0	4	100	MC
	Professional Elective – V	3	0	0	3	100	MC
	Professional Elective – VI	3	0	0	3	100	MC
	Open Elective – III	3	0	0	3	100	
	Simulation and Analysis Laboratory	0	0	3	1.5	100	MC
	Robotics and Machine Vision System Laboratory	0	0	3	1.5	100	MC
	Internet of Things Laboratory	0	0	3	1.5	100	MC
Total		**21**	**0**	**9**	**25.5**	**900**	

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): 170

Total Credits (2020 Batch onwards): 170

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Professional Electives

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
Design							
	Design for Manufacture, Assembly and Environment	3	0	0	3	100	-
	Design of Transmission system	3	0	0	3	100	-
	Turbo Machinery	3	0	0	3	100	-
	Automotive Engine and its systems	3	0	0	3	100	-
	Finite Element Analysis	3	0	0	3	100	-
	Design of Mechatronic systems	3	0	0	3	100	-
	Product Design and Development	3	0	0	3	100	-
	Composite Materials	3	0	0	3	100	-
	Finite Element Analysis	3	0	0	3	100	-
Manufacturing and Management							
	Unconventional Machining Processes	3	0	0	3	100	-
	Flexible Manufacturing systems	3	0	0	3	100	-
	Additive Manufacturing	3	0	0	3	100	-
	Automobile Engineering	3	0	0	3	100	-
	Disaster Management	3	0	0	3	100	-
	Principles of Management	3	0	0	3	100	-
	Industrial safety Management	3	0	0	3	100	-
	Non- Destructive Testing Methods	3	0	0	3	100	-
	Maintenance Engineering	3	0	0	3	100	-
	Quality Engineering	3	0	0	3	100	-
Electronics, Control and Networking							
	Machine Learning	3	0	0	3	100	-
	Industrial Internet of Things	3	0	0	3	100	-
	Micro Electro Mechanical systems	3	0	0	3	100	-
	Hybrid Electric Vehicles	3	0	0	3	100	-
	Digital control Engineering	3	0	0	3	100	-

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Open Electives

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
	Machine Vision and Image Processing	3	0	0	3	100
	Medical Mechatronics	3	0	0	3	100
	Field and service robots	3	0	0	3	100
	Soft Robotics	3	0	0	3	100
	Optimization techniques	3	0	0	3	100

Legend for identification of course category (Digit No. 5 in course code)

B	BASIC SCIENCE
S	ENGINEERING SCIENCE
H	HUMANITIES
C	CORE
E	ELECTIVE
O	OPEN ELECTIVE
I	INDUSTRY OFFERED COURSE
R	REVISION IN SYLLABUS
V	OCC
P	PROJECT / SKILL DEVELOPMENT /INTERNSHIP
M	MANDATORY NON CREDIT COURSE

Passed in Board of Studies meeting

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BOS Chairman

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

Passed in BOS meeting held on 21.04.20

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BOS Chairman

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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BOS Convener

BOS Chairman

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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BOS Convener

BOS Chairman

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

Passed in BOS meeting held on 21.04.20

BOS Convener

BOS Chairman

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.

Passed in BOS meeting held on 21.04.20

BOS Convener

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 BOS meeting held on 21.04.20

BOS Convener

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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BOS Chairman

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**

Passed in BOS meeting held on 21.04.20

BOS Convener

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 BOS meeting held on 21.04.20

BOS Convener

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.

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UNIT IV **Pointers, Structures & Union** **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

Passed in BOS meeting held on 21.04.20

BOS Convener

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/**

Passed in BOS meeting held on 21.04.20

BOS Convener

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	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 BOS meeting held on 21.04.20

BOS Convener

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.

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Unit V **Isometric Projection** **12 Hours**

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.

