B.Tech.–II Year I Semester

S.No.	Course code	Title	L	T	P	Credits
1	23A100015	Numerical Methods & Transform Techniques	3	0	0	3
2	23A100032	Universal Human Values Understanding Harmony & Ethical human conduct	2	1	0	3
3	23A103201	Thermodynamics	2	0	0	2
4	23A103202	Mechanics of Solids	3	0	0	3
5	23A103203	Material Science and Metallurgy	3	0	0	3
6	23A103204	Mechanics of Solids and Materials Science Lab	0	0	3	1.5
7	23A103205	Computer-Aided Machine Drawing	0	0	3	1.5
8	23A104209	Embedded Systems and IoT	0	0	2	1.0
9	23A105205	Python programming	0	1	2	2
10	23A100033	Environmental Science	2	0	0	-
Total			**15**	**2**	**10**	**20**

B.Tech. II Year II Semester

S.No.	Course code	Title	L	T	P	Credits
1	23A103210	Industrial Management	2	0	0	2
2	23A100017	Complex Variables, Probability and Statistics	3	0	0	3
3	23A103206T	Manufacturing processes	3	0	0	3
4	23A103207T	Fluid Mechanics & Hydraulic Machines	3	0	0	3
5	23A103208	Theory of Machines	3	0	0	3
6	23A103207P	Fluid Mechanics &Hydraulic Machines Lab	0	0	3	1.5
7	23A103206P	Manufacturing processes Lab	0	0	3	1.5
8	23A100034	Soft Skills	0	1	2	2
9	23A103209	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation						

B.TECH ME III-I Sem

S.No	Course code	Title	L	T	P	Credits
1	23A103501	Machining Process	3	0	0	3
2	23A103502T	Thermal Engineering	3	0	0	3
3	23A103503	Metrology and Measurements	3	0	0	3
4	23A104320	Introduction To Quantum Technologies &Applications	3	0	0	3
5	23A103504b	**Professional Elective-I** Automobile Engineering	3	0	0	3
6	23A10036	**Open Elective-I** Entrepreneur-ship and New Venture Creation	3	0	0	3
7	23A103502P	Thermal Engineering Lab	0	0	3	1.5
8	23A103505P	Dynamics lab	0	0	3	1.5
9	23A103503P	**Skill Enhancement course** Machine Tools & Metrology lab	0	1	2	2
10	23A104306P	**Engineering Science** Tinkering Lab	0	0	2	1
11	23A103508	**Evaluation of Community Service Internship** Community Service Internship/Project	-	-	-	2
Total			18	1	10	**26**

B.TECH ME III-II

S.No	Course code	Title	L	T	P	Credits
1	23A103601T	Heat Transfer	3	0	0	3
2	23A103602T	CAD/CAM	3	0	0	3
3	23A103603	Design of Machine Members	3	0	0	3
4	23A103604d	**Professional Elective-II** Operations Research	3	0	0	3
5	23A103605b	**Professional Elective-III** Industrial Safety	3	0	0	3
6	23A102312	**Open Elective-II** Renewable Energy Sources	3	0	0	3
7	23A103601P	Heat Transfer Lab	0	0	3	1.5
8	23A103602P	CAD/CAM Lab	0	0	3	1.5
9	23A103608	**Skill Enhancement course** 3D Printing Lab	0	1	2	2
10	23A99601	**Audit Course** Technical paper writing and IPR	2	0	0	-
11	23A103601T	Workshop	0	0	0	0
Total			**20**	**1**	**08**	**23**
Mandatory Industry Internship of 6-8weeks duration during summer vacation						

B.TechME-IV-I

S.No	Coursecode	Title	L	T	P	Credits
1	23A103701	AI & ML for Mechanical Engineering	3	0	0	3
2	23A100702c	**Management Course-II** Management Science	2	0	0	2
3	23A103702d	**Professional Elective-IV** Mechatronics &MEMS	3	0	0	3
4	23A103702d	**Professional Elective-V** Automation &Robotics	3	0	0	3
5	23A152703	**Open Elective-III** Employability Skills	3	0	0	3
6	23A100055	**Open Elective-IV** Sensors & Actuators for Engineering Applications	3	0	0	3
7	23A103706	**Skill Enhancement Course** Introduction to Drone Technology	0	1	2	2
8	23A100059	**Audit Course** Gender Sensitization	2	0	0	-
9	23A03707	**Internship** Evaluation of Industry Internship	-	-	-	2
Total			**18**	**1**	**04**	**21**

IVB.TechIISemester(ME)

S.No.	Coursecode	Title	Category	L	T	P	Credits
1	23A103801	Internship		-	-	-	4
2	23A103802	Project		-	-	-	8
Total							**12**

B.Tech.–II Year I Semester

S.No.	Course code	Title	L	T	P	Credits
1	23A100015	Numerical Methods & Transform Techniques	3	0	0	3
2	23A100032	Universal Human Values Understanding Harmony & Ethical human conduct	2	1	0	3
3	23A103201	Thermodynamics	2	0	0	2
4	23A103202	Mechanics of Solids	3	0	0	3
5	23A103203	Material Science and Metallurgy	3	0	0	3
6	23A103204	Mechanics of Solids and Materials Science Lab	0	0	3	1.5
7	23A103205	Computer-Aided Machine Drawing	0	0	3	1.5
8	23A104209	Embedded Systems and IoT	0	0	2	1.0
9	23A105205	Python programming	0	1	2	2
10	23A100033	Environmental Science	2	0	0	-
Total			**15**	**2**	**10**	**20**

B.Tech. II Year II Semester

S.No.	Course code	Title	L	T	P	Credits
1	23A103210	Industrial Management	2	0	0	2
2	23A100017	Complex Variables, Probability and Statistics	3	0	0	3
3	23A103206T	Manufacturing processes	3	0	0	3
4	23A103207T	Fluid Mechanics & Hydraulic Machines	3	0	0	3
5	23A103208	Theory of Machines	3	0	0	3
6	23A103207P	Fluid Mechanics &Hydraulic Machines Lab	0	0	3	1.5
7	23A103206P	Manufacturing processes Lab	0	0	3	1.5
8	23A100034	Soft Skills	0	1	2	2
9	23A103209	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation						

II Year B.Tech.ME–I Semester

L	T	P	C
3	0	0	3

(23A100015)NUMERICALMETHODS&TRANSFORM TECHNIQUES (MECH)

Course Outcomes:

COs	Statements	Blooms level
CO1	Applynumericalmethodstosolvealgebraic andtranscendentalequations	L2,L3
CO2	Deriveinterpolatingpolynomialsusinginterpolationformulae	L3,L5
CO3	Solvedifferentialandintegralequationsnumerically	L3
CO4	UnderstandtheuseofLaplacetransforminsystemmodeling,digitalsignalprocessing, process control, solving Boundary Value Problems.	L2,L3
CO5	Apply Fourier series and Fourier transform in communication theory and signal analysis,imageprocessingandfilters,dataprocessingandanalysis,solvingpartial differential equations for problems on gravity.	L3,L5

UNITI SolutionofAlgebraic&TranscendentalEquations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Jacoby and Gauss Siedal method.

UNITIIIInterpolation

Finite differences-Newton‘s forward and backward interpolation formulae – Lagrange‘s formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNITIIISolutionofInitialvalueproblems toOrdinarydifferentialequations

Numerical solution of Ordinary Differential equations: Solution by Taylor‘s series-Picard‘s Method of successive Approximations-Euler‘s and modified Euler‘s methods-Runge-Kutta methods (second and fourth order).

UNITIVLaplaceTransforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, transforms of derivatives and integrals – Unit step function – Second shifting theorem– Convolution theorem – Laplace transform of Periodic function.

UNITVFourierseriesand**Fouriertransforms**

Fourier series: Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series -Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions

Fourier transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complexformofFourierintegral.Fouriertransform –Fouriersineandcosinetransforms–Properties – Inverse transforms – convolution theorem.

Textbooks:

1. SSSastry,IntroductoryMethodsofNumericalAnalysis,PHILearningPrivateLimited.
2. B.S.Grewal,HigherEngineeringMathematics,KhannaPublishers,2017,44thEdition

ReferenceBooks:

1. ErwinKreyszig,AdvancedEngineeringMathematics,JohnWiley&Sons,2018,10th Edition.
2. R.K.JainandS.R.K.Iyengar,AdvancedEngineeringMathematics,AlphaScienceInternational Ltd.,20215th Edition(9th reprint).
3. H.KDas,Er.RajnishVerma,HigherEngineeringMathematics,S.ChandPublications,2014, Third Edition (Reprint 2021)
4. AlanJeffrey,AdvancedEngineeringMathematics,Elsevier

OnlineLearningResources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma05/preview
3. http://nptel.ac.in/courses/111105090

IIYearB.Tech.ME–ISemester

L	T	P	C
2	1	0	3

(23A100032)UNIVERSALHUMANVALUES–UNDERSTANDINGHARMONYAND ETHICAL HUMAN CONDUCT

(Common to All Branches of Engineering)

Course Objectives:

- Tohelpthestudentsappreciatetheessentialcomplementarybetween'VALUES'and'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding ofthe Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- TohighlightplausibleimplicationsofsuchaHolisticunderstandingintermsofethicalhuman conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

COURSEOUTCOMES: At theend ofthe course, studentswill beable to		**BloomsLevel**
CO1	DefinethetermslikeNaturalAcceptance,HappinessandProsperity	L1,L2
CO2	Identifyone‘sself,andone‘ssurroundings(family,societynature)	L1,L2
CO3	Applywhattheyhavelearnttotheirownselfindifferentday-to-day settings in real life	L3
CO4	Relatehumanvalueswithhumanrelationshipandhumansociety.	L4
CO5	Justifytheneedforuniversalhumanvaluesand harmoniousexistence	L5
CO6	Developassociallyandecologicallyresponsibleengineers	L3,L6

CourseTopics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher‘s Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNITI IntroductiontoValueEducation(6lecturesand3tutorialsforpracticesession)

Lecture1:RightUnderstanding,RelationshipandPhysicalFacility(Holistic Development and the Role of Education)

Lecture2:UnderstandingValueEducation

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture3:self-explorationastheProcessforValueEducation

Lecture4:ContinuousHappinessandProsperity–theBasicHumanAspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial3:PracticeSessionPS3ExploringNaturalAcceptance

UNIT II Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture7:UnderstandingHumanbeingastheCo-existenceoftheselfandthebody.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial4:PracticeSessionPS4ExploringthedifferenceofNeedsofselfandbody.

