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. Automobile Engineering

Semesters I to IV

Regulations 2019

Department of Automobile Engineering

Vision

To offer cutting-edge technology in the broad area of automobile engineering and develop globally competitive engineers

Mission

- To develop automobile engineering graduates for a successful career in automotive industry around the globe through effective teaching-learning and training
- To develop the capability of graduates for creating innovative products/ systems to enhance the quality of life
- To inculcate in them the ability to solve societal problems through engineering and professional skills

OBE Coordinator

Programme Coordinator

Head of the Department

Head - OBE

Programme: B.E. Automobile Engineering

Programme Educational Objectives (PEOs) – Regulations 2019

B.E. Automobile Engineering graduates will:

PEO1.Technical expertise: Actively apply technical and professional skills in engineering practices to face industrial challenges around the globe

PEO2.Higher studies and research: Own their professional and personal development by continuous learning to create new knowledge

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

Programme Outcomes (POs) – Regulations 2019

On successful completion of B.E. Automobile 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/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

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

OBE Coordinator | Programme Coordinator | Head of the Department

Head - CEE

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

Programme Specific Outcomes (PSOs) - Regulations 2016

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

PSO1. Analyze the systems behavior and optimize for the results using modeling, simulation and experiments.

PSO2. Design automotive components with due considerations of environment and sustainability.

OBE Coordinator

Programme Coordinator

Head of the Department

Head - OBE

Dr. MAHALINGAM COLLEGE OF TECHNOLOGY, POLLACHI

2019 REGULATION -COURSE CODE GENERATION PROCEDURE FOR UG COURSES

1	2	3	4	5	6	7	8	9	10
1	9	A	U						

REGULATION

BOARD /DEPARTMENTS	
CHARACTER TYPE-ALPHABET	
AU	AUTO
CE	CIVIL
CS	CSE
EC	ECE
EE	EEE
EI	EIE
IT	IT
ME	MECH
MC	MECHATRONICS
PR	PRODUCTION
CH	CHEMISTRY
EN	ENGLISH
MA	MATHS
PH	PHYSICS
PS	PROFESSIONAL SKILLS

SEMESTER NUMBER	
CHARACTER TYPE-NUMBER	
1to8	SEMESTER
0	FLOATINGSEMESTER

MODE OF ASSESSMENT	
CHARACTER TYPE-NUMBER	
1	THEORY
2	THEORY WITH PRACTICALCOMPONENT
3	PRACTICAL
4	PRACTICALWITHTHEORY COMPONENT
5	THEORY WITH SELFSTUDY COMPONENT
6	CUSTOMIZED

SEQUENCE NUMBER
CHARACTERTYPE-NUMBER
01,02,03….99

COURSE TYPE	
CHARACTER TYPE – ALPHABET	
B	BASIC SCIENCE
S	ENGINEERING SCIENCE
H	HUMANITIES
C	PROFESSIONAL CORE
E	PROFESSIONAL ELECTIVE
O	OPENELECTIVE
I	INDUSTRY OFFERED COURSE
R	MEJOR REVISION IN SYLLABUS
V	OCC
P	PROJECT SKILLDEVELOPMENT/INTERNSHIP
M	MANDATORY NON – CREDIT COURSE

COMMON TOANY BOARD/DEPARTMENTS	
CHARACTERTYPE-ALPHABET	
G	GENERIC (COMMON TOALL BRANCHES–ex COMMUNICATION SKILLS)
N	NON COMMON COURSE(INDIVIDUAL)
C	COMMON COURSE(ex COMMON TO EC, EE, EI)

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Programme: B.E Automobile Engineering
2019 Regulations
Curriculum for Semester 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,EC, EE, EI MC, ME
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19PHBC2101	Physics for Mechanical Sciences	3	0	2	4	100	AU, MC, ME
19CSSC2001	C Programming	3	0	2	4	100	AU, MC, ME
19MESC4001	Engineering Drawing	1	0	3	2.5	100	AU, CS, IT,EC, EI, MC, ME
19PSHG3001	Wellness for Students	0	0	2	1	100	All
TOTAL		12	1	11	18.5	600	

Semester II (2019 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1201	Ordinary Differential Equations and Complex Variables	3	1	0	4	100	AU, CE, EC, EE, EI, MC, ME
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19CHBC2201	Chemistry for Mechanical Sciences	3	0	2	4	100	AU, MC, ME
19MESC2001	Introduction to Engineering	2	0	2	3	100	AU, EC, EE, EI, MC, ME
19MESC2201	Engineering Materials	2	0	2	3	100	AU, MC, ME
19MECC3201	Engineering Practices Laboratory	0	0	3	1.5	100	AU, MC, ME
19PSHG3002	Personal Effectiveness	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
TOTAL		13	1	13	19.5	800	

Passed in Board of Studies meeting
BOS Convener

Approved in Academic Council meeting
BOS Chairman

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Programme: B.E Automobile Engineering
2019 Regulations
Curriculum for Semester I to IV

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

Semester I (2020 Batch)

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

Semester II (2020 Batch)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1201	Ordinary Differential Equations and Complex Variables	3	1	0	4	100	AU, CE, EC, EE, EI, MC, ME
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19CHBC2201	Chemistry for Mechanical Sciences	3	0	2	4	100	AU, MC, ME
19MESC2001	Introduction to Engineering	2	0	2	3	100	AU, EC, EE, EI, MC, ME
19MESC2201	Engineering Materials	2	0	2	3	100	AU, MC, ME
19MECC3201	Engineering Practices Laboratory	0	0	3	1.5	100	AU, MC, ME
19PSHG6001	Wellness for Students*	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	100	All
TOTAL		**13**	**1**	**13**	**19.5**	**800**	