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

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

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BOS Convener BOS Chairman

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 BOS meeting held on 21.04.20

BOS Convener

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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BOS Chairman

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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BOS Convener

BOS Chairman

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

Passed in BOS meeting held on 21.04.20

BOS Convener

BOS Chairman

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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BOS Chairman

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 BOS meeting held on 21.04.20

BOS Convener

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 BOS meeting held on 21.04.20

BOS Convener

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.

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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 BOS meeting held on 21.04.20

BOS Convener

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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BOS Chairman

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

Passed in BOS meeting held on 21.04.20

BOS Convener

BOS Chairman

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 BOS meeting held on 21.04.20

BOS Convener

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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BOS Convener

BOS Chairman

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

Passed in BOS meeting held on 21.04.20

BOS Convener

BOS Chairman

Course Code: 19MESC2201		Course Title: Engineering Materials (Common to AU,MC, ME)	
Course Category: Basic 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 Fe3C 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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BOS Chairman

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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BOS Convener

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	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 BOS meeting held on 21.04.20

BOS Convener

BOS Chairman

Course Code: 19MECC3201	Course Title :Engineering Practices Laboratory (Common to AU, ME, MC)		
Course Category: Engineering Science		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 Convener

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 BOS meeting held on 21.04.20

BOS Convener

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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BOS Chairman

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 BOS meeting held on 21.04.20

BOS Convener

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

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 Convener

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 BOS meeting held on 21.04.20

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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 BOS meeting held on 21.04.20

BOS Convener

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.

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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.

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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

BOS Chairman

SEMESTER III

Course Code: 19MABC1302	Course Title: Numerical Methods and Linear Algebra (Common to EE,EC, EI and MC)		
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
- Ordinary Differential Equation and Complex variables

Course Objectives

The course is intended to:

1. Solve the system of linear equations, nonlinear equations & calculate the dominant Eigen value.
2. Determine the unknown values from the given set of data & Compute derivatives and integrals.
3. Solve first ordinary differential equation.
4. Apply the concept of vector spaces to electrical network problems
5. Apply the concept of Inner product spaces in Fourier approximation

Unit I Solution of System Of Linear Equations 9+3 Hours

Solution of system of linear equations– Direct methods: Gaussian elimination method – Indirect methods: Gauss Jacobi method, Gauss-Seidel method– sufficient conditions for convergence – Solution of nonlinear equations: Newton Raphsonmethod –Power method to find the dominant Eigen value and the corresponding Eigen vector.

Unit II Interpolation, Numerical Differentiation And Integration 9+3 Hours

Newton's forward, backward interpolation — Lagrange's interpolation. Numerical Differentiation and Integration — Trapezoidal rule — Simpson's 1/3 rule — Double integration using Trapezoidal rule.

Unit III Numerical Solution Of Ordinary Differential Equation 9+3 Hours

Numerical solution of first order ordinary differential equation-Single step method: Taylor's series-Euler's method - Runge-Kutta method of fourth order — Multi step method: Milne's and Adams – Bash forth predictor corrector methods for solving first order equations.

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Unit IV Vector Spaces **9+3 Hours**

System of linear equations -Vector spaces- Subspace of a vector space- basis and dimension of vector space - linear combination and spanning sets of vectors -linear independence and linear dependence of vectors-Row space, Column space and Null space- Rank and nullity of subspaces. Applications to linear equations: Simple electrical network problems to find loop current using Kirchhoff's voltage law.

Unit V Orthogonality And Inner Product Spaces **9+3 Hours**

Inner product of vectors: length of a vector, distance between two vectors, and orthogonality of vectors-Orthogonal projection of a vector-Gram-Schmidt process to produce orthogonal and orthonormal basis -Inner product spaces- Fourier approximation of continuous functions using inner product spaces.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Solve the system of linear equations, nonlinear equations & calculate the dominant Eigen value.	Apply
CO2: Determine the unknown values from the given set of data & Compute derivatives and integrals.	Apply
CO3: Solve first ordinary differential equation.	Apply
CO4: Apply the concept of vector spaces to electrical network problems.	Apply
CO5: Apply the concept of Inner product spaces in Fourier approximation	Apply

Text Book(s):

T1. Grewal, B.S. and Grewal, J. S., "Numerical Methods in Engineering and Science", Eleventh Edition, Khanna Publishers, New Delhi, 2013.