Lecture 9: The body as an Instrument of the self

Lecture10:UnderstandingHarmonyintheself

Tutorial5:PracticeSessionPS5ExploringSourcesofImaginationintheself Lecture 11: Harmony of the self with the body

Lecture12: Programmetoensureself-regulation and Health

Tutorial6:PracticeSessionPS6ExploringHarmonyofselfwiththebody

UNIT III HarmonyintheFamilyandSociety(6lecturesand3tutorialsforpracticesession)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial7:PracticeSessionPS7ExploringtheFeelingofTrust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture16:OtherFeelings,JusticeinHuman-to-HumanRelationship

Lecture 17: Understanding Harmony in the Society

Lecture18:VisionfortheUniversalHumanOrder

Tutorial9:PracticeSessionPS9ExploringSystemstofulfilHumanGoal

UNITIV HarmonyintheNature/Existence(4 lecturesand2tutorials forpracticesession)

Lecture19:UnderstandingHarmonyintheNature

Lecture20:Interconnectedness,self-regulationandMutualFulfilmentamong the Four Orders of Nature

Tutorial10:PracticeSessionPS10ExploringtheFourOrdersofNature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture22:TheHolisticPerceptionofHarmonyinExistence

Tutorial11:PracticeSessionPS11ExploringCo-existenceinExistence

UNITV Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values

Lecture24:Definitivenessof(Ethical)HumanConduct

Tutorial12:PracticeSessionPS12ExploringEthicalHuman Conduct

Lecture25:ABasisforHumanisticEducation,HumanisticConstitutionandUniversal Human Order

Lecture26:CompetenceinProfessionalEthics

Tutorial13:PracticeSessionPS13ExploringHumanisticModelsinEducation

Lecture27:HolisticTechnologies,ProductionSystemsandManagementModels-Typical Case Studies

Lecture28:StrategiesforTransitiontowardsValue-basedLifeandProfession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards UniversalHuman Order

PracticeSessionsforUNITI–IntroductiontoValueEducation PS1

Sharing about Oneself

PS2ExploringHumanConsciousness PS3

Exploring Natural Acceptance

PracticeSessionsforUNITII–HarmonyintheHumanBeing PS4

Exploring the difference of Needs of self and body

PS5ExploringSourcesofImaginationintheself PS6

Exploring Harmony of self with the body

PracticeSessionsforUNITIII–HarmonyintheFamilyandSociety PS7

Exploring the Feeling of Trust

PS8Exploringthe FeelingofRespect

PS9ExploringSystemstofulfilHuman Goal

PracticeSessionsforUNITIV–HarmonyintheNature(Existence) PS10

Exploring the Four Orders of Nature

PS11ExploringCo-existenceinExistence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12ExploringEthicalHuman Conduct

PS13ExploringHumanisticModelsin Education

PS14ExploringStepsofTransitiontowardsUniversalHumanOrder

READINGS:

TextbookandTeachersManual

a. TheTextbook

R R Gaur, RAsthana, G P Bagaria, AFoundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. TheTeacher‘sManual

R R Gaur, RAsthana, G PBagaria,Teachers‘ManualforAFoundation Course in HumanValues and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

ReferenceBooks

1. JeevanVidya:EkParichaya,ANagaraj,JeevanVidyaPrakashan,Amarkantak,1999.

2. HumanValues,A.N.Tripathi,NewAgeIntl.Publishers,NewDelhi,2004.

3. TheStoryofStuff(Book).

4. TheStoryofMyExperimentswithTruth-byMohandasKaramchandGandhi

5. SmallisBeautiful-E. F Schumacher.

6. SlowisBeautiful-CecileAndrews

7. Economyof Permanence -JC Kumarappa

8. BharatMeinAngrejiRaj–PanditSunderlal

9. RediscoveringIndia- byDharampal

10. Hind Swaraj orIndianHomeRule-byMohandas K. Gandhi

11. IndiaWinsFreedom-MaulanaAbdulKalamAzad

12. Vivekananda-RomainRolland(English)

13. Gandhi-RomainRolland(English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorialhoursaretobeusedforpractice sessions.

While analyzing and discussing the topic, the faculty mentor‘s role is in pointing to essentialelements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one‘s own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up ‖ordinary‖ situations rather than‖ extra-ordinary‖ situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course.The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working basedon basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Programon Universal Human Values is deemed essential.

Online Resources

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf

2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf

3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf

4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf

5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf

7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf

8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385

https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

IIYearB.Tech.ME–ISemester

L	T	P	C
2	0	0	2

(23A103201)THERMODYNAMICS

Course Objectives

- Familiarize concepts of heat, work, energy and governing rules for conversion of one form to other.
- Explainrelationshipsbetweenpropertiesofmatterandbasiclawsofthermodynamics.
- Teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- Introducethe concept of availableenergyformaximumworkconversion.
- ProvidefundamentalconceptsofRefrigerationandPsychrometry.

Course Outcomes:

COs	Statements	Blooms Level
CO1	Explainthe importance of thermodynamic properties relatedtoconversionof heat energy into work.	L3
CO2	ApplytheZeroethandFirstLawofThermodynamics.	L3
CO3	UnderstandSecondLawofThermodynamics.	L2
CO4	AnalyzetheMolliercharts,T-Sandh-sdiagrams,Steamcalorimetry,Phase Transformations	L4
CO5	EvaluatetheCOPofrefrigeratingsystemsandproperties,processesof psychrometry and sensible and latent heat loads.	L5

Unit-I

Introduction: Basic Concepts : System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi static Process, Irreversible Process, Causes of Irreversibility

Unit-II

Energy in State and in Transition, Types, Work and Heat, Point and Path function.Zeroeth Law of Thermodynamics – PMM-I, Joule‘s Experiment – First law of Thermodynamics and applications. Limitations of the First Law – Enthalpy, Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance.

Unit-III

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM-II, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature,ClausiusInequality,Entropy,PrincipleofEntropyIncrease–EnergyEquation, AvailabilityandIrreversibility–ThermodynamicPotentials,GibbsandHelmholtzFunctions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

Unit-IV

Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

Unit– V

Introduction to Refrigeration: working of Air, Vapourcompression,VCR system Components, COP Refrigerants.

IntroductiontoAirConditioning**:**Psychrometricproperties&processes –characterizationofsensible and latent heat loads – load concepts of SHF.

Requirements of human comfort and concept of effective temperature- comfort chart –comfort air conditioning, and load calculations.

Textbooks:

1. P.K.Nag,EngineeringThermodynamics,5/e,TataMcGrawHill, 2013.
2. ClausBorgnakkeRichardE.Sonntag,FundamentalsofThermodynamics, 7/e,Wiley,2009.

ReferenceBooks

1. J.B.Jones,andR.E.Dugan, EngineeringThermodynamics,1/e,PrenticeHall, 1995.
2. Y.A.Cengel&M.A.Boles,Thermodynamics–AnEngineeringApproach,7/e,McGrawHill, 2010.
3. P.Chattopadhyay,EngineeringThermodynamics,1/e,OxfordUniversityPress,2011.
4. CPArora,RefrigerationandAir-conditioning,4/e,McGrawHill, 2021.

OnlineLearningResources:

- https://www.edx.org/learn/thermodynamics.
- https://archive.nptel.ac.in/courses/112/106/112106310.
- https://www.youtube.com/watch?v=7NI5P4KqrAs&t=1s
- https://kp.kiit.ac.in/pdf_files/02/Study-Material_3rd-Semester_Winter_2021_Mechanical-Engg.-_Thermal-Engineering-1_Abhijit-Samant.pdf
- https://www.coursera.org/learn/thermodynamics-intro

IIYearB.Tech.ME–ISemester

L	T	P	C
3	0	0	3

(23A103202)MECHANICSOFSOLIDS

CourseObjectives: Theobjectives of thecourseareto

- Understandthebehaviourofbasicstructuralmemberssubjectedtouniaxialandbi axial loads.
- Apply the concept of stress and strain to analyse and design structural members and machine parts under axial, shear and bending loads, moment and torsional moment.
- Students will earn all the methods to analyse beams, columns, frames for normal, shear, and torsionstressesand tosolvedflectionproblemsinpreparationforthedesignofsuchstructural components. Students are able to analyse beams and draw correct and complete shear and bending moment diagrams for beams.
- Studentsattainadeeperunderstandingoftheloads,stresses,andstrainsactingonastructure and their relations in the elastic behavior
- DesignandanalysisofIndustrialcomponentslikepressurevessels.

Course Outcomes:

COs	Statements	Blooms Level
CO1	Learnallthemethodstoanalyzebeams,columns, framesfornormal,shear,and torsionstressesandtosolvedeflectionproblemsinpreparationforthedesignof such structural components	L1
CO2	Analysebeamsanddrawcorrectandcompleteshearandbendingmoment diagrams for beams.	L4
CO3	Applythe concept ofstress and strain to analyzeand design structural members and machine parts under axial, shear and bending loads, and moments.	L3
CO4	Model &Analyze the behavior of basic structural members subjected to various loads	L4
CO5	DesignandanalysisofIndustrialcomponentslikepressurevessels.	L6

UNIT–I

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains– Hooke‘s law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson‘s ratio & volumetric strain – Bars of varying section – composite bars – Temperaturestresses-ComplexStresses -Stressesonaninclinedplaneunderdifferentuniaxialand biaxial stress conditions - Principal planes and principal stresses - Mohr‘s circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT–II

SHEARFORCEANDBENDINGMOMENT: Definitionofbeam–Typesofbeams–Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a sectionof abeam.

UNIT–III

FLEXURAL STRESSES : Theory of simple bending, Derivation of bending equation, Determination of bending stresses – section modulus of rectangular, circular, I and T sections– Design of simple beam sections.

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I and T sections.

UNIT–IV

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature–Differentialequationforthe elastic lineofa beam – DoubleintegrationandMacaulay‘s methods – Determination of slope and deflection for cantilever and simply supported beams subjectedtopointloads,UDLandUVL.Mohr‘stheoremandMomentareamethod –applicationto simple cases.

TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission ofpower by circular shafts, Shafts in series, Shafts in parallel.

UNIT–V

THIN AND THICK CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells. Wire wound thin cylinders. Lame‘s equation – cylinders subjected to inside & outside pressures –compound cylinders.