*Annual Pattern

Passed in Board of Studies meeting

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Semester III

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABC1301	Numerical Methods	3	1	0	4	100	AU, ME
19MESC1301	Engineering Mechanics	3	1	0	4	100	AU, MC, ME
19MECC2301	Fluid Mechanics and Hydraulic Machinery	3	0	2	4	100	AU, MC, ME
19AUCN1301	Production Processes	3	0	0	3	100	-
19AUSN2301	Automotive Engines	3	0	2	4	100	-
19AUCN3301	Production Technology Laboratory	0	0	3	1.5	100	-
19AUCN3302	Modeling and Drafting of Automotive Components Laboratory	0	0	3	1.5	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	All
TOTAL		**15**	**2**	**12**	**23**	**800**	

Semester IV

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABG1401	Probability and Statistics	3	1	0	4	100	AU, CE,CS, EC, EE, IT, ME
19MECC2401	Strength of Materials	3	0	2	4	100	AU, MC, ME
19AUCN1402	Mechanics of Machines	3	1	0	4	100	-
19AUCN2401	Automotive Electrical and Electronics	3	0	2	4	100	-
19AUCN3401	Fuel, Engine Performance and Emission Testing Laboratory	0	0	3	1.5	100	-
19PSHG6002	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
19AUPN6401	Mini – Project	0	0	4	2	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
TOTAL		**14**	**3**	**13**	**23.5**	**800**	

Course Code	Course Title	Duration	Credits	Marks
19AUPN6001	Internship or Skill Development*	2 or 4 Weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

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Tentative Curriculum for Semesters V to VIII

Semester V

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Problem Solving & Python	3	0	0	3	100	-
	Design of Automotive Elements	3	1	0	4	100	-
	Applied Thermodynamics & Heat Transfer	3	1	0	4	100	-
	Professional Elective – I	3	0	0	3	100	-
	Open Elective – I	3	0	0	3	100	-
	Approved Online Course-I	3	0	0	3	100	-
	Automotive Chassis and Transmission	3	0	2	4	100	-
	Vehicle Maintenance Laboratory	0	0	3	1.5	100	-
	Employability Skills-I	0	0	2	1	100	All
TOTAL		**21**	**2**	**7**	**26.5**	**900**	

Semester VI

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Finite Element Analysis	3	1	0	4	100	-
	Data Science	3	0	0	3	100	-
	Automotive Embedded System	3	0	2	4	100	-
	Professional Elective - II	3	0	0	3	100	-
	Open Elective - II	3	0	0	3	100	-
	Approved Online Course-II	3	0	0	3	100	-
	Innovative and Creative Project	0	0	4	2	100	-
	Employability Skills-II	0	0	2	1	100	All
TOTAL		**18**	**1**	**8**	**23**	**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			
	Artificial Intelligence and Machine Learning	3	0	0	3	100	-
	Electric Vehicle Technology	3	0	0	3	100	-
	Vehicle Dynamics	3	1	0	4	100	-
	Professional Elective – III	3	0	0	3	100	-
	Professional Elective – IV	3	0	0	3	100	-
	Open Elective - III	3	0	0	3	100	-
	Simulation and Analysis Laboratory	0	0	3	1.5	100	-
	IoT Laboratory	0	0	3	1.5	100	-
TOTAL		**18**	**1**	**6**	**22**	**800**	

Semester VIII

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
	Project Work	0	0	12	8	200	-
TOTAL		**0**	**0**	**12**	**8**	**200**	

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

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits(2019 Batch only): 170

Total Credits(2020 Batch onwards): 169

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Professional Electives

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
Design Stream							
	Mechanics of Road Vehicles	3	0	0	3	100	-
	Electric, Hybrid and Fuel Cell Vehicles	3	0	0	3	100	-
	Vehicle Safety and Comfort Systems	3	0	0	3	100	-
	Hydraulic and Pneumatic Systems	3	0	0	3	100	-
	Automotive Aerodynamics	3	0	0	3	100	-
	Noise, Vibration and Harshness	3	0	0	3	100	-
	Off Road Vehicles	3	0	0	3	100	-
	Design for Sheet Metal	3	0	0	3	100	-
	Design for Manufacturing and Assembly	3	0	0	3	100	-
Manufacturing Stream							
	Unconventional Machining Processes	3	0	0	3	100	-
	Non-Destructive Testing Methods	3	0	0	3	100	-
	Product Life Cycle Management	3	0	0	3	100	-
	Computer Integrated Manufacturing	3	0	0	3	100	-
	Lean Manufacturing	3	0	0	3	100	-
	Logistics Engineering	3	0	0	3	100	-
	Composite Materials	3	0	0	3	100	-
	Production of Automobile Components	3	0	0	3	100	-
	Jigs and Fixtures	3	0	0	3	100	-
	Welding and Joining Technologies	3	0	0	3	100	-

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Automobile and Service Stream							
	Alternative Fuels for IC Engines	3	0	0	3	100	-
	Automotive Fuels and Lubricants	3	0	0	3	100	-
	Automotive Pollution Control	3	0	0	3	100	-
	Automotive Air Conditioning Systems	3	0	0	3	100	-
	Vehicle Body Engineering	3	0	0	3	100	-
	Vehicle Maintenance	3	0	0	3	100	-
	Transport Management	3	0	0	3	100	-
	Reliability and Maintenance Engineering	3	0	0	3	100	-
	Industrial Safety Management	3	0	0	3	100	-
	Quality Engineering	3	0	0	3	100	-
	Engineering Economics and Cost Analysis	3	0	0	3	100	-

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BOS Chairman

Open Electives

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
	Environmental Impact Assessment	3	0	0	3	100
	Safety Engineering	3	0	0	3	100
	Geographical Information System	3	0	0	3	100
	Human Computer Interaction	3	0	0	3	100
	Management Information Systems	3	0	0	3	100
	Data Science Using Hadoop	3	0	0	3	100
	Artificial Intelligence	3	0	0	3	100
	Soft Computing	3	0	0	3	100
	Electric and Hybrid vehicles	3	0	0	3	100
	Solar Energy System	3	0	0	3	100
	Energy Auditing and Conservation	3	0	0	3	100
	Applied Design Thinking	3	0	0	3	100
	Industrial Internet of Things	3	0	0	3	100
	Smart Sensor Technology	3	0	0	3	100
	Virtual Instrumentation	3	0	0	3	100
	Open Source Technologies	3	0	0	3	100
	Multimedia Systems and Applications	3	0	0	3	100
	Cyber Law and Information Security	3	0	0	3	100
	E-Commerce	3	0	0	3	100
	User Interface Design	3	0	0	3	100
	Disaster Management	3	0	0	3	100
	Software Modeling-Principles and Practices	3	0	0	3	100
	Automation Systems	3	0	0	3	100
	Total Quality Management	3	0	0	3	100
	Machine Vision and Image Processing	3	0	0	3	100