T2. David C Lay, "Linear Algebra and its Applications', Fifth Edition, Pearson Education, 2015.

Reference Book(s):

R1. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2006.

Passed in BoS meeting held on 21.04.2020

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R2.Jain M. K., Iyengar, S. R. and Jain, R. K, "Numerical Methods for Scientific and Engineering Computation', New Age Publishers, 2012.

R3.Sastry.S.S "Introductory Methods of Numerical Analysis", 3 Edition, PHI, 2003.

R4.Gilbert Strang, "Linear algebra and its Applications', Fourth Edition, Cengage Learning India Private Limited, 2012.

Web References:

1. http://nptel.ac.in/courses/122104018/node2.html
2. http://nptel.ac.in/courses/111105038/

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	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 I	1,2	50	30
	CCET II	3,4	50	
	Retest	1,2,3,4	50	
	CCET III	5	50	
	Tutorial	1,2,3,4,5	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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MESC2301	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

Pre-requisites

- 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, venturimeters, orificemeters 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.

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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.

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: Calculate the properties of real fluids such as water, oils and mercury.	Apply
CO2: Determine the flow properties of ideal fluid by applying the kinematic and dynamic principles.	Apply
CO3: Determine flow rates and head losses in real fluids under viscous and turbulent flows.	Apply

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CO4: Evaluate the performance of impulse and reaction turbines under various loading and head conditions.	Apply
CO5: Evaluate the performance of rotary and reciprocating pumps under various head conditions.	Apply

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", Khanna Publishers, 2014.

Reference Book(s):

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

R2.Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 2013.

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

Web References:

1. 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	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 Comprehensive Evaluation	CCET 1	1,2	50	20
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	

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	CCET 3	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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCSN1301	Course Title: Basics of Electrical and Electronics Engineering		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours: 45	Max Marks: 100

Pre-requisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

1. Understand the Basic Electric circuit laws and Theorems.
2. Construct the single phase and three phase AC circuits and Loads
3. Explain the working principles of Electrical Machines
4. Outline the working principles of Special Electrical Machines
5. Illustrate the working principle of various electronic devices

Unit I DC Circuits **9 Hours**

Basic circuit components – Ohms Law, Kirchoff's Law, Resistors in series and parallel circuits - – Mesh current and node voltage method of analysis for D.C circuits- Thevenin's Theorem, Norton's Theorem.

Unit II AC Circuits **9 Hours**

Introduction to AC circuits – waveforms and RMS value – power and power factor, star delta conversion - single phase and three-phase balanced circuits – Three phase loads.

Unit III Electrical Machines **9 Hours**

Principles of operation and characteristics of - DC Machines (Shunt motor, Shunt Generator), AC Machines - Induction motors (three phase and single phase), Transformers (single phase)

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Unit IV **Special Electrical Machines** **9 Hours**

Constructional feature, working principle, Phasor diagram, Performance and Application - Brushless D.C. machines, Stepper Motors, Universal Motor, AC Servo motor, DC Servomotor

Unit V **Electronic Devices and Circuits** **9 Hours**

Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction – Forward and Reverse Bias –Semiconductor Diodes –Bipolar Junction Transistor – Characteristics – Field Effect Transistors – Transistor Biasing

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Illustrate the Basic Electric circuit laws and Theorems.	Understand
CO2: Apply the electrical concepts for single phase and three phase circuits for balanced loads	Apply
CO3: Outline the working principles of Electrical Machines	Understand
CO4: Explain the working principles of Special Electrical Machines	Understand
CO5: Compare the working principle of various electronic devices	Understand

Text Book(s):

T1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuits Analysis,Tata McGraw Hill publishers, 7th edition, New Delhi, 2007.