COLUMNS:

BucklingandStability,ColumnswithPinnedends,ColumnswithothersupportConditions, Limitations of Euler‘s Formula, Rankine‘s Formula

TextBooks:

1. GHRyder,Strengthofmaterials,PalgraveMacmillanpublishersIndiaLtd,1961.
2. B.C.Punmia,Strengthofmaterials,10/e,LakshmipublicationsPvt.Ltd,NewDelhi, 2018.

ReferenceBooks:

1.Gere&Timoshenko,Mechanicsofmaterials,2/e,CBSpublications,2004. 2.U.C.Jindal, Strength of Materials, 2/e, Pearson Education, 2017.
3.Timoshenko,StrengthofMaterialsPart–I&II,3/e,CBSPublishers, 2004.
4. AndrewPytelandFerdinandL.Singer,StrengthofMaterials,4/e,LongmanPulications, 1990.
5. Popov,MechanicsofSolids,2/e,NewPearsonEducation,2015.

OnlineLearningResources:

- https://onlinecourses.nptel.ac.in/noc19_ce18/preview.
- https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6.
- https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
- https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
- https://www.coursera.org/learn/mechanics-1
- https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-1-linear-elastic-behavior
- https://archive.nptel.ac.in/courses/112/107/112107146/

IIYearB.Tech.ME–ISemester

L	T	P	C
3	0	0	3

(23A103203)MATERIAL SCIENCE & METALLURGY

Course Objective:

- Understandthecrystallinestructureofdifferentmetalsandstudythestabilityofphasesin different alloy systems.
- Studythebehaviorofferrousandnonferrousmetalsandalloysandtheirapplicationin different domains
- Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.
- Graspthemethodsofmakingofmetalpowdersandapplicationsofpowdermetallurgy
- Comprehendthepropertiesandapplicationsofceramic,compositesandotheradvancedmethods

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understandthecrystallinestructureofdifferentmetalsandstudythestability of phases in different alloy systems.	L2
CO2	Studythebehaviorofferrousandnon-ferrousmetalsandalloysandtheir application in different domains.	L1
CO3	Understandtheeffectofheattreatment,additionofalloyingelementsonproperties of ferrous metals.	L2
CO4	Graspthemethodsofmakingofmetalpowdersandapplicationsofpowdermetallurgy.	L3
CO5	Comprehendthepropertiesandapplicationsofceramic,compositesandother advanced methods.	L4

UNIT–I

Structure of Metals and Constitution of alloys: Crystallization of metals, Packing Factor - SC, BCC, FCC& HCP-line density, plane density. Grain and grain boundaries, effect of grain boundaries–determination of grainsize.

Imperfections,SlipandTwinning.

Necessity of alloying, types of solid solutions, Hume Rothery‘s rules, intermediate alloy phases, and electron compounds

Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coringmiscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationshipbetweenequilibriumdiagramsandpropertiesofalloys.Studyofbinaryphasediagrams such as Cu-Ni and Fe-Fe_3C.

UNIT–II

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey castiron,Spheriodalgraphitecastiron,Alloycastiron.Classificationofsteels,structureandpropertiesof

plaincarbonsteels,Lowalloysteels, Hadfieldmanganesesteels,toolanddiesteels.
Non-ferrousMetalsandAlloys: StructureandpropertiesofCopperanditsalloys,Aluminiumand its alloys, Titanium and its alloys, Magnesium and its alloys, Super alloys.

UNIT–III
Heat treatment of Steels: Effect of alloying elements on Fe-Fe_3C system, annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, age hardening treatment, Cryogenic treatment.

UNIT–IV
Powder Metallurgy: Basic processes- Methods of producing metal powders- milling atomization-Granulation-Reduction-Electrolytic Deposition. Compacting methods – Sintering - Methods of manufacturingsinteredparts.Secondaryoperations,Applicationsofpowdermetallurgicalproducts.

UNIT–V
Ceramic and Advanced materials: Crystalline ceramics, glasses, cermets, abrasive materials, Classification of composites, manufacturing methods, particle reinforced composites, fiber reinforced composites, PMC, MMC, CMC and CCCs. Introduction to Nanomaterials and smart materials.

TextBooks:

1. S.H.Avner,IntroductiontoPhysicalMetallurgy,2/e,TataMcGraw-Hill,1997.
2. DonaldR.Askeland,EssentialsofMaterialsscienceandEngineering,4/e,CL Engineering publications, 2018.

ReferenceBooks:

1. Dr.V.D.kodgire,MaterialScienceandMetallurgy,39/e,EverestPublishingHouse,2017.
2. V.Raghavan,MaterialScienceandEngineering,5/e,PrenticeHallofIndia,2004.
3. WilliamD.CallisterJr,MaterialsScienceandEngineering:AnIntroduction,8/e,JohnWiley and Sons, 2009.
4. GeorgeE.Dieter,MechanicalMetallurgy,3/e,McGraw-Hill,2013.
5. Yip-WahChung,IntroductiontoMaterialScienceandEngineering,2/e,CRCPress,2022.
6. AVKSuryanarayana,MaterialScienceandMetallurgy,BSPublications,2014.
7. U.C.Jindal,MaterialScienceandMetallurgy,1/e,PearsonPublications,2011.

OnlineLearningResources:

- https://archive.nptel.ac.in/courses/113/106/113106032/
- https://www.edx.org/learn/mechanics/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-3-time-dependent-behavior.
- https://www.youtube.com/watch?v=9Sf278j1GTU
- https://www.coursera.org/learn/fundamentals-of-materials-science
- https://www.coursera.org/learn/material-behavior.

IIYearB.Tech.ME–ISemester

L	T	P	C
0	0	3	1.5

(23A103204)MECHANICS OF SOLIDS & MATERIAL SCIENCE LAB

Course Objective:

- Evaluate the values of yield stress, ultimate stress and bending stress of the given specimenunder tension test and bending test
- Conductthetorsiontesttodeterminethemodulusofrigidityof given specimen.
- Justifythe Rockwell hardness test over with Brinell hardness and measure the hardness of the given specimen.
- Examinethestiffnessoftheopencoilandclosedcoilspringandgradethem.
- Analyzethemicrostructureandcharacteristicsofferrousandnonferrousalloyspecimens.

Course Outcomes:

COs	Statements	BloomsLevel
CO1	Understandthestressstrainbehaviorofdifferentmaterials.	L2
CO2	Evaluatethehardnessofdifferentmaterials.	L4
CO3	Explaintherelationbetweenelasticconstantsandhardnessofmaterials.	L1
CO4	Identifyvariousmicrostructuresofsteelsandcastirons.	L3
CO5	Evaluatehardnessoftreatedanduntreatedsteels.	L4

NOTE:Any6experimentsfromeachsectionAand B.

A) MECHANICSOFSOLIDSLAB:

1. Tensiletest
2. Bendingteston
   a) Simplysupportedbeam
   b) Cantileverbeam
3. Torsiontest
4. Hardnesstest
   a) Brinell‘shardnesstest
   b) Rockwellhardnesstest
   c) Vickershardnesstest
5. Testonsprings
6. Impacttest
   a) Charpytest
   b) Izodtest
7. Punchsheartest

8. Liquidpenetrationtest

B) MATERIALSCIENCELAB:

1. PreparationandstudyoftheMicrostructureofpuremetals.
2. PreparationandstudyoftheMicrostructureofMildsteel,mediumcarbonsteels,andHigh carbon steels.
3. StudyoftheMicrostructures of CastIrons.
4. StudyoftheMicrostructures of Non-Ferrousalloys.
5. StudyoftheMicrostructures of Heat treatedsteels.
6. HardenabilityofsteelsbyJominyEndQuenchTest.

Virtuallab:

1. To investigate the principal stresses σa and σb at any given point of a structural element or machine component when it is in a state of plane stress. (https://virtual-labs.github.io/exp-rockwell-hardness-experiment-iiith/objective.html)
2. To find the impact resistance of mild steel and cast iron.(https://sm-nitk.vlabs.ac.in/exp/izod-impact-test).
3. To find the impact resistance of mild steel.(https://sm-nitk.vlabs.ac.in/exp/charpy-impact-test/index.html)
4. To find the Rockwell hardness number of mild steel, cast iron, brass, aluminum and spring steel etc. (https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test)
5. To determine the indentation hardness of mild steel, brass, aluminum etc. using Vickers hardness testing machine. (https://sm-nitk.vlabs.ac.in/exp/vickers-hardness-test).

IIYearB.Tech.ME–ISemester

L	T	P	C
0	0	3	1.5

(23A103205)COMPUTER-AIDEDMACHINE DRAWING

Course Objectives

- Introduceconventionalrepresentationsofmaterialandmachinecomponents.
- Trainto usesoftwarefor2Dand 3D modeling.
- Familiarizewiththreadprofiles,riveted,weldedandkeyjoints.
- Teachsolidmodelingofmachinepartsandtheirsections.
- Explaincreationof2Dand3DassemblydrawingsandFamiliarizewithlimits,fits,and tolerances inmating components

Course Outcomes:

COs	Statements	Blooms Level
CO1	Demonstratetheconventionalrepresentationsofmaterialsandmachinecomponents.	L3
CO2	Model riveted, welded and keyjointsusingCADsystem.	L6
CO3	Createsolidmodelsandsectionalviewsofmachinecomponents.	L6
CO4	Generatesolidmodelsofmachinepartsandassemblethem.	L5
CO5	Translate3D assembliesinto2D drawings.	L6

The following are to be done by any 2D software package

Conventionalrepresentationofmaterialsandcomponents:

Detachablejoints: Drawingofthreadprofiles,hexagonalandsquare-headedboltsandnuts,bolted joint with washer and locknut, stud joint, screw joint and foundation bolts.

Rivetedjoints: Drawingofrivet,lapjoint,buttjointwithsinglestrap,singleriveted,doubleriveted double strap joints.

Weldedjoints: LapjointandTjointwithfillet,buttjointwithconventions.

Keys: Taperkey,sunktaperkey,roundkey,saddlekey,featherkey,woodruffkey.

Couplings:rigid–Muff,flange;flexible–bushedpin-typeflangecoupling,universalcoupling, Oldham‘s‘coupling.

Thefollowingexercisesaretobedonebyany3Dsoftwarepackage: Sectional

views:

Creatingsolidmodelsofcomplexmachinepartsandsectionalviews.

Assemblydrawings:(Anyfourofthefollowingusingsolidmodelsoftware)

Lathetoolpost,toolheadofshapingmachine,tail-stock,machinevice, gatevalve,carburetor,piston, connecting rod, eccentric, screw jack, plumber block, axle bearing, pipe vice, clamping device, Geneva cam, universal coupling.