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	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
	Industrial Automation and Robotics	3	0	0	3	100
	Entreprenuership Development	3	0	0	3	100

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2019 REGULATIONS

Detailed Syllabi for Semester I to IV

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

Pre-requisites

- Nil

Course Objectives

The course is intended to:

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

List of Activities:

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

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

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
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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Semester- I

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

Pre-requisites:

- 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.

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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.

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

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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.

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

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 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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BOS Convener

Approved in Academic Council meeting
BOS Chairman

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.

LIST OF TASKS

1. BEC Preliminary Listening Test-1 & Speaking Test-1.
2. BEC Preliminary Listening Test-2 & Speaking Test-2.
3. BEC Preliminary Listening Test-3 & Speaking Test-3.
4. BEC Preliminary Listening Test-4 & Speaking Test-4.
5. BEC Preliminary Listening Test-5 & Speaking Test-5.
6. BEC Preliminary Listening Test-6 & Speaking Test-6

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.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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,

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	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	-	-	-	-	-	-	-	2	3	-	-	-	-
CO2	2	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	1	-	-	-	-	-	-	1	-	3	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	3	-	-	-	-

High-3; Medium-2;Low-1

Assessment pattern

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19PHBC2101		Course Title: Physics For Mechanical Sciences (Common to AU, MC, ME)	
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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BOS Chairman

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 Convener

Approved in Academic Council meeting
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):

R1. Balasubramaniam "Callister's Material Science and Engineering", John Wiley and Sons Inc., Second Edition, 2015.

R2. Brijlal & N. Subramaniam, "Heat & Thermodynamics", S.Chand & Co., 2008.

R3. 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 Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment pattern

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19CSSC2001		Course Title: C Programming (Common to AU, MC, ME)	
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 Exercises **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 Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

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 Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MESC4001	Course Title: Engineering Drawing (Common to AU, CS, IT, EC, EI, MC, ME)		
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.

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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):

1. 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 Chairman

Publications of Bureau Of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing 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.

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	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO2	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO3	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO4	2	-	-	-	-	-	-	-	2	2	-	-	-	-
CO5	2	-	-	-	-	-	-	-	2	2	-	-	-	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	CO. No.	Marks	Total Marks
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	4,5	50	
			Total	100

Passed in Board of Studies meeting
BOS Convener

Approved in Academic Council meeting
BOS Chairman

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

Pre-requisites

- Nil

Course Objectives

The course is intended to:

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

Unit I Wellness - Importance and dimensions

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

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

Unit II Practices for physical wellness through Yoga

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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.

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/ Affective**
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	Respond
CO4:Sense and improve the wellness periodically and its impact on personal Effectiveness	Value
CO5: Maintain harmony with self, family, peers, society and nature	Internalize

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BOS Convener

Approved in Academic Council meeting

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,I Ed. (2010).

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

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	**Yoga:** Physical Exercises, KayaKalpa Meditation Assessment of student's workbook	1,2,3,4,5	15 15 10	75
	Sports: Physical Exercises, KayaKalpa Assessment of student's workbook		20 15	
End Semester Examination (combined for yoga and sports)	Written test (MCQ and short answers) Physical exercises Viva-voce	1,2,3,4,5	30 50 20	Marks out of 100 is reduced to 25
			Total	100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Semester- II

Course Code: 19MABC1201		Course Title: Ordinary Differential Equations and Complex Variables (Common to AU, CE, EC, EE, EI, MC, ME)	
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Pre-requisites:

- Matrices and Calculus

Course Objectives:

The course is intended to:

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

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

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

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

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

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

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

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

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

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

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

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

Text Book(s):

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

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

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Reference Book(s):

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

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

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

Course Code: 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.

LIST OF TASKS

1. BEC Vantage Listening Test-1 & Speaking Test-1.
2. BEC Vantage Listening Test-2 & Speaking Test-2.
3. BEC Vantage Listening Test-3 & Speaking Test-3.
4. BEC Vantage Listening Test-4 & Speaking Test-4.
5. BEC Vantage Listening Test-5 & Speaking Test-5.
6. BEC Vantage Listening Test-6 & Speaking Test-6.

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.

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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

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

High-3; Medium-2; Low-1

Assessment pattern

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

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

Course Code: 19CHBC2201	Course Title: Chemistry for Mechanical Sciences (Common to AU, MC, ME)		
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 **S**equential **B**atch **R**eactor 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 **30 Hours**

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

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

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Text Book(s):

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

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

Reference Book(s):

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

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

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

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

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

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2;Low-1

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Assessment pattern

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

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BOS Chairman

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

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. 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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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.

List of Exercises: **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

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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

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.

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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	2	-	-	-	-	-	-	1	1	2	-	2	-	-
CO2	2	-	-	-	-	-	-	1	-	1	-	1	-	-
CO3	2	-	-	-	-	-	-	1	-	1	-	1	-	-
CO4	3	-	-	-	-	-	-	3	3	3	2	3	-	-
CO5	2	-	-	-	-	-	-	1	-	1	-	1	-	-
CO6	2	-	-	-	-	-	-	1	1	2	-	2	-	-

High-3; Medium-2; Low-1

Assessment pattern

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

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BOS Chairman

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

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Calculate the crystalparameters.
2. Analyze the phasediagram.
3. Choose an appropriate ferrous and nonferrousalloy.
4. Select an appropriate powder metallurgytechnique.
5. Select an appropriate heat treatmentprocess.