T2. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016

T3. Thereja .B.L., "Fundamentals of Electrical Engineering and Electronics", S. Chand & Co. Ltd., 2008

Reference Book(s):

R1. Del Toro, "Electrical Engineering Fundamentals", Pearson Education, New Delhi, 2007

R2. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006

R3. Allan S Moris, "Measurement and Instrumentation Principles", Elsevier, First Indian Edition, 2006

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R4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2007.

R5. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, "Basic Electrical Engineering", McGraw Hill Education(India) Private Limited, 2009

R6. N K De, Dipu Sarkar, "Basic Electrical Engineering", Universities Press (India)Private Limited 2016

R7. P. S. Bimbra, Generalized Theory of Electrical Machines, Khanna Publication

Web References:

1. https://nptel.ac.in/courses/108108076/
2. https://nptel.ac.in/courses/108105053/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2					1	2	2	2	1	1		1
CO2	3	2					1	2	2	2	1	1		1
CO3	3	2					1	2	2	2	1	1		1
CO4	3	2					1	2	2	2	1	1		1
CO5	3	2					1	2	2	2	1	1		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	
	Assignment	1,2,3,4,5	10	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				**100**

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCCN1301	Course Title: Sensors and Instrumentation		
Course Category: Professional Core		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 0	Credits: 3	Total Contact Hours: 45	Max Marks: 100

Pre-requisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

1. Classify the transducers and instruments based on their working principles, characteristics and order of the system.
2. Summarize the principle and application of resistance transducers.
3. Summarize the principle and application of variable inductance and capacitance transducers.
4. Illustrate the advanced types of transducers.
5. Explain the principle of signal conditioning and data acquisition

Unit I Measurement Systems **9 Hours**

Generalized Measurement System – Performance Characteristics: Static and Dynamic Characteristics – Generalized Performance of Zero Order, First Order Systems – Classifications of Transducers.

Unit II Variable Resistance Transducers **9 Hours**

Principle of operation, construction details, characteristics and application of potentiometer, strain gauge, resistance thermometer, Thermistor, hot-wire anemometer, piezo resistive sensor and humidity sensor.

Unit III Variable Inductance and Capacitance Transducers **9 Hours**

Induction potentiometer – Variable reluctance transducers – Principle of operation, construction details, characteristics and application of LVDT –Capacitive transducer and types – Capacitor microphone.

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Unit IV Special Transducers **9 Hours**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors –Piezoelectric – Tactile sensors, Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors , MEMS & Nano Sensors

Unit V Signal Conditioning and Data Acquisition **9 Hours**

Amplification, Filtering – Level conversion – Linearization - Buffering – Sample and Hold circuit – Quantization – Multiplexer / Demultiplexer – Analog to Digital converter – Digital to Analog converter- Data Acquisition -Data Logging.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Classify the transducers and instruments based on their working Principles, characteristics and order of the system.	Understand
CO2. Describe the working principle, Construction, Characteristics and Application of Resistance type transducers.	Understand
CO3. Describe the working principle, Construction, Characteristics and Application of capacitive and inductive type transducers	Understand
CO4. Explain the working principle, Construction and Application of advanced type of transducers.	Understand
CO5. Explain the DAQ systems with different sensors for real time applications.	Understand

Text Book(s):

T1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009

T2. Sawney A K and PuneetSawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, DhanpatRai& Co, New Delhi, 2013.

Reference Book(s):

R1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.

R2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 2009.

Web References:

1. https://nptel.ac.in/courses/108/108/108108147/
2. https://nptel.ac.in/courses/108/108/108108113/
3. https://nptel.ac.in/courses/108/105/108105064/

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Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	3		2								1		1	1
CO2	3		2								1			2
CO3	3		3								1		1	
CO4	3		2								1		2	
CO5	3		3								1		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
	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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MESC1301	Course Title: Engineering Mechanics (Common to AU, ME and 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 **12 Hours**

Fundamental laws of mechanics (Review) – Free body 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 Geometric Properties of Lamina and Bodies **12 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.