Productiondrawing:

Representation of limits, fits and tolerances for mating parts. Use any four parts of above assembly drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

Textbooks:

1 MachineDrawingbyK.L.Narayana,P.KannaiahandK.VenkatReddy,NewAge International Publishers, 3/e, 2014
2 MachinedrawingbyN.Sideshwar, P.Kannaiah, V.V.S.Sastry,TMH Publishers. 2014.

ReferenceBooks:

1. CecilJensen,JayHelselandDonaldD.Voisinet,ComputerAidedEngineeringDrawing, Tata McGraw-Hill, NY, 2000.
2. JamesBarclay,BrainGriffiths,EngineeringDrawingforManufacture,KoganPage Science, 2003.
3. N.D.Bhatt,Machine Drawing, CharotarPublishers, 50/e, 2014.

OnlineLearningResources:

- https://eeedocs.wordpress.com/wp-content/uploads/2014/02/machinedrawing.pdf
- https://archive.nptel.ac.in/courses/112/105/112105294/
- https://www.edx.org/learn/engineering/dassault-systemes-solidworks-solidworks-cad-fundamentals?index=product&queryID=c90b35a82a6ef58b0d6f89679c63f6a1&position=2&linked_from=autocomplete&c=autocomplete
- https://www.youtube.com/watch?v=0bQkS3_3Fq4

IIYearB.Tech.ME–ISemester

L	T	P	C
0	0	2	1

(23A104209)EMBEDDED SYSTEMS & IoT

Course Objectives:

- TocomprehendMicrocontroller-Transducers Interfacetechniques
- ToestablishSerialCommunicationlinkwithArduino
- To analysebasics of SPIinterface.
- TointerfaceStepperMotorwithArduino
- ToanalyseAccelerometerinterface techniques
- TointroducetheRaspberryPIplatform, that is widelyusedinIoTapplications
- Tointroducetheimplementationofdistancesensoron IoTdevices.

Course Outcomes:

COs	Statements	Blooms Level
CO1	ComprehendMicrocontroller-Transducers Interfacetechniques.	L4
CO2	EstablishSerialCommunicationlinkwithArduino	L6
CO3	AnalysebasicsofSPIinterface.	L4
CO4	UnderstandtheconceptofM2M(machinetomachine)withnecessaryprotocols and get awareness in implementation of distance sensor.	L2
CO5	Realizetherevolutionofinternetinmobiledevices,cloudandsensornetworks	L3

EmbeddedSystemsExperiments: (Any5experimentsfromthe following)

1. MeasureAnalogsignalfromTemperature Sensor.
2. GeneratePWMoutput.
3. DrivesinglecharactergenerationonHyperTerminal.
4. DriveagivenstringonHyperTerminal.
5. FullduplexLinkestablishmentusingHyperterminal.
6. Driveagivenvalueona 8bitDAC consistingofSPI.
7. DriveSteppermotorusingAnalogGPIOs.
8. Drive Accelerometer and Display the readings on Hyper Terminal.

COMPONENTS/BOARDS:1.ArduinoDuemilanoveBoard2.ArduinoSoftwareIDE.

TextBooks:

1. EmbeddedSystemsArchitecture-ByTammyNoergaard,ElsevierPublications,2013.
2. EmbeddedSystems-ByShibu.K.V-TataMcGrawHillEducationPrivateLimited,2013.
3. EmbeddedSystemDesign,FrankVahid,TonyGivargis,JohnWileyPublications,2013.
4. EmbeddedSystems-LylaB.Das-PearsonPublications,2013.

InternetofThings Experiments: (Any5 experimentsfromthefollowing)

1. GettingstartedwithRaspberryPi,InstallRaspianonyourSDcard.
2. Python-basedIDE(integrateddevelopmentenvironments)fortheRaspberryPiandhowto trace
3. anddebugPythoncodeon the device.
4. UsingRaspberrypia.Calculatethedistanceusingdistancesensor.b.BasicLEDfunctio nality.
5. RaspberryPiinteractwithonlineservicesthroughtheuseofpublicAPIsandSDKs.
6. StudyandInstallIDEofArduinoanddifferenttypesofArduino.
7. StudyandImplementZigbeeProtocolusingArduino/Raspberry Pi.
8. Calculate thedistanceusingdistancesensorUsingArduino.
9. BasicLEDfunctionalityUsingArduinoandNodeMCU.
10. Calculatethemoisturecontent in thesoilusingArduino and NodeMCU.
11. Calculate thedistanceusingdistancesensorUsingNodeMCU.
12. BasicLEDfunctionalityUsingNodeMCU.

IIYearB.Tech.ME–ISemester

L	T	P	C
0	1	2	2

CourseObjectives:

(23A105205)PYTHON ROGRAMMING (SKILL ENHANCEMENT COURSE)

Themain objectivesof thecourse areto

- IntroducecoreprogrammingconceptsofPythonprogramminglanguage.
- DemonstrateaboutPythondatastructureslikeLists,Tuples,Setsanddictionaries
- ImplementFunctions,ModulesandRegularExpressionsinPythonProgrammingandto create practical and contemporary applications using these

Course Outcomes:

Aftercompletionofthe course, studentswillbeableto

- ClassifydatastructuresofPython(L4)
- ApplyPythonprogrammingconcepts to solveavarietyof computational problems (L3)
- Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs (L3)
- Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas (L2)
- Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries (L3)
- Proposenewsolutionstocomputationalproblems(L6)

UNTI-I: History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop,for Loop, continue and breakStatements, CatchingExceptionsUsingtryandexceptStatement.

SampleExperiments:

1. Writeaprogram to find thelargest element amongthreeNumbers.
2. WriteaProgramtodisplayallprimenumbers within an interval
3. Writeaprogramtoswaptwonumbers without usingatemporaryvariable.
4. DemonstratethefollowingOperatorsinPython with suitableexamples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii)

Identity Operators

5. Writeaprogram to addandmultiplycomplexnumbers
6. Writeaprogramtoprintmultiplicationtableofagivennumber.

UNIT-II:Functions: Built-InFunctions,CommonlyUsedModules,FunctionDefinitionandCalling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command LineArguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Usedon Lists, List Methods, del Statement.

SampleExperiments:

7. Writeaprogramtodefineafunctionwithmultiplereturnvalues.
8. Writeaprogramtodefineafunctionusingdefaultarguments.
9. Writeaprogramtofindthelengthofthestringwithoutusinganylibrary functions.
10. Writeaprogram to checkifthesubstringis present in agivenstringornot.
11. Writeaprogramto perform thegivenoperationsonalist:
    i. Addition ii.Insertion iii. slicing
12. Write aprogramto performany5built-infunctions bytakinganylist.

UNIT-III: Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: CreatingTuples, BasicTuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Usingzip() Function, Sets, Set Methods, Frozenset.

SampleExperiments:

13. Writeaprogramtocreatetuples(name,age,address,college)foratleasttwomembersand concatenate the tuples and print the concatenated tuples.
14. Writeaprogramtocountthenumberofvowelsinastring(Nocontrolflowallowed).
15. Write aprogram to checkifagivenkeyexists in a dictionaryornot.
16. Writeaprogramtoaddanewkey-value pairtoanexisting dictionary.
17. Writeaprogramtosumalltheitemsinagivendictionary.

UNIT-IV:Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance,Polymorphism.

SampleExperiments:

18. Writeaprogramtosortwordsinafileandputtheminanotherfile.Theoutputfileshould

haveonlylower-case words, soanyupper-casewordsfrom source must belowered.
19. Pythonprogramtoprinteachlineofafileinreverse order.
20. Pythonprogramtocomputethenumberofcharacters,wordsandlinesinafile.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Writeaprogram to add, transpose and multiplytwomatrices.
23. Write a Python program to create a class that represents a shape. Include methods tocalculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:IntroductiontoDataScience: FunctionalProgramming,JSONandXMLinPython, NumPy with Python, Pandas.

SampleExperiments:

24. PythonprogramtocheckwhetheraJSONstringcontainscomplexobjectornot.
25. PythonProgram to demonstrateNumPyarrayscreationusingarray() function.
26. Pythonprogramtodemonstrateuseofndim,shape,size, dtype.
27. Pythonprogramtodemonstratebasicslicing,integerand Boolean indexing.
28. Pythonprogramtofindmin,max,sum,cumulativesumofarray
29. Create a dictionarywith at least fivekeys and each keyrepresent value as a list wherethis list contains at least ten values and convert this dictionaryas a pandas data frame and explore the data through the data frame as follows:
    a) Applyhead () function tothepandas data frame
    b) PerformvariousdataselectionoperationsonDataFrame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

ReferenceBooks:

1. GowrishankarS,VeenaA., IntroductiontoPythonProgramming,CRCPress.
2. PythonProgramming,SSridhar,JIndumathi,V MHariharan,2nd Edition,Pearson,2024
3. IntroductiontoProgrammingUsingPython,Y.DanielLiang,Pearson.

OnlineLearningResources/VirtualLabs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

Text Books:

1. ArsheepBahga&VijayMadisetti,InternetofThings-AHands-onApproach,1/e,OrientBlackswan Private Limited - New Delhi, 2015.
2. ArshdeepBahgaandVijayMadisetti,UniversitiesPress, 2015.
3. GettingStartedwithRaspberryPi,MattRichardson&ShawnWallace,O'Reilly(SPD), 2014,.

OnlineLearningSources

1. https://onlinecourses.nptel.ac.in/noc21_cs17/preview
2. https://onlinecourses.nptel.ac.in/noc20_ee98/preview
3. https://archive.nptel.ac.in/courses/108/105/108105057/
4. https://www.edx.org/learn/embedded-systems/the-university-of-texas-at-austin-embedded-systems-shape-the-world-microcontroller-input-output?index=product&objectID=course-

785cf551-7f66-4350-b736-64a93427b4db&webview=false&campaign=Embedded+Systems+-+Shape+The+World%3A+Microcontroller+Input%2FOutput&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fembedded-systems

5. https://www.edx.org/learn/iot-internet-of-things/universitat-politecnica-de-valencia-introduction-to-the-internet-of-things?index=product&queryID=e1322674dcb3d246be981d0669265399&position=4&linked_from=autocomplete&c=autocomplete
6. https://www.edx.org/learn/iot-internet-of-things/curtin-university-iot-sensors-and-devices?index=product&queryID=94ff5bcb80b8e4f427a0985bb2a5e07f&position=3&results_level=first-level-results&term=IOT&objectID=course-967eee29-87e8-4f2d-9257-a1b38ec07e85&campaign=IoT+Sensors+and+Devices&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Fsearch
7. VirtualLabs-http://vlabs.iitkgp.ac.in/rtes/
8. VirtualLabs-https://cse02-iiith.vlabs.ac.in/
9. VirtualLabs-https://iotvirtuallab.github.io/vlab/Experiments/index.html

IIYearB.Tech.ME–ISemester

L	T	P	C
2	0	0	0

(23A100033)ENVIRONMENTALSCIENCE

Course Objectives:

- Tomakethestudentstogetawarenesson environment.
- Tounderstandtheimportanceofprotectingnaturalresources,ecosystemsforfuture generations and pollution causes due to the day to day activities of human life
- Tosaveearthfromtheinventionsbythe engineers.