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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9 Hours

Unit III Ferrous and Nonferrous Alloy

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.

List of Experiments **15 Hours**

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

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

Text Book(s):

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

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

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

Reference Book(s):

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

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

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

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

Web References:

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

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Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment pattern

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

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

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

List of Experiments:

[A] Electrical &Electronics:

1) Symbols of electrical and electronic components and study of electricaldrawing.
2) Insulation Testing usingMegger.
3) Soldering practice of simple circuit andtesting.
4) Fluorescent tube, staircase and housewiring.
5) Verification of Kirchhoff's current and voltagelaw.

[B] Civil &Mechanical:

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

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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 and other 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.

Course Articulation Matrix

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

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	Batch I: 1, 2 Batch II: 3	50	25
	Cycle Test 2	Batch I: 3 Batch II: 1, 2	50	
			Total	100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

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	**Cognitive/ Affective**
At the end of this course, students will be able to:	
CO1:Identify the strengths, weaknesses and opportunities	Apply
CO2:Set well-articulated goals for academics, career, and personal aspirations	Apply
CO3:Establish the road map to realize the goals	Apply
CO4:Apply time management techniques to complete planned tasks on time	Apply
CO5:Create time and pursue activities of self-interest that add value	Value

Text book(s):

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

Reference Book(s):

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

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BOS Chairman

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	**Yoga:** Physical Exercises, KayaKalpa Meditation Assessment of student's workbook	1,2,3,4,5	15 15 10	75
	Sports: Physical Exercises, KayaKalpa Assessment of student's workbook		20 15	
End Semester Examination (combined for yoga and sports)	Written test (MCQ and short answers) Physical exercises Viva-voce	1,2,3,4,5	30 50 20	Marks out of 100 is reduced to 25
			Total	100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting.

BOS Chairman

Course Code: 19PSHG6001	Course Title: Wellness for Students (Common to all B.E/B.TechProgrammes) (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

Pre-requisites

- NIL

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career andlife
2. Apply time managementtechniques
3. Articulate the importance of wellness for success inlife.
4. Understand the dimensions of wellbeing and relevantpractices

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-pointcommitment.

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

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BOS Chairman

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

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

Text book(s):

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

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Reference Book(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).

R4. Dr. R. Nagarathna, Dr.H.R. Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R5. Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	Personal Effectiveness	1,2,5	35	75
	Yoga and physical Exercise:	3,4,5		
	Physical Exercises		20	
	Meditation		10	
	Assessment of student's workbook		10	
End Semester Examination	Written test (MCQ and short answers)	1,2,3,4,5	30	Marks out of 100 is reduced to 25
	Physical exercises		50	
	Viva-voce		20	
			Total	100

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Course Code: 19CHMG6201	Course Title: Environmental Sciences (Common to all B.E/B.Tech Programmes)	
Course Category: Mandatory Non-Credit Course	Course Level: Introductory	
L:T:P(Hours/Week): 1: 0: 0	Total Contact Hours:15	Max. Marks: 100

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 Resources **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

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ii) Slogan making event

iii) Poster making event

(b) Actual Activities:

i) Plantation

ii) Cleanliness drive

iii) Drive for segregation of waste

iv) To know about the different varieties of plants

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

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

Text Book(s):

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.

Reference Book(s):

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO5	1	-	-	-	-	-	-	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
Activity(ies)	50	Report on the activity performed
Total	**100**	

Non-letter Grades

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

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Semester- III

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

Prerequisites

- Matrices and Calculus

Course Objectives

The course is intended to:

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

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

Solution of system of linear equations, Gauss elimination method, Crout's method, iterative methods of Gauss Jacobi and Gauss Seidal method, Eigen values of matrix by power method.

Unit II Solution Of Non-Linear Equations And Curve Fitting **9+3 Hours**

Solution of non-linear equations: Method of false position, Newton Raphson method, order of convergence. Curve fitting: Method of least square fit a straight line, fitting a curve.

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

Interpolation with equal intervals, Newton's forward and backward difference formulae, interpolation with unequal interval, Lagrange's interpolation, numerical differentiation, numerical integration, trapezoidal rule, Simpson's rule, double integration using trapezoidal rule.

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

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

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

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

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

Text Book(s):

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

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

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

Reference Book(s):

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

R2. Bali N.P. 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.

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

Course Articulation Matrix

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

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO .No.	Marks	Total
Continuous 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
End Semester Examination	ESE	1,2,3,4,5	100	60
				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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

Prerequisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

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

Unit I Free body Diagram **9+3 Hours**

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

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

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

Unit III Geometric Properties of Lamina and Bodies **9+3 Hours**

Properties of surfaces – centroid of composite planes such as L, I and T – Moment of Inertia (MI) – Parallel and perpendicular axis theorem – MI of composite sections involving simple

geometries such as rectangle, circle and triangle – Centre of gravity and mass moment of inertia of composite solids involving block, cylinder, cone and sphere.

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

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

Unit V Kinetics of Rigid Body **9+3 Hours**

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

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

Text Book(s):

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

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

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

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BOS Convener

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BOS Chairman

Reference Book(s):

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

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

R3. Norton, R.L., "Kinematics and Dynamics of Machinery", Tata McGrawHill Education Pvt. Ltd.,New Delhi, SI Edition 2014.

Web References:

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	PSO2
CO1	2	1		2	2			2	2	3		2		
CO2	2	1		2	2			2	2	3		2		
CO3	2	1		2	2			2	2	3		2		
CO4	2	1		2	2			2	2	3		2		
CO5	2	1		2	2			2	2	3		2		

High-3; Medium-2;Low-1

Assessment pattern:

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19MECC2301	Course Title: Fluid Mechanics and Hydraulic Machinery (Common to AU,MC, ME)		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Prerequisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

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

Unit I Fluid Properties and Flow Characteristics **9 Hours**

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

Flow characteristics, Continuity equation and Bernoulli's equation for 1-D flow, 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 series pipes, parallel pipes and syphon.