Unit III Force Analysis of Beams, Frames and Machines **12 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, wedge and screw.

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Unit IV **Introduction to Mechanisms** **12 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: peucelliar straight line mechanism, Ackermann steering mechanism, pantograph, Geneva mechanism.

Unit V **Kinetics of Rigid Body** **12 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:	
CO6. Develop the free body diagram of particles and rigid bodies such as beams, frames and machines under static and dynamic conditions.	Apply
CO7. Select reinforcement shapes/structures to modify centroids, centre of gravity and moment of inertia to meet the given requirements	Apply
CO8. Determine various forces on rigid bodies such as beams, frames and machines under static conditions.	Apply
CO9. Determine the degrees of freedom of given mechanism.	Apply
CO10. Calculate the kinetic parameters of rigid bodies for dynamic equilibrium.	Apply

Text Book(s):

T1. R C Hibbeler, "Engineering mechanics – Statics and Dynamics", Twelfth Edition, Pearson, New Delhi, 2009.

T2. F.P. Beer and Jr. E.R. Johnston, "Vector Mechanics for Engineers – Statics and Dynamics", TATA McGraw Hill publishing company, New Delhi, 2012

Reference Book(s):

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

R2. Irving H. Shames, "Engineering mechanics – Statics and Dynamics", Fourth Edition, Pearson, New Delhi, 2005

Web References:

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BoS Convener

BoS Chairman

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

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
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 Assessment	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
	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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCCN3301	Course Title : Computer Aided Machine Drawing Laboratory for Mechatronics		
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

- Engineering Graphics

Course Objectives

The course is intended to:

1. Explain drawing Standards, Limits, Fits and Tolerances
2. Develop part models and Draft
3. Prepare Assembly model and Assembly drawing

Unit I Drawing Standards **3 Hours**

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, and fasteners – Reference to hand book for the selection of standard components such as bolts, nuts, screws, keys.

Unit II Fits and Tolerances **6 Hours**

Limits, fits and tolerances-need, types, representation of tolerances on drawing, calculation of minimum and maximum clearances and allowances.
Geometric tolerance- types of form and position tolerances, symbols, method of indicating geometric tolerances on part drawings.

Unit III Computer Aided Assembly and Detailed Drawing Exercises **36 Hours**

1. Part Modeling of Flange Coupling
2. Assembly modeling and drawing of Flange coupling
3. Part Modeling of Screw jack
4. Assembly modeling and drawing of Screw jack
5. Part Modeling of Plummer Block
6. Assembly Modeling and drawing of Plummer Block

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BoS Convener

BoS Chairman

7. Part Modeling of Robot arm
8. Assembly Modeling and drawing of Robot arm

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Explain drawing Standards, Limits, Fits and Tolerances	Understand
CO2. Develop part models and Draft as per the drawing standards.	Apply
CO3. Prepare assembly drawings of automobile components to understand the assembly process.	Apply

Reference(s):

R1. Gopalakrishna K.R., "Machine Drawing", 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013.

R2. Bhatt, N.D., (1999), Machine Drawing, Published by R.C.Patel, Chartstar Book Stall, Anand, India.