UNITI

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forestecosystem.
b. Grasslandecosystem
c. Desertecosystem.
d. Aquaticecosystems(ponds,streams,lakes,rivers,oceans,estuaries)

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productiveuse,social,ethical,aestheticandoptionvalues –Biodiversityatglobal,Nationalandlocal levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity:habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India– Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

EnvironmentalPollution: Definition,Cause,effectsandcontrolmeasuresof:

a. Air Pollution.
b. Waterpollution
c. Soil pollution
d. Marine pollution
e. Noisepollution
f. Thermalpollution
g. Nuclearhazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns.Case studies – Environmental ethics:Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.Case Studies – Wasteland reclamation. – Consumerism andwasteproducts.–EnvironmentProtectionAct.–Air(PreventionandControlofPollution)Act.
– Water(PreventionandcontrolofPollution)Act–WildlifeProtectionAct–ForestConservationAct
– Issuesinvolvedinenforcementofenvironmentallegislation–Public awareness.

UNIT V

HumanPopulationandtheEnvironment: Populationgrowth,variationamongnations.Population explosion – FamilyWelfareProgrammes. – Environment and human health – Human Rights –Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Textbooks:

1. TextbookofEnvironmentalStudiesforUndergraduateCoursesErachBharuchaforUniversity Grants Commission, Universities Press.
2. Palaniswamy,—EnvironmentalStudies‖,Pearsoneducation
3. S.AzeemUnnisa,—EnvironmentalStudies‖AcademicPublishingCompany
4. K.RaghavanNambiar,—TextbookofEnvironmentalStudiesforUndergraduateCoursesas per UGC model syllabus‖, Scitech Publications (India), Pvt. Ltd.

References:

1. DeekshaDaveandE.SaiBabaReddy,—TextbookofEnvironmentalScience‖,CengagePublications.
2. M.AnjiReddy,—TextbookofEnvironmentalSciencesandTechnology‖,BSPublication.
3. J.P.Sharma,ComprehensiveEnvironmentalstudies,Laxmipublications.
4. J.GlynnHenryandGaryW.Heinke, —EnvironmentalSciencesandEngineering‖,Prentice hall of India Private limited
5. G.R.Chatwal,—ATextBookofEnvironmentalStudies‖HimalayaPublishingHouse
6. GilbertM.MastersandWendellP.Ela,—IntroductiontoEnvironmentalEngineeringand Science, Prentice hall of India Private limited.
3. https://www.coursera.org/learn/python-for-applied-data-science-ai
4. https://www.coursera.org/learn/python?specialization=python#syllabus

IIYearB.Tech.ME–IISemester

L	T	P	C
2	0	0	2

(23A103210)INDUSTRIAL MANAGEMENT

CourseObjectives: Theobjectives of thecourseareto

- Introducethescopeandroleofindustrialengineeringandthetechniquesforoptimaldesignofl ayouts
- Illustratehowworkstudyisusedtoimprove productivity
- ExplainTQMandqualitycontroltechniques
- Introducefinancialmanagementaspectsand
- Discusshumanresourcemanagementandvalueanalysis.

Course Outcomes:

COs	Statements	BloomsLevel
CO1	Learnabouthowtodesigntheoptimallayout	L1
CO2	Demonstrateworkstudymethods	L3
CO3	Explain QualityControltechniques	L2
CO4	Discussthefinancialmanagementaspects	L3
CO5	Understandthehumanresourcemanagementmethods.	L2

UNIT–I

INTRODUCTION: Definitionofindustrialengineering(I.E),development,applications,roleofanindustrial engineer, quantitativetoolsofIEandproductivitymeasurement.Conceptsofmanagement,importance,functionsofman agement, scientific management, Taylor‘s principles, Fayol‘s principles ofmanagement.
PLANTLAYOUT: Factorsgoverningplantlocation,typesofproductionlayouts,advantagesanddisadvantagesofpro cesslayoutandproductlayout,applications,quantitativetechniquesforoptimaldesignof layouts.

UNIT–II

WORKSTUDY: Importance,typesofproduction,applications,workstudy,methodstudyandtimestudy,wor ksampling,PMTS,micro-motionstudy,ratingtechniques,MTM,workfactorsystem,principlesofErgonomics,flowprocesscharts,strin gdiagramsandTherbligs.

UNIT–III

STATISTICAL QUALITY CONTROL: Quality control, Queuing assurance and its importance, SQC,attributesamplinginspectionwithsingleanddoublesampling,Controlcharts–*X*andR–charts*X* and *Sch*artsand their applications, simple numerical examples.

TOTALQUALITYMANAGEMENT: Elements of TQM – Continuous Improvement – zerodefectconcept,qualitycircles,implementation,applications,ISOqualitysystems.SixSigma–definition,basic concepts.

UNIT–IV

FINANCIAL MANAGEMENT: Scope and nature of financial management, Sources of finance, Management of working capital, estimation of working capital requirements, budget and budgetary control, Capital budgeting – Nature of InvestmentDecisions–InvestmentEvaluationcriteria-NPV,IRR,PI,PaybackPeriod,andARR,numericalproblems.

UNIT–V

HUMAN RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentiveplans, and types.
VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

TextBooks:

1. O.PKhanna, IndustrialEngineeringandManagement,DhanpatRaiPublications(P)Ltd.
2. MartandTelsang, IndustrialEngineeringandProductionManagement,S.Chand& Company Ltd.New Delhi

ReferenceBooks:

1. BhattacharyaDK,IndustrialManagement,S.Chand, publishers.
2. J.GMonks,OperationsManagement,3/e,McGrawHillPublishers.
3. T.R.Banga,S.C.Sharma,N.K.Agarwal,IndustrialEngineeringandManagementScience,KhannaPublishers.
4. KoontzO'Donnell,PrinciplesofManagement,McGrawHillPublishers.
5. R.C.Gupta,StatisticalQualityControl,Khanna Publishers.
6. NVSRaju, IndustrialEngineeringandManagement,CengageIndiaPrivateLimited.

OnlineLearningSources

- https://onlinecourses.nptel.ac.in/noc21_me15/preview
- https://onlinecourses.nptel.ac.in/noc20_mg43/preview
- https://www.edx.org/learn/industrial-engineering
- https://youtube.com/playlist?list=PL299B5CC87110A6E7&si=TghLCbEobuxjEaXi
- https://youtube.com/playlist?list=PLbjTnj-t5Gkl0z3OHOGK5RB9mvNYvnImW&si=oaX_5RG69hS3v2ll

IIYearB.Tech.ME–IISemester

L	T	P	C
3	0	0	3

(23A100017)COMPLEX VARIABLES,PROBABILITY AND STATISTICS

Course Outcomes:

COs	Statements	Blooms level
CO1	Analyze limit, continuity and differentiation of functions of complex variablesand Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.	L2,L3
CO2	UnderstandCauchytheorem,Cauchyintegralformulasandapplytheseto evaluate complex contour integrals. Classify singularities and poles; find residues and evaluate complex integrals using the residue theorem.	L3,L5
CO3	ApplyProbabilitytheorytofindthechancesofhappeningofevents.	L3
CO4	Understandvariousprobabilitydistributionsandcalculatetheirstatistical constants.	L2,L3
CO5	Analyze to test various hypotheses included in theoryand types oferrors for large samples.	L3,L5

UNITI: ComplexVariable–Differentiation

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation,Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

UNITII: ComplexVariable–Integration

Lineintegral-Contourintegration,Cauchy‘sintegraltheorem(SimpleCase),CauchyIntegralformula,
Power series expansions: Taylor‘s series, zeros of analytic functions, singularities, Laurent‘s series, Residues,CauchyResiduetheorem(withoutproof),Evaluationofdefiniteintegralinvolvingsineandcosine.

UNITIII:Probabilitytheory

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye‘s theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation

UNITIV: Randomvariables&Distributions

Probability distribution - Binomial, Poisson approximation to the binomial distribution, Normal distribution and their properties

UNITV :EstimationandTestingofhypothesis,largesampletests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, twotypes of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Textbooks:

3. B.S.Grewal,HigherEngineeringMathematics,KhannaPublishers,2017,44th Edition
4. MillerandFreunds,ProbabilityandStatisticsfor Engineers,7/e,Pearson, 2008.

ReferenceBooks:

6. R.K.Jain and S.R.K.Iyengar,AdvancedEngineeringMathematics,AlphaScience International Ltd., 20215th Edition(9th reprint).
7. B.V.Ramana,HigherEngineeringMathematics,McGrawHillpublishers
8. W.Feller,anIntroductiontoProbabilityTheoryanditsApplications,1/e,Wiley, 1968.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
2. https://archive.nptel.ac.in/courses/111/106/111106111/

IIYearB.Tech.ME–IISemester

L	T	P	C
3	0	0	3

(23A103206T)MANUFACTURINGPROCESSES

CourseObjective:Theobjectivesofthecourseareto

- Knowtheworkingprincipleofdifferentmetalcastingprocessesandgatingsystem.
- Classifytheweldingprocesses,workingofdifferenttypesofweldingprocessesandweldingdefects .
- Knowthenatureofplasticdeformation,coldandhotworkingprocess,workingofarolling mill and types, extrusion processes.
- Understandtheprinciplesofforging,toolsanddies,workingofforgingprocesses.
- KnowabouttheAdditivemanufacturing.