Unit III Dimensional Analysis **9 Hours**

Need for dimensional analysis, methods of dimensional analysis, Buckingham's π theorem.

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Similitude, types of similitude, Dimensionless parameters, application of dimensionless parameters, Model analysis.

Unit IV Hydraulic Pumps **9 Hours**

Centrifugal pump: 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, inlet and exit velocity triangles, Euler turbine equation. Pelton, Francis and Kaplan turbines - working principle and construction, work done by water on the runner, Draft tube. Specific speed, unit quantities and performance curves. Governing of turbines.

List of Experiments **30 Hours**

1. Determination of coefficient of discharge of given Orifice meter (CO1)
2. Determination of coefficient of discharge of given Venturimeter (CO2)
3. Determination of friction factor of given set of pipes (CO2)
4. Performance study of Centrifugal pumps (CO4)
5. Performance study of reciprocating pumps (CO4)
6. Performance characteristics of a Pelton wheel (CO5)
7. Performance test on a Francis Turbine (CO5)
8. Performance test on a Kaplan Turbine (CO5)

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1: Apply mathematical knowledge to predict the properties and characteristics of a fluid.	Apply
CO2: Analyze and calculate major and minor losses associated with pipe flow in piping networks.	Apply
CO3: Mathematically predict the nature of physical quantities.	Apply

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CO4: Select a suitable hydraulic pump for the customer provided site conditions.	Apply
CO5: Select a suitable hydraulic turbine for the given rated parameters.	Apply

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 (7th edition), 2014.

Web References:

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

Course Articulation Matrix

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

High-3; Medium-2;Low-1

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Assessment pattern:

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19AUCN1301		Course Title: Production Processes	
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours: 45	Max. Marks:100

Prerequisites

- Material Science

Course Objectives:

The course is intended to:

1. Explain operational and procedural steps required in casting process.
2. Describe the procedure of forging process
3. Choose appropriate welding process.
4. Select appropriate metal cutting processes to manufacture a cylindrical part.
5. Select appropriate metal cutting processes to manufacture a prismatic a part.

Unit I Casting **9 Hours**

Sand casting process, Pattern - Types, materials and allowances. Moulding sand – Types and properties. Mould preparation- Tools and equipments, Core making process. Centrifugal casting processes (True, Semi, Centrifuging), Continuous casting, Lost wax process, Shell mould casting, Die casting (Cold chamber / Hot chamber), Casting defects.

Unit II Metal Forming **9 Hours**

Hot working and Cold working of metals. Rolling: Rolling mills, Roll passes and sequences, Rolling defects; Forging: Types (Smith, Drop, Press & Machine), Forging operations (Drawing down / Swaging, Upsetting); Forging defects; Extrusion: Types (Direct, Indirect, Impact, Tube).

Unit III Metal Joining **9 Hours**

Fusion welding processes: Arc welding processes - Manual metal arc welding, GTAW, GMAW, Submerged arc welding, Gas welding process (Oxy-acetylene) - Types of flames, Working principle, Equipments. Non- fusion welding processes: Electrical resistance welding (ERW), Types (Spot, seam, percussion, projection, flash butt), Thermit welding, Electron beam welding, Laser beam welding, welding defects, Welding symbol.

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BOS Chairman

Unit IV **Lathe, Drilling and Grinding** **9 Hours**

Center lathe – Operations performed - attachments / accessories, Process parameters, Capstan lathe and Turret lathe.

Constructional features of drilling machine, Upright drilling machine, Radial drilling machine, operations performed in drilling machine and process parameters.

Grinding operation - Grinding wheel – Designation and selection – Grinding Processes : Cylindrical, Surface and Centerless grinding

Unit V **Milling and CNC** **9 Hours**

Milling machines - Types. Milling cutter - Types, nomenclature. Up milling & Down milling, Operations performed in milling machine, Process parameters.

CNC Machines- Types, Machining centre, Part programming fundamentals

Course Outcomes	**Cognitive Level**
At the end of this course, students will be able to:	
CO1. Explain operational and procedural steps required for manufacturing a cast part.	Understand
CO2. Describe the procedure for manufacturing a part using metal forming processes.	Understand
CO3. Choose appropriate welding process for the required weld joint	Apply
CO4. Select appropriate metal cutting processes to manufacture a cylindrical part which involve lathe, drilling and grinding machines	Apply
CO5. Select appropriate metal cutting processes to manufacture a prismatic part which involve milling machine.	Apply

Text Book(s):

T1. Rao P C, "Manufacturing Technology, Vol 2, Metal Cutting and Machine Tools", 2nd Edition, Tata McGraw Hill, New Delhi, 13th reprint 2012.

T2. Kalpakjian, "Manufacturing Engineering and Technology", Addison Wesley Publishing company, 3rd edition, 1995.

T3. Serope Kalpakjian, Steven R Schmid, "Manufacturing Process for Engineering Materials" –

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Pearson Education, 4th Edition, 2009.

Reference Book(s):

R1. HMT Bangalore, "Production Technology", McGraw Hill Education Pvt. Ltd., New Delhi, Reprint 2011.

R2. Jain. R.K., "Production Technology", Khanna Publishers, New Delhi, 2012.

R3. Hajra Choudhury A. K., Nirjhar Roy, Hajra Choudhury S. K., "Elements of Production Technology –Vol. II", Asia Publishing House, 2008.

Web References:

1. http://nptel.ac.in/courses/112107144/
2. http://nptel.ac.in/courses/112107145/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1		1	1			2	1	2		1		
CO2	1	1		1	1			2	1	2		1		
CO3	2	1		2	2			2	1	2		1		
CO4	2	1		2	2			2	1	2		1		
CO5	2	1		2	2			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	40
	CCET 2	3,4	50	
	Retest	1,2,3,4	50	
	CCET 3	5	50	
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19AUSN2301	Course Title: Automotive Engines		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours:60	Max. Marks:100

Prerequisites

- Physics for Mechanical Sciences

Course Objectives

The course is intended to:

1. Compare the construction and working of IC engines.
2. Explain the induction and ignition system.
3. Infer the influences of combustion chamber geometry.
4. Illustrate the construction and working of engine subsystems
5. Interpret the developments employed in IC engines.