R3. Faculty of Mechanical Engineering, PSG College of Technology, "Design Data Book", Kalaikathir Achagam, Coimbatore, 2012.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

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BoS Convener

BoS Chairman

Assessment pattern

	Assessment component	CO. No.	Marks	Total Marks
Continuous Assessment	Each Lab Experiment	1,2,3	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	1,2,3	50	
	Total			**100**

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCSN3301	Course Title: Basics of Electrical, Electronics and Instrumentation Laboratory		
Course Category: Engineering Science		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours: 45	Max Marks: 100

Pre-requisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

1. Demonstrate circuit laws and Theorems using simple Electric Circuits.
2. Design and test simple Electronic circuits using diodes and transistors
3. Determine the characteristics of different transducers

List of Experiments

1. Verification of Circuit Laws
2. Verification of Circuit Theorems
3. Diode based application circuits
4. Transistor based application circuits
5. Displacement measurement using potentiometer and LVDT and plotting the characteristic curves.
6. Characteristics and calibration of strain gauge and Load Cell
7. Temperature measurement using Thermocouple, Thermistor and RTD and comparing the characteristics.
8. Characteristics of Capacitive Transducer
9. Characteristics of Hall Effect Transducer
10. Design and testing of sample and hold circuit

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BoS Chairman

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Demonstrate circuit laws and Theorems using simple Electric Circuits.	Understand
CO2: Design and test simple Electronic circuits using diodes and transistors	Apply
CO3: Determine the characteristics of different transducers	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	CO. No.	Marks	Total Marks
Continuous Assessment	Each Lab Experiment	1,2,3	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	2,3	50	
	Total			100

End of Semester III

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BoS Chairman

SEMESTER IV

Course Code: 19MABG1401	Course Title: Probability and Statistics (Common to All Branches)		
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. Apply 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+3 Hours**

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

Unit III Two Dimensional Random Variables **9+3 Hours**

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

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Unit IV **Testing of Hypotheses** **9+3 Hours**

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.

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: Apply the samples based on variance	Apply

Text Book(s):

T1. Dr.J.Ravichandran, "Probability and Statistics for Engineers", 1st Edition, Wiley India Pvt.Ltd.,2010.

T2. Douglas C.Montgomery and George C. Runger, "Applied Statistics and Probability for Engineers", 6th Edition, Wiley India Pvt.Ltd.,2017.

T3. Veerarajan T, "Probability, Statistics and Random process", 4th Edition, Tata McGraw-Hill, New Delhi, 2013.

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, 2016.

R2. M.R. Spiegel,J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 3rd Edition,Tata McGraw Hill edition, 2009.

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

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BoS Convener

BoS Chairman

R4. Johnson and C.B. Gupta,"Probability and Statistics for Engineers", 9th Edition,Pearson Education, Asia, 2016.

Web References:

1. https://onlinecourses.nptel.ac.in/111105041/
2. https://nptel.ac.in/courses/111105090/
3. https://nptel.ac.in/courses/111104075/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3	2			2	2	3		2		
CO2	3	3		3	2			2	2	3		2		
CO3	3	3		3	2			2	2	3		2		
CO4	3	3		3	2			2	2	3		2		
CO5	3	3		3	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	1,2,3,4,5	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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MESC2401	Course Title: Strength of Materials (Common to AU, ME & MC)		
Course Category: Engineering Science		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 Hardness Number of metals by Brinell and Rockwell Hardness tester.
5. Estimate the stiffness and modulus of rigidity of the helical spring by Compression test.

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

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BoS Convener

BoS Chairman

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", Prentice-Hall of India, New Delhi, 2013.

T2. James M Gere, "Mechanics of Materials", Cengage Learning, India, 2012.

Reference Book(s):

R1. Rattan SS "Strength of Materials" Tata McGraw-Hill Education Pvt Ltd., New Delhi, 2011.

R2. Beer F. P. and Johnston R," Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002.

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

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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 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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCCN1401	Course Title: Theory of Machines (Common to ME & MC)		
Course Category: Professional Core		Course Level: Theory	
L:T:P(Hours/Week) 3: 1: 0	Credits: 4	Total Contact Hours: 60	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. Perform static and dynamic force analysis and balancing of revolving and Reciprocating masses.
3. Calculate the kinematic parameters of spur gear and gear trains.
4. Analyze single degree of freedom free and forced vibration system.
5. Analyze natural frequency and mode shapes of the transverse and torsional vibration systems.