Course Outcomes:

COs	Statements	BloomsLevel
CO1	Designthepatternsandcoreboxesformetalcastingprocesses	L6
CO2	Understandthedifferentweldingprocesses	L2
CO3	Demonstratethedifferenttypesofbulkformingprocesses	L3
CO4	Understandsheetmetalformingprocesses	L2
CO5	Learnaboutthedifferenttypesofadditivemanufacturingprocesses	L2

UNIT–I

Casting: Steps involved in making a casting – Advantage of casting and its applications. Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Molding, different types of cores , Principles of Gating, Risers, casting design considerations. Methods of melting and types of furnaces, Solidification of castings and casting defects- causes and remedies. Basic principles and applications of special casting processes - Centrifugal casting, Die casting, Investment casting and shell molding.

UNIT–II

Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, power characteristics, Manual metal arc welding, submerged arc welding, TIG&MIG welding. Electro–slag welding.

Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermitwelding,PlasmaArcwelding,Laserwelding,electronbeamwelding,Soldering&Brazing. Heat affected zones in welding; pre & post heating, welding defects –causes and remedies.

UNIT–III

Bulk Forming: Plastic deformation in metals and alloys-recovery, recrystallization and grain

growth.
Hot working and Cold working-Strain hardening and Annealing. Bulk forming processes: Forging-Types of Forging, forging defects and remedies; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

UNIT–IV
Sheet metal forming- Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools.
High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations.

UNIT-V
Additive manufacturing - Steps in Additive Manufacturing (AM), Classification of AMprocesses, Advantages of AM, and types of materials for AM, VAT photo polymerization AM Processes, Extrusion - Based AM Processes, Powder Bed Fusion AM Processes, Direct Energy Deposition AM Processes, Post Processing of AM Parts, Applications

Textbooks:

1. Kalpakjain S and Steven R Schmid,Manufacturing Processes for Engineering Materials, 5/e, Pearson Publications, 2007.
2. P.N.Rao,ManufacturingTechnology-VolI,5/e,McGrawHillEducation,2018.

ReferenceBooks:

1. A.Ghosh&A.K.Malik,ManufacturingScience,EastWestPressPvt.Ltd,2010.
2. Lindberg and Roy, Processes and materials of manufacture, 4/e, Prentice Hall India Learning Private Limited, 1990.
3. R.K.Jain,ProductionTechnology,KhannaPublishers,2022.
4. SharmaP.C.,ATextbookofProductionTechnology,8/e,SChandPublishing,2014.
5. H.S.Shaun, ManufacturingProcesses, 1/e,Pearson Publishers, 2012.
6. WAJChapman,WorkshopTechnology,5/e,CBSPublishers&DistributorsPvt.Ltd, 2001.
7. HindustanMachineTools,ProductionTechnology,TataMcGrawHillPublishers,2017.
8. IanGibson,DavidWRosen,BrentStucker.,AdditiveManufacturingTechnologies:3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, 2/e, Springer, 2015.

OnlineLearning Resources:

- https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technology-fundamentals-of-manufacturing-processes
- https://onlinecourses.nptel.ac.in/noc21_me81/preview
- www.coursera.org/learn/introduction-to-additive-manufacturing-processessera
- https://archive.nptel.ac.in/courses/112/103/112103263/
- https://elearn.nptel.ac.in/shop/nptel/principles-of-metal-forming-technology/?v=c86ee0d9d7ed

IIYearB.Tech.ME–IISemester

L	T	P	C
3	0	0	3

(23A103207T)FLUIDMECHANICS&HYDRAULICMACHINES

CourseObjectives: Thestudentscompletingthiscoursareexpectedto

- Understandthepropertiesoffluids,manometry,hydrostaticforcesactingondifferent surfaces
- Understandthekinematicanddynamicbehaviorthroughvariouslawsoffluidslike continuity, Euler‘s, Bernoulli‘s equations, energy and momentum equations.
- Understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

Course Outcomes:

COs	Statements	BloomsLevel
CO1	Understandthebasicconceptsoffluidproperties.	L2
CO2	Estimatethemechanicsoffluidsinstaticanddynamicconditions.	L5
CO3	ApplytheBoundarylayertheory,flowseparationanddimensionalanalysis.	L3
CO4	Estimatethehydrodynamicforcesofjetonvanesindifferentpositions.	L5
CO5	UnderstandtheworkingPrinciplesandperformanceevaluationof hydraulic pump and turbines.	L2

UNITI

Fluid statics: Dimensions and units: physical properties of fluids - specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric, gauge and vacuum pressure, Measurement of pressure – Manometers - Piezometer, U-tube, inverted and differential manometers. Pascal‘s & hydrostatic laws.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of meta center height. Stability analysis and applications.

UNITII

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics: surface and body forces –Euler‘s and Bernoulli‘s equations for flow along a streamline, momentum equation and its applications, force on pipe bend.

Closed conduit flow: Reynold‘s experiment- Darcy Weisbach equation- Minor losses in pipes-pipesinseriesandpipesinparallel-totalenergyline-hydraulicgradientline.

UNITIII

BoundaryLayerTheory: Introduction,momentum integral equation,displacement,momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis: Dimensions and Units, Dimensional Homogeneity, Nondimensionalization of equations, Method of repeating variables and Buckingham Pi Theorem.

UNITIV

Basics of turbo machinery: hydro dynamic force of jets on stationaryand moving flat, inclined, and curvedvanes,jetstrikingcentrallyandattip,velocitydiagrams, workdoneand efficiency, flowOver radial vanes.

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube-theory-functions and efficiency.

UNITV

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies-specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

Textbooks:

1. Y.A.Cengel, J.M.Cimbala,Fluid Mechanics, Fundamentals and Applications,6/e,McGraw Hill Publications, 2019.
2. Dixon,FluidMechanicsandThermodynamicsofTurbomachinery,7/e,ElsevierPublishers, 2014.

ReferenceBooks:

1. PNModiandSMSeth,Hydraulics&FluidMechanicsincludingHydraulicsMachines, Standard Book House, 2017.
2. RKBansal,FluidMechanicsandHydraulicMachines,10/e,LaxmiPublications(P)Ltd,2019.
3. Rajput,FluidMechanicsandHydraulicMachines,SChand&Company,2016.
4. D.S.Kumar,FluidMechanicsandFluidPowerEngineering,SKKataria&Sons,2013.
5. D.RamaDurgaiah,FluidMechanicsandMachinery,1/e,NewAgeInternational,2002.

OnlineLearningResources:

- https://archive.nptel.ac.in/courses/112/105/112105206/
- https://archive.nptel.ac.in/courses/112/104/112104118/
- https://www.edx.org/learn/fluid-mechanics
- https://onlinecourses.nptel.ac.in/noc20_ce30/previewnptel.ac.in
- www.coursera.org/learn/fluid-powerera

IIYearB.Tech.ME–IISemester

L	T	P	C
3	0	0	3

(23A103208)THEORY OF MACHINES

CourseObjectives: Theobjectives of thecourseareto makethestudentslearn about

- Introducevariousbasicmechanismsandtheir applications.
- Explainimportanceofdegreeoffreedom.
- Familiarizevelocityandaccelerationinmechanisms.
- Describethecamsand follower motions.
- Explaintheimportanceofgyroscopiccouples.
- Introducetheequationofmotionforsingledegreeoffreedomsystem.

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understanddifferentmechanismsandtheirinversions.	L2
CO2	Calculatevelocityandaccelerationofdifferentlinksinamechanism	L4
CO3	Applytheeffectsofgyroscopiccoupleinships,aeroplanesandroad vehicles.	L3
CO4	Evaluateunbalancemassinrotatingmachines.	L5
CO5	Analyzefreeandforcedvibrationsofsingledegreefreedomsystems.	L4

UNIT–I:SimpleMechanisms

Simple Mechanisms: Classification of mechanisms – Basic kinematic concepts and definitions – Degreeoffreedom,mobility–Grashof'slaw,kinematicinversionsoffourbarchainandslidercrank chains- Limit positions – Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line mechanisms – UniversalJoint – Rocker mechanisms.

UNIT–II:Planeandmotionanalysis

Plane and motion analysis: Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations – kinematicanalysis of simple mechanisms – slidercrank mechanism dynamics – Coincidentpoints – Corioliscomponent of acceleration.

UNIT–III:Gyroscope&GearProfile

Gyroscope: Principle of gyroscope, gyroscopic effect in an aeroplane, ship, car and two wheeler, simple problems

GearProfile: Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting – helical, bevel, worm, rack& pinion gears, epicyclic and regular gear train kinematics.

UNIT–IV:Balancingof Rotatingmasses&Cams

Balancing of Rotating masses: Need for balancing, balancing of single mass and several masses in different planes, using analytical and graphical methods.

Cams: Classification of cams and followers-Terminology and definitions – Displacement diagrams –Uniform velocity, parabolic, simple harmonic and cycloidal motions – derivatives of follower motions- specified contour cams- circular and tangent cams –pressure angle and undercutting.

UNIT–V:Vibrations&TurningMomentDiagramsandFlywheels

Vibrations: Introduction, degree of freedom, types of vibrations, free natural vibrations, Newton method and energy method for single degree of freedom. Damped vibrations- under damped, critically damped; and over damped systems, forced vibrations with and without damping in single degree of freedom; Vibration isolation and transmissibility.

Turning Moment Diagrams and Flywheels: Turning moment diagrams for steam engine, I.C engine and Multi Cylinder Engine. Crank effort – coefficient of fluctuation of energy, coefficient of fluctuation of speed – Fly Wheel and their design, fly wheels for punching press.

Textbooks:

1.S.S.Rattan,TheoryofMachines, 4/e,TataMc-Graw Hill, 2014.
2.P.L.Ballaney,Theoryof Machines &Mechanisms,25/e,KhannaPublishers,Delhi,2003.

ReferenceBooks:

1.F.Haidery,Dynamicsof Machines,5/e,NiraliPrakashan,Pune, 2003.
2.J.E.Shigley,Theoryof Machines andMechanisms, 4/e, Oxford, 2014.
3.G.K.Groover, MechanicalVibrations,8/e,NemchandBros,2009.
4.Norton,R.L.,DesignofMachinery–AnIntroductiontoSynthesisandAnalysisof MechanismsandMachines,2/e,McGrawHill,NewYork, 2000.
5.WilliamT.Thomson,Theoryofvibrationwithapplications,4/e,EnglewoodCliffs,N.J.: PrenticeHall, 1993.

IIYearB.Tech.ME–IISemester

L	T	P	C
0	0	3	1.5

(23A103207P)FLUIDMECHANICS&HYDRAULICMACHINERY LAB

CourseObjective: Toimpartpracticalexposureontheperformanceevaluationmethodsofvarious flow measuring equipment and hydraulic turbine sand pumps.