Unit I **IC Engines Construction and Working** **9 Hours**

Heat engines, engine components, engine nomenclature, classification, 4 stroke engines, valve timing diagram, SI and CI engines, construction, working and applications, engine performance parameters and emissions.

Unit II **Induction and Ignition System** **9 Hours**

SI engine: carburetion, air-fuel ratio, importance, requirements, simple carburetor, working, petrol injection, throttle body and multi point injections. CI engine: fuel injection system functional requirements, inline and rotary injection systems, working, feed pump, atomizer, injection pump, injector and nozzles. Ignition system:, requirements, ignition timing, spark advance mechanism, centrifugal and vacuum advance mechanism, battery coil, magneto, CDI and distributor-less ignition, spark plug.

Unit III **Combustion and Combustion Chambers** **9 Hours**

Richard's combustion theory, SI engine, combustion stages, factors affecting SI engine combustion, knocking. SI Engine combustion chamber, Types. CI Engine, combustion stages, abnormal combustion, factors affecting CI engine combustion. CI engine combustion chambers, classification, factors controlling combustion chamber design. Air motion, swirl, squish and turbulence.

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Unit IV **Cooling, Lubrication and Exhaust Systems** **9 Hours**

Cooling system, importance of cooling, cooling system classification, air cooling system, liquid cooling system, coolant properties, thermostat, thermosyphon, forced circulation cooling. Lubrication system, engine friction fundamentals, influence of engine variable on friction, functions of the lubrication system, mist lubrication, wet sump lubrication, construction and working. Exhaust system, exhaust manifold, exhaust down pipe, resonator, muffler, tailpipe, catalytic converter.

Unit V **Developments in IC engines** **9 Hours**

Supercharger and turbocharger, HCCI, Lean burn engine, stratified charge engine, four valve and overhead cam engines, variable valve timing (VVT), variable geometry turbochargers (VGT), electronic engine management, CRDI, GDI, DAQ System – combustion and heat release analysis in engines.

List of Experiments

1. Plot valve timing and port timing diagram (CO1).
2. Dismantle, identify the components and assemble the given petrol engine (CO1).
3. Dismantle, identify the components and assemble the given diesel engine (CO1).
4. Dismantle, identify the components and assemble the given fuel injection system components (CO2).
5. Dismantle, identify the components and assemble the given engine exhaust system components (CO4).
6. Case study on interpretation of vehicle manufacturer's engine specification based on load and speed (CO5).

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BOS Convener

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BOS Chairman

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Compare the construction and working of IC engines based on working cycle and ignition of the mixture.	Understand
CO2: Explain the induction and ignition system of petrol and diesel engine.	Understand
CO3: Infer the influences of combustion chamber geometry on combustion characteristics of SI and CI engines.	Apply
CO4: Illustrate the construction and working of engine subsystems such as cooling, lubrication and exhaust systems.	Understand
CO5: Interpret the developments employed in IC engines to improve volumetric, thermal efficiencies and emissions.	Apply

Text Book(s)

T1.Mathur M.L. and Sharma R.P., "Internal Combustion Engines", Dhanpat Rai Publishing Co Pvt Ltd, 7th edition, , 2014.

T2.Ganesan V, "Internal Combustion Engines", Tata McGraw Hill, 4th edition, 2012.

T3.Ramalingam K.K., "Internal Combustion Engines", Sci-Tech Publications, 3rd edition, 2015.

Reference Book(s)

R1. John B. Heywood, "Internal Combustion Engines Fundamentals", McGraw Hill, 1st edition, 2011.

R2. Pundir, B. P., "I. C. Engines: Combustion and Emissions", Narosa Publishing House, New Delhi, Reprint, 2017.

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code: 19AUCN3301	Course Title : Production Technology Laboratory		
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

Prerequisites

- NIL

Course Objectives

The course is intended to:

1. Develop process sequence for manufacturing a machined part
2. Use Lathe, Drilling, Milling, Slotting and grinding machines
3. Produce a sand mould
4. Produce a welded part

List of Experiments:

1. Exercise on Turning of shaft
2. Exercise on Key-way Milling
3. Exercise on Cylindrical Grinding
4. Exercise on Drilling, Reaming and Tapping
5. Exercise on Spur Gear Cutting
6. Exercise on Machining of Key-way in Slotting machine
7. Preparation of Sand mould for split pattern
8. Manual Metal Arc welding of T- joint
9. Manual Metal Arc welding of gear box casing
10. Exercise on Assembly of manufactured components in to a gear box.

Passed in Board of Studies meeting

BOS Convener

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BOS Chairman

Assessment pattern

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

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Develop process sequence for manufacturing the given design requirement using the available machine tools	Apply
CO2: Use Lathe, Drilling, Milling, Slotting and grinding machines to manufacture the part as per the given design requirement	Apply
CO3: Make a mould using sand casting process for the given design requirement.	Apply
CO4: Make a welded component using arc welding for the given design requirement	Apply
Reference(s):	
R1. Jain. R.K., "Production Technology", Khanna Publishers, New Delhi, 2012 R2. Hajra Choudhury A. K., Nirjhar Roy, Hajra Choudhury S. K., "Elements of Production Technology –Vol. II", Asia Publishing House, 2008.	

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

High-3; Medium-2; Low-1

Assessment pattern

	Assessment component	CO. No.	Marks	Total Marks
Continuous Assessment	Each Lab Experiment	1,2,3,4	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	1,3,4	50	
			Total	100

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BOS Chairman

Course Code:19AUCN3302	Course Title: Modeling and Drafting of Automotive Components Laboratory		
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

Prerequisites

- 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, Assembly drawing and Exploded View

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 and keys.

Unit II Fits and Tolerances **6 Hours**

Definitions, Classifications of Fits, System of Fits, Selection of Fits, Method of Indicating Fits on Drawings, Tolerance Grade, Fundamental of Deviations, Shaft and Hole Basis systems, Method of Placing Limit Dimensions, Surface finish and IT Grades, Tolerance stack up - Interference checking.