Unit I Mechanism analysis **9+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 **9+3 Hours**

Static force analysis of four bar and slider crank mechanisms using analytical method – Force analysis in engines: gas forces – crank effort – bearing thrust.

Unit III Balancing of rotating and reciprocating masses **9+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

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BoS Convener

BoS Chairman

in different planes - balancing of reciprocating masses-balancing of primary and secondary unbalanced forces of reciprocating masses. Partial balancing in locomotive engines – balancing of coupled locomotives.

Unit IV **Kinematics of spur gear and gear trains** **9+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** **9+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.

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: Perform static and dynamic balancing of revolving & reciprocating masses.	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.

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BoS Convener

BoS Chairman

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/

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; Medium1-2; 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	
	Assignment	1,2,3,4,5	10	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				**100**

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCCN2401	Course Title: Electrical Drives and Control		
Course Category: Programme Core		Course Level: Introductory	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours: 75	Max Marks: 100

Pre-requisites

- Basics of Electrical and Electronics Engineering

Course Objectives

The course is intended to:

1. Summarize electrical drives and its control
2. Explain the characteristics of DC drives with different control techniques
3. Compare the characteristics of AC drives with different stator side control.
4. Explain the operating principle of special electrical drives
5. Choose an electrical drive for an applications

Unit I Introduction **9 Hours**

Fundamentals of electric drives - characteristics of loads — different types of mechanical loads — four quadrant operation of electric drive- control circuit components: Fuses, circuit breakers, contactors, relays

Unit II Speed Control of DC Machines **9 Hours**

Constructional features and working principle of a DC machine - Speed Torque characteristics of DC shunt & series motor — Methods of Speed control - Solid state DC drives: bridge rectifier fed DC drives, Chopper fed DC drives, Static Ward Leonard method.

Unit III Speed Control of AC Machines **9 Hours**

Constructional details of induction motors — Types of rotors — Principle of operation —Slip - Speed torque Characteristics of Induction motors — speed control using: pole changing, stator frequency variation, stator voltage variation - basic inverter fed induction motor drive - variable voltage variable frequency drive.

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Unit IV **Special Electrical Drives & Controls** **9 Hours**

Stepper motor: Constructional and working — applications -BLDC motor: Constructional and working — applications — encoders - AC and DC Servo Motor: Constructional and working — applications.

Unit V **Control and Selection of Electric Drives** **9 Hours**

Microcontroller, PLC & PC based control - Selection of an electric drive —IP classes -insulation testing and classes of electric motors - SF motors - continuous, intermittent and short time duty — Selection of drive for home appliances, machine tools, automobile applications, locomotives and steel rolling mills.

List of Experiments **30 Hours**

1. Draw the load characteristics of DC shunt motor
2. Draw the load characteristics of DC series motor.
3. Draw the load characteristics of 3 phase Induction motor.
4. Draw the speed control curves of DC shunt motor
5. Draw the speed control curves of 3 phase Induction motor using VFD.
6. Draw the speed control curves of DC shunt motor using Bridge rectifier.
7. Demonstrate the position control of stepper motor.
8. Demonstrate insulation testing of motors using megger.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Demonstrate an electrical drives and its control to operate in different modes.	Understand
CO2: Compare the characteristics of DC drives with different control techniques such as field and armature control.	Understand
CO3: Illustrate the characteristics of AC drives with different stator side control.	Understand
CO4: Relate the operating principle of special electrical drives such as stepper, BLDC and servo drive.	Understand
CO5: Choose an electrical drive for applications such as residential and industrial.	Understand

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Text Book(s):

T1.NE De and P.K Sen "Electric Drive&' Prentice Hall of India Private Ltd., 2012.

T2.VedamSubramaniam "Electric Drives" Tata McGraw HIN, New Delhi, 2010.