Course Outcomes:

COs	Statements	BloomsLevel
CO1	Demonstratethedevicesusedformeasuringflow.	L3
CO2	Computemajorlosses in pipes.	L5
CO3	Illustratetheoperatingparametersof turbines.	L2
CO4	Explaintheworkingofdifferenttypes of pumps.	L2
CO5	Explainthedevicesusedformeasuringflow.	L2

List ofExperiments

1. Impactofjetson Vanes.
2. PerformanceTestonPeltonWheel.
3. PerformanceTestonFrancisTurbine.
4. PerformanceTestonKaplanTurbine.
5. PerformanceTestonSingleStageCentrifugalPump.
6. PerformanceTestonMultiStageCentrifugalPump.
7. PerformanceTestonReciprocatingPump.
8. CalibrationofVenturimeter.
9. CalibrationofOrificemeter.
10. Determinationoffrictionfactorforagivenpipeline.
11. Determinationoflossofheadduetosuddencontractioninapipeline.
12. Turbineflowmeter.

VirtualLab:

1. Tostudydifferentpatternsofaflowthroughapipeandcorrelatethemwiththe Reynolds number of the flow. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/reynolds/introduction.html)
2. To calculate Total Energy at different points of venture meter. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/bernoulli/introduction.html).
3. Tocalculatetheflow(orpoint)velocityatcenterofthegiventubeusingdifferentflow rates. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/pitot/introduction.html)
4. Todeterminethehydrostaticforceonaplanesurfaceunderpartialsubmergeandfull submerge condition. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/cop/introduction.html).
5. To determine the discharge coefficient of a triangular notch. (https://me.iitp.ac.in/Virtual-Fluid-Laboratory/notch/introduction.html)
6. Todeterminethecoefficientofimpactofjetonvanes.(https://fm-nitk.vlabs.ac.in/exp/impact-of-jet).
7. Todeterminefrictioninpipes.(https://fm-nitk.vlabs.ac.in/exp/friction-in-pipes/index.html).

IIYearB.Tech.ME–IISemester

L	T	P	C
0	0	3	1.5

(23A103206P)MANUFACTURINGPROCESSESLAB

CourseObjective: AcquirepracticalknowledgeonMetalCasting,Welding,PressWorkingand Processing of Plastics.

Course Outcomes:

COs	Statements	Blooms Level
CO1	Makemouldsforsandcasting.	L2
CO2	Fabricatedifferenttypesofcomponentsusingvariousmanufacturingtechniques.	L5
CO3	Adaptunconventionalmanufacturingmethods.	L3
CO4	DevelopDifferentWeldjoints.	L6
CO5	Explaindifferenttypesof 3dPrinting techniques.	L2

List ofExperiments

1. Designandmakingofpattern
   i. Singlepiece pattern
   ii. Split pattern
2. Sandpropertiestesting
   i. Sieveanalysis(drysand)
   ii. Claycontenttest
   iii. Moisturecontenttest
   iv. Strengthtest(Compressiontest&Sheartest)
   v. Permeabilitytest
3. Mouldpreparation
   i. Straight pipe
   ii. Bentpipe
   iii. Dumble
   iv. Gearblank
4. Gascuttingandwelding
5. Manualmetalarcwelding
   i. Lapjoint
   ii. Buttjoint
6. InjectionMolding
7. Blow Molding
8. Simplemodelsusingsheetmetaloperations
9. Studyofdeepdrawingandextrusionoperations
10. TomakeweldmentsusingTIG/MIGwelding
11. ToweldusingSpotweldingmachine
12. TojoinusingBrazingandSoldering
13. Tomakesimplepartsona3Dprintingmachine
14. Demonstrationofmetalcasting.

VirtualLab:

1. Tostudyandobservevariousstagesofcastingthroughdemonstrationofcasting process.(https://virtual-labs.github.io/exp-sand-casting-process-dei/theory.html)
2. Toweldandcutmetalsusinganoxyacetyleneweldingsetup.(https://virtual-labs.github.io/exp-gas-cutting-processes-iitkgp/index.html).
3. To simulate Fused deposition modelling process (FDM) (https://3dpdei.vlabs.ac.in/exp/simulation-modelling-process)
4. https://altair.com/inspire-mold/
5. https://virtual-labs.github.io/exp-simulation-cartesian-system-dei/theory.html

IIYearB.Tech.ME–IISemester

L	T	P	C
0	1	2	2

(23A100034)SOFTSKILLS

Course Objectives:

- Toencourageallrounddevelopment of thestudentsbyfocusingonsoftskills
- Tomakethestudentsawareofcriticalthinkingand problem-solvingskills
- Toenhancehealthyrelationship and understandingwithinandoutside an organization
- Tofunctioneffectivelywithheterogeneousteams

Course Outcomes

- Listoutvariouselementsofsoftskills(L1,L2)
- Describemethodsforbuildingprofessionalimage(L1,L2)
- Applycriticalthinkingskillsin problem solving(L3)
- Analysetheneeds ofanindividualandteamforwell-being(L4)
- Assess thesituationandtakenecessarydecisions(L5)
- Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being (L6)

UNITI : SoftSkills&CommunicationSkills

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity.

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporaryissues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbalcommunication –Publicspeaking – Mockinterviews –presentationswithanobjectiveto identify non- verbal clues and remedy the lapses on observation.

UNIT II: CriticalThinking

ActiveListening – Observation– Curiosity –Introspection– Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquingissues–placingtheproblem –findingtherootcause-seekingviablesolution – judgingwithrationale – evaluating the views of others - Case Study, StoryAnalysis

UNIT III: ProblemSolving&DecisionMaking

Meaning &featuresofProblemSolving– ManagingConflict – Conflictresolution –Teambuilding-Effective decision making in teams – Methods & Styles

Activities:

Placinga problem which involves conflict of interests, choice and views – formulatingthe problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

CaseStudy&GroupDiscussion

UNIT IV: EmotionalIntelligence&StressManagement

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providingsituationsfortheparticipantstoexpressemotionssuchashappiness,enthusiasm,gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V: CorporateEtiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette-Corporate grooming tips - Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

PrescribedBooks:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, PersonalityDevelopmentandSoftSkills :PreparingforTomorrow,I K International Publishing House, 2018

ReferenceBooks

1. Sharma,Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. AlexK,SoftSkillsS.Chand&Co,2012(Revisededition)
3. GajendraSinghChauhan& SangeethaSharma,SoftSkills:AnIntegratedApproachtoMaximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and EmployabilitySkills, Cambridge University Press, 2018
5. SoftSkillsforaBigImpact(English,Paperback, RenuShorey)Publisher:NotionPress
6. Dr.RajivKumarJain,Dr.UshaJain,LifeSkills(PaperbackEnglish)Publisher:Vayu Education of India, 2014

OnlineLearningResources:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

IIYearB.Tech.ME–IISemester

L	T	P	C
1	0	2	2

(23A103209)DESIGNTHINKING&INNOVATION

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes:

- Definetheconceptsrelated todesignthinking.(L1,L2)
- ExplainthefundamentalsofDesignThinkingand innovation(L1,L2)
- Applythe design thinkingtechniquesforsolvingproblems in various sectors. (L3)
- Analyseto work inamultidisciplinaryenvironment(L4)
- Evaluatethevalueof creativity(L5)
- Formulatespecificproblemstatementsofrealtimeissues(L3,L6)

UNITI: IntroductiontoDesignThinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT II: DesignThinkingProcess

Design thinking process (empathize, analyze, idea & prototype), implementingthe process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer,journey map, brainstorming, product development

Activity: Everystudent presents theirideainthreeminutes,Everystudent can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT III: Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planningfromideato innovation, Debate on value-based innovation.

UNIT IV: ProductDesign

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importanceofmodelling,howtosetspecifications,Explainingtheirownproductdesign.

UNIT V: DesignThinkinginBusinessProcesses

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles thatredefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: Howtomarketourownproduct,Aboutmaintenance,Reliabilityandplanforstartup.

Textbooks:

1. TimBrown,Changebydesign,HarperBollins(2009)
2. IdrisMootee,Design ThinkingforStrategicInnovation,2013,JohnWiley& Sons.

ReferenceBooks:

1. DavidLee,DesignThinkingintheClassroom,Ulyssespress
2. ShrutinNShetty, DesigntheFuture, NortonPress
3. WilliamLidwell,UniversalPrinciplesofDesign-Kritinaholden,JillButter.
4. Chesbrough.H,TheEraofOpenInnovation–2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/https://nptel.ac.in/courses/

109/104/109104109/https://swayam.gov.in/nd1_noc19_mg60/preview

COMMUNITYSERVICEPROJECT

……Experientiallearningthroughcommunityengagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.The specific objectives are;

- Tosensitizethestudentstothelivingconditionsofthepeoplewhoarearoundthem,
- Tohelpstudentstorealizethestarkrealitiesof society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of boxsolutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

ImplementationofCommunityService Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Eachclass/sectionshouldbeassignedwithamentor.
- Specific Departments could concentrate on their major areas of concern.For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- Thelogbook has to becountersignedbythe concerned mentor/facultyincharge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- Thefinalevaluationtobereflectedinthegradememoofthestudent.

- TheCommunityServiceProjectshouldbedifferentfromtheregularprogramsof NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minorprojectreportsshouldbesubmittedbyeachstudent.AninternalVivashallalsobe conducted by a committee constituted by the principal of the college.

- AwardofmarksshallbemadeasperttheguidelinesofInternship/apprentice/onthejob training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- TheCommunityService Project is atwofold one–
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas.Acommon survey format could be designed.This should not be viewed as a duplication of work bythe Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area.The different areas, could be like –
        - Agriculture
        - Health
        - MarketingandCooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - RevenueandSurvey
        - NaturalDisasterManagement
        - Irrigation
        - Law& Order
        - ExciseandProhibition
        - MinesandGeology
        - Energy
        - Internet
        - FreeElectricity
        - DrinkingWater

EXPECTEDOUTCOMES

BENEFITSOFCOMMUNITYSERVICEPROJECTTOSTUDENTS

LearningOutcomes

- Positiveimpactonstudents‘academic learning
- Improvesstudents‘abilitytoapplywhattheyhavelearnedin—therealworld‖
- Positive impactonacademicoutcomessuchasdemonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improvedabilitytounderstandcomplexityandambiguity

PersonalOutcomes

- Greatersenseofpersonalefficacy,personalidentity,spiritualgrowth,andmoraldevelopment
- Greater interpersonal development, particularlytheabilityto work well with others, and build leadership and communication skills.