Geometric tolerance - 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 Universal Coupling
2. Assembly modeling and drawing of Universal coupling
3. Part Modeling of Screw jack
4. Assembly modeling and drawing of Screw jack
5. Part Modeling of Fuel Injector
6. Assembly modeling and drawing of Fuel Injector

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7. Part Modeling of Piston and Connecting rod
8. Exploded view of Piston and Connecting rod Assembly

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., "Machine Drawing, Published", Chartstar Book Stall, Anand, India, 1999.

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

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern

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

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BOS Chairman

Semester- IV

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

Prerequisites

- 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 practicalproblems
3. Calculate the correlation and regression for two variables
4. Test the samples based on hypothesis
5. Analyze the samples based on variance

Unit I Probability and Random Variables **9+3 Hours**

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

Unit II Standard Distributions **9+3Hours**

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

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

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

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

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

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BOS Chairman

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

Text Book(s)

T1. Veerajan T, "Probability, Statistics and Random process", 2nd Edition, Tata McGraw-Hill, New Delhi, 2009.

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

Reference Book(s)

R1. Walpole R.E., Myers R.H., Myers S.L., Ye K., "Probability and Statistics for Engineers and Scientists", 8'" Edition Pearson Education, Asia, 2007.

R2. M.R. Spiegel, J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", Tata McGraw Hill edition, 2004.

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

Web References

- https://onlinecourses.nptel.ac.in/111105041/
- https://nptel.ac.in/downloads/111105041/
- https://nptel.ac.in/courses/111105090/

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BOS Convener

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BOS Chairman

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern:

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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

Prerequisites

- Physics for Mechanical Sciences
- 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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BOS Chairman

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

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

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

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

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

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

Unit V **Theories of failure** **9 Hours**

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

List of Experiments **30 Hours**

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

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

Text Book(s):

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

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

Reference Book(s):

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

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

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

Web References:

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment pattern:

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

Passed in Board of Studies meeting

BOS Convener

Approved in Academic Council meeting

BOS Chairman

Course Code:19AUCN1402		Course Title: Mechanics of Machines	
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max. Marks:100

Prerequisites

- Engineering Mechanics

Course Objectives:

The course is intended to:

1. Calculate Kinematic parameters of simple mechanisms.
2. Develop cam profile for different follower motions
3. Calculate the natural frequency of a free vibrating system
4. Calculate the kinematic parameters of gear trains
5. Calculate the balancing masses required for balancing of rotating systems.

Unit I **Velocity and Acceleration in Simple Mechanisms** **9+3 Hours**

Linear and angular velocities- absolute and relative velocities- rubbing velocity- tangential, radial and coriolis components of acceleration, graphical method for determination of velocity and acceleration of the links in four bar mechanism and single slider crank mechanism.

Unit II **Design of Cam Profile** **9+3 Hours**

Types of cams, types of followers, radial cam, terminology of radial cam, types of follower motions: uniform velocity motion, simple harmonic motion, constant acceleration/deceleration motion, cycloidal motion, cam profile for knife edge, roller and flat faced follower – Graphical method.

Unit III **Vibration** **9+3 Hours**

Introduction- Terminology- types of vibrations- Types of free vibration- Natural frequency of free longitudinal, transverse and torsional vibrations. Effect of inertia- natural frequency of free transverse vibration due to point load on a simply supported shaft. Critical speed and damping (Theory only). Torsion vibration in single, two and three rotor system- Torsionally equivalent shaft.

Passed in Board of Studies meeting
BOS Convener

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BOS Chairman

Unit IV **Kinematics of Gear trains** **9+3 Hours**

Types of gears, spur, Helical, Bevel and worm gear terminologies, law of gearing, Classification of gear trains, calculation of Gear ratio, number of teeth for the gears in the gear trains, velocities of the gears in gear trains such as Simple, Compound, Reverted & Epicyclic (using tabulation method) gear trains, Differential gear train.

Unit V **Balancing of masses** **9+3 Hours**

Static and dynamic balancing - Balancing of rotating masses – Balancing of single rotating mass (in single plane and several planes)- Balancing of several masses in single or several planes- Balancing of reciprocating masses (Introduction only)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Calculate the velocity and acceleration of links in four bar and slider crank chain using graphical method.	Apply
CO2: Develop the radial cam profile for the given type of follower and motion function	Apply
CO3: Determine the natural frequency of a free longitudinal, transverse and torsional vibrating system.	Apply
CO4: Calculate the kinematic parameters of gear trains such as simple, compound and epicyclic gear trains	Apply
CO5: Determine the balancing masses required for balancing of rotating masses in single or several planes.	Apply

Text Book(s):

T1. Rattan SS, "Theory of machines" – Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2009.

T2. Ambekar A.G., "Mechanism and machine Theory", Prentice Hall of India New Delhi, 2007.

Reference Book(s):

R1. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009

R2. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 3rd Edition, Oxford University Press, 2009.

R3. Ghosh, A, Mallick, A.K., "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.

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BOS Chairman

Web References:

- http://nptel.ac.in/courses/112104121/1

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

High-3; Medium-2;Low-1

Assessment pattern

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

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BOS Chairman

Course Code:19AUCN2401	Course Title: Automotive Electrical and Electronics		
Course Category: Professional Core		Course Level: Practice	
L:T:P(Hours/Week) 3:0:2	Credits:4	Total Contact Hours:75	Max. Marks:100

Prerequisites

- Nil

Course Objectives:

The course is intended to:

1. Calculate the electrical parameters in the circuit
2. Demonstrate the characteristics of different types of electronic devices and driver circuit used in Automobiles
3. Conduct the test on battery charging system and engine starting system
4. Explain the construction and working of sensors and actuators used in automobile
5. Diagnosis faults in the automobile electronic systems

Unit I Basic Electrical **9 Hours**

Voltage, current, energy and power. Electrical elements: resistor, inductor and capacitor. Measuring instruments: voltmeter, ammeter and energy meter. Kirchhoff's laws, series and parallel resistor circuits. Voltage and current divider rule. RC and RL circuits. Resistor circuit Mesh analysis.