Reference Book(s):

R1. Bhattacharya Brinjinder Singh S.K, "Control of Electrical Machines" New Age International Publishers, 2006.

R2. Dubey.G.K., "Fundamental of Electrical Drives", Narosa publishing House, New Delhi 2013.

R3. Krishnan R, "Electric motor drives Modeling, analysis and control", Pearson Education, New Delhi, 2003.

Web References:

1. https://nptel.ac.in/courses/108108077/

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

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 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 BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCCN3401	Course Title: Theory of Machines Laboratory For Mechatronics		
Course Category: Engineering Science		Course Level: Practice	
L:T:P(Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours: 45	Max Marks: 100

Pre-requisites

- Engineering Mechanics
- Strength of Materials

Course Objectives

The course is intended to:

1. Apply the concepts of displacement, velocity, and acceleration to analyze mechanisms
2. Construct characteristic curve for governor
3. Manipulate the gyroscopic couple and moment of inertia for a given application.
4. Perform static and dynamic balancing of rotating and reciprocating masses.
5. Calculate natural frequency of forced and free vibrations

List of Experiments

1.Kinematics of 4 bar mechanisms — Slider crank and Crank Rocker Mechanism - Determination of velocity and acceleration.

2.Kinematics of Universal Joints — Determination of velocity and acceleration

3.Kinematics of Gear Trains —Determination of velocity ratio and Torque

4.Governors - Determination of sensitivity, effort, etc. for Watt, Porter, Proell, Spring controlled Governors

5.Motorized Gyroscope-Verification of laws -Determination of gyroscopic couple.

6.Whirling of shaft-Determination of critical speed of shaft with concentrated loads.

7.Balancing of reciprocating masses and rotating masses

8.Determination of moment of inertia by oscillation method for connecting rod and flywheel.

9.Determination of transmissibility ratio - vibrating table.

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BoS Convener

BoS Chairman

10.Vibrating system — spring mass system —Determination of damping co-efficient of single degree of freedom system.

11.Determination of torsional frequencies for compound pendulum and flywheel system with lumped Moment of inertia.

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Demonstrate the concepts of displacement, velocity, and acceleration to analyze mechanisms	Apply
CO2: Determine the characteristic curve for governor	Apply
CO3: Demonstrate the gyroscopic couple and moment of inertia for a given application.	Apply
CO4: Examine static and dynamic balancing of rotating and reciprocating masses.	Apply
CO5: Illustrate natural frequency of forced and free vibrations	Apply

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Assessment pattern

Continuous Assessment	**Assessment component**	**CO. No.**	**Marks**	**Total Marks**
	Each Lab Experiment	1,2,3	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	2,3	50	
	Total			**100**

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19PSHG6002		Course Title: Universal Human Values 2 :Understanding Harmony	
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

- Induction Program (UHV 1)

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

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

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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 wellbeing of self and practice techniques to promote wellbeing.	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: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, 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.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx
2. http://hvpenotes.blogspot.com/
3. 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

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BoS Convener

BoS Chairman

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	
EndSemester 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%

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCPN6401	Course Title: Mini - Project (Common to all B.E/B.Tech Programmes)		
Course Category: Project		Course Level: Practionary	
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 object 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.

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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.	Understand
CO2: Work collaboratively on a team to successfully complete a design project	Understand
CO3: Effectively communicate the results of projects in a written and oral format	Understand

Passed in BoS meeting held on 21.04.2020

BoS Convener

BoS Chairman

Course Code: 19MCPN6001	Course Title: Internship (Common to all B.E/B.Tech Programmes)		
Course Category: Project		Course Level: Practice	
L:T:P (Hours/Week) 2 Weeks	Credits: Nil	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	Understand
CO2: Solve simple industrial problems	Understand
CO3: Work collaboratively on a team	Understand
CO4: Effectively communicate the activities of internship in a written and oral format	Understand

Passed in BoS meeting held on 21.04.2020

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End of Semester IV

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