Unit II Electronic Devices **9 Hours**

BJT, FET, SCR and IGBT: Construction and characteristics, Device selection. Driver circuits: Continuous output control, PWM, Relays, H-bridge. Protection circuitry: reverse polarity, short circuit, high voltage protection

10 Hours

Unit III Battery charging and Engine Starting Systems

Battery: state of health, state of charge. Automobile alternator construction, working and output voltage characteristics. Automobile regulator functions, Nine diode rectifier, IC Voltage Regulator construction and working. DC Motor, Engine Starter Motor and BLDC working and characteristics.

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UNIT IV Sensors and Actuators **9 Hours**

Sensors for Modern Vehicles: Speed, Crank and Cam position, Throttle position, Manifold Absolute Pressure, Air intake temperature, Coolant temperature, Exhaust Oxygen level. Piezoelectric and solenoid Injectors: construction, working and control.

UNIT V Fundamentals of Automotive Electronic Systems **8 Hours**

Car Electrical system layout , Switches, relays, fuses, lighting system and circuits types. Horns, wipers, defogger, power windows , seat belt, electronic door lock. Electronic dashboard instruments. Electromagnetic interference and suppression, electromagnetic compatibility.

List of Experiments **30 Hours**

1) Design simple DC power supply for Automobile systems (CO2)
2) Speed control of PMDC Motor using PWM (CO2)
3) Design simple driver circuit using SCR and draw its characteristics (CO2)
4) Conduct No load test on Starter motor (CO3)
5) Conduct load test on three phase induction motor (CO3)
6) Conduct Load test on Alternator (CO3)
7) Design of battery voltage indicator using LM741 (CO5)
8) Fault diagnosis in the car electrical system (CO5)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Calculate electrical parameter such as voltage, current and resistance in a given electrical circuit	Apply
CO2: Demonstrate characteristics of different types of electronic devices and driver circuit used in Automobiles	Apply
CO3: Conduct tests on battery charging system and engine starting system	Apply
CO4: Explain the construction and working of sensors and actuators used in automobiles	Understand
CO5: Diagnosis faults in automobile electronic systems	Apply

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Text Book(s)

T1. Kohli, P.L., "Automotive Electrical Equipment", Tata McGraw-Hill Co. Ltd., New Delhi, 2014.

T2. Tom Denton, "Automobile Electrical and Electronic systems", 3rd Edition, Elsevier Publications, 2011.

T3. William Ribbens, "Understanding Automotive Electronics", Butterworth-Hienemann, 2012.

Reference Book(s)

R1. Mckenzie Smith I, John Hiley and Keith Brown, "Hughes Electrical and Electronics Technology", Pearson, 10th Edition, 2010.

R2. Cathay J.J., Nasar S A, "Basic Electrical Engineering" 2nd Edition, McGraw-Hill, 2012.

R3. Jegathesan V., Vinoth kumar K., Saravana Kumar R., "Basic Electrical and Electronics Engineering", Wiley India, 2011.

Web References:

- https://nptel.ac.in/courses/108/108/108108122/
- https://nptel.ac.in/courses/108108147/
- https://nptel.ac.in/courses/108105017/

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

High-3; Medium-2; Low-1

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Assessment pattern:

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

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BOS Chairman

Course Code:19AUCN3401	Course Title: Fuels, Engine Performance and Emission Testing Laboratory		
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

Prerequisites

- NIL

Course Objectives

The course is intended to:

1. Determine the fuel properties
2. Determine the performance characteristics of IC engines
3. Measure the exhaust emissions

List of Experiments

1. Determine flash and fire points of given fuel.
2. Determine the temperature dependence of viscosity of given fuel.
3. Conduct ASTM distillation test of liquid fuels.
4. Conduct performance test on petrol engine.
5. Conduct performance test on diesel engine.
6. Conduct heat balance test on IC engine.
7. Conduct Morse Test in MPFI engine.
8. Conduct retardation test on single cylinder diesel engine.
9. Plot P-θ and P-V diagrams using EPA software.
10. Conduct emission test on turbocharged engine.

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Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Determine the liquid fuel properties such as flash, fire points, and viscosity and vapor characteristics as per ASTM standard.	Apply
CO2. Determine the performance characteristics of SI and CI engines.	Apply
CO3. Measure the exhaust emissions using five-gas analyzer.	Apply

Reference(s):

R1. "Fuels, engine performance and emission testing laboratory manual", MCET-Automobile Engineering, 2020.

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				
CO2	2	1		2	2				2	2				
CO3	2	1		2	2				2	2				

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

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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

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Unit IV Harmony in the Nature **6+3**

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

Unit V Harmony on Professional Ethics **6+3**

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

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

Text Book(s):

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

Reference Book(s):

R1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
R2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
R3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

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

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Course Articulation Matrix

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

High-3; Medium-2; Low-1

Assessment Pattern

	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%

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Course Code: 19AUPN6401		Course Title: Mini-Project	
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 objective of Mini-Project is to enable the student to take up investigative study in the broad field of Automobile 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 assignedtopic.
2. Working out a preliminary Approach to the Problem relating to the assignedtopic.
3. Conducting preliminaryAnalysis/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 departmentalcommittee.

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

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Course Code: 19AUPN6001		Course Title: Internship or Skill Development (Common to all B.E/B.TechProgrammes)	
Course Category: Project		Course Level: Practionary	
L:T:P (Hours/Week) 2 Weeks	Credits: 1	Total Contact Hours: Nil	Max. Marks:100

Pre-requisites:

- Nil

Course Objectives:

The course is intended to:

1. Understand industry-specific terminology andpractices
2. Solve simple industrialproblems
3. Work collaboratively on ateam
4. Effectively communicate the activities of internship in a written and oralformat

Minimum of six weeks in an Industry in the area of Automobile 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

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