SocialOutcomes

- Reducedstereotypesandgreaterinter-culturalunderstanding
- Improvedsocialresponsibilityandcitizenshipskills
- Greaterinvolvementincommunityserviceaftergraduation

CareerDevelopment

- Connections with professionals and communitymembers for learning and career opportunities
- Greateracademiclearning,leadershipskills,andpersonalefficacycanleadtogreater opportunity.

RelationshipwiththeInstitution

- Strongerrelationshipswithfaculty
- Greatersatisfactionwith college
- Improvedgraduationrates

BENEFITSOFCOMMUNITYSERVICEPROJECTTOFACULTYMEMBERS

- Satisfactionwiththequalityofstudentlearning
- Newavenuesforresearchandpublicationvianewrelationshipsbetweenfacultyand community
- Providingnetworkingopportunitieswithengagedfacultyinother disciplines orinstitutions
- Astrongercommitmenttoone‘sresearch.

BENEFITSOFCOMMUNITYSERVICEPROJECTTOCOLLEGESANDUNIVERSITIES

- Improvedinstitutional commitment.
- Improvedstudent retention
- Enhanced communityrelations

BENEFITSOFCOMMUNITYSERVICEPROJECTTOCOMMUNITY

- Satisfactionwithstudentparticipation
- Valuablehumanresourcesneededtoachievecommunitygoals.
- Newenergy,enthusiasmandperspectivesappliedtocommunitywork.
- Enhancedcommunity-universityrelations.

SUGGESTIVELISTOFPROGRAMMESUNDERCOMMUNITYSERVICEPROJECT

Thefollowingthe recommended list ofprojectsforEngineeringstudents.Thelistsarenot exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues forthis kind ofproject.Thestudents are expectedto carryout these projects with involvement, commitment,responsibility,andaccountability.Thementorsofagroupofstudentsshouldtakethe

responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

ForEngineeringStudents

1. Waterfacilitiesanddrinkingwateravailability
2. Healthand hygiene
3. Stresslevelsandcopingmechanisms
4. Healthinterventionprogrammes
5. Horticulture
6. Herbalplants
7. Botanicalsurvey
8. Zoologicalsurvey
9. Marine products
10. Aqua culture
11. Inlandfisheries
12. Animalsandspecies
13. Nutrition
14. Traditionalhealthcaremethods
15. Food habits
16. Air pollution
17. Waterpollution
18. Plantation
19. Soil protection
20. Renewableenergy
21. Plant diseases
22. Yogaawarenessandpractice
23. Healthcareawarenessprogrammesandtheir impact
24. Useof chemicals onfruitsandvegetables
25. Organicfarming
26. Crop rotation
27. Flouryculture
28. Accesstosafedrinkingwater
29. Geographicalsurvey
30. Geologicalsurvey
31. Sericulture
32. Studyofspecies
33. Food adulteration
34. IncidenceofDiabetesandotherchronicdiseases
35. Humangenetics
36. Blood groupsandbloodlevels
37. InternetUsageinVillages
38. AndroidPhoneusagebydifferentpeople
39. Utilisationoffreeelectricityto farmers and related issues
40. Genderrationinschoolinglvel- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

ProgramsforSchoolChildren

1. ReadingSkillProgram(ReadingCompetition)
2. Preparation ofStudyMaterialsforthe next class.
3. Personality/ LeadershipDevelopment
4. CareerGuidanceforXclassstudents
5. ScreeningDocumentaryandothereducationalfilms
6. AwarenessProgramonGoodTouchandBadTouch(Sexualabuse)
7. AwarenessProgramonSociallyrelevantthemes.

Programs for Women Empowerment

1. GovernmentGuidelinesandPolicyGuidelines
2. Women'sRights
3. DomesticViolence
4. PreventionandControlofCancer
5. PromotionofSocialEntrepreneurship

General Camps

1. GeneralMedicalcamps
2. EyeCamps
3. DentalCamps
4. Importanceofprotecteddrinkingwater
5. ODFawarenesscamp
6. Swatch Bharath
7. AIDSawarenesscamp
8. Anti PlasticAwareness
9. Programson Environment
10. Healthand Hygiene
11. Handwashprogrammes
12. CommemorationandCelebrationofimportantdays

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholismandDrugaddiction
3. Anti-tobacco
4. AwarenessonCompetitiveExaminations
5. PersonalityDevelopment

Common Programs

1. AwarenessonRTI
2. Healthinterventionprogrammes
3. Yoga
4. Treeplantation
5. ProgramsinconsonancewiththeGovt.Departmentslike–
    i. Agriculture
    ii. Health
    iii. MarketingandCooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. RevenueandSurvey

ix. NaturalDisasterManagement
x. Irrigation
xi. Law& Order
xii. ExciseandProhibition
xiii. MinesandGeology
xiv. Energy

RoleofStudents:

- Studentsmaynothavetheexpertisetoconductalltheprogrammesontheirown. The students then can play a facilitator role.
- ForconductingspecialcampslikeHealthrelated,theywillbecoordinatingwiththe Governmental agencies.
- AsandwhenrequiredtheCollegefacultythemselvesactasResourcePersons.
- StudentscanworkincloseassociationwithNon-GovernmentalOrganizationslikeLions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- Andalso,withtheGovernmentalDepartments. Iftheprogramisrolledout,theDistrict Administration could be roped in for the successful deployment of the program.
- Anin-housetrainingandinductionprogramcouldbearrangedforthefacultyandparticipating students, to expose them to the methodology of Service Learning.

TimelinefortheCommunityServiceProjectActivity

Duration:8 weeks

1. **PreliminarySurvey(OneWeek)**
   - Apreliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty.(However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **CommunityAwarenessCampaigns(OneWeek)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time.The list of activities suggested could be taken into consideration.

3. **CommunityImmersionProgramme(ThreeWeeks)**
   Along with the CommunityAwarenessProgrammes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them.This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be inconsonance with the Govt. Departments.

4. **CommunityExitReport(OneWeek)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks‘ works to be drafted and a copy shall be submitted to the local administration. Thisreportwillbeabasisforthenextbatchofstudentsvisitingthathabitation.

- The same report submitted to the teacher-mentor will be evaluated bythe mentor and suitable marks are awarded for onward submission to the University.
  Throughout the Community Service Project, a daily logbook need to be maintained by the studentsbatch,whichshouldbecountersignedbythegovernmentalagencyrepresentativeand the teacher-mentor, who is required to periodically visit the students and guide them.

B.TECH ME III-I Sem

S.No	Course code	Title	L	T	P	Credits
1	23A103501	Machining Process	3	0	0	3
2	23A103502T	Thermal Engineering	3	0	0	3
3	23A103503	Metrology and Measurements	3	0	0	3
4	23A104320	Introduction To Quantum Technologies &Applications	3	0	0	3
5	23A103504b	**Professional Elective-I** Automobile Engineering	3	0	0	3
6	23A10036	**Open Elective-I** Entrepreneur-ship and New Venture Creation	3	0	0	3
7	23A103502P	Thermal Engineering Lab	0	0	3	1.5
8	23A103505P	Dynamics lab	0	0	3	1.5
9	23A103503P	**Skill Enhancement course** Machine Tools & Metrology lab	0	1	2	2
10	23A104306P	**Engineering Science** Tinkering Lab	0	0	2	1
11	23A103508	**Evaluation of Community Service Internship** Community Service Internship/Project	-	-	-	2
Total			18	1	10	**26**

B.TECH ME III-II

S.No	Course code	Title	L	T	P	Credits
1	23A103601T	Heat Transfer	3	0	0	3
2	23A103602T	CAD/CAM	3	0	0	3
3	23A103603	Design of Machine Members	3	0	0	3
4	23A103604d	**Professional Elective-II** Operations Research	3	0	0	3
5	23A103605b	**Professional Elective-III** Industrial Safety	3	0	0	3
6	23A102312	**Open Elective-II** Renewable Energy Sources	3	0	0	3
7	23A103601P	Heat Transfer Lab	0	0	3	1.5
8	23A103602P	CAD/CAM Lab	0	0	3	1.5
9	23A103608	**Skill Enhancement course** 3D Printing Lab	0	1	2	2
10	23A99601	**Audit Course** Technical paper writing and IPR	2	0	0	-
11	23A103601T	Workshop	0	0	0	0
Total			**20**	**1**	**08**	**23**
Mandatory Industry Internship of 6-8weeks duration during summer vacation						

B.TECH-ME-III-ISem

23A103501	**MACHINING PROCESSES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Courseobjectives: Theobjectivesofthecourseareto	
1	Gainknowledgeonworkingprincipleofdifferentmetalcuttingprocessesandfamiliarize with cutting forces, machining calculations and cutting fluids.
2	Makethestudentlearnaboutprinciplesoflatheand Drillingmachines.
3	Makethe student learnabout principles ofGrindingand Milling machines.
4	Toacquireknowledgeintheelementarymechanismandmachinabilityofmaterialswith different Mechanical and Electrical energy based Machining Processes.
5	Tomakestudentfamiliarwithvariousadvancedmachiningoperations.

CourseOutcomes: On successful completionofthecourse,thestudentwillbeableto,		
CO1	Operationofvariousmachineslikelathe,drilling,grinding,slotting,shaping, milling etc	**L1, L2**
CO2	Practicalexposureonflatsurfacemachining, millingandgrindingoperations.	**L2**
CO3	Illustrateadvancedmachiningprocesses,cuttingtoolsandcuttingfluidsfora specific material and part features.	**L1, L2**
CO4	Differentiate Electrical Energy Based machining processes, mechanism of metal removal, machine tool selection.	**L3**
CO5	InterpretElectroChemicalmachiningprocess,economicaspectsofECM	**L2,L4**

UNITI

Elementary treatment of metal cutting theory – Elements of cutting process – Geometry of single point tool and angles, chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting –Merchant‘s Force diagram, cutting forces – cutting speeds, feed, depth of cut, heat generation, tool life, coolants, machinability –economics of machining. cuttingTool materials and cutting fluids –types and characteristics.

UNIT II

Engine lathe – Principle of working- specification of lathe – types of lathes – work holders and tool holders –Taper turning, thread cutting operations and attachments for Lathes.

Drilling, Boring Machines, Shaping, Slotting and planning machines - Principles of working, specifications, types, Tools and tool holding devices – operations performed, machining time calculation.

UNIT III

Milling machine – Principles of working – specifications – classifications of milling machines – methods of indexing, milling cutters - machining operation,Accessories to milling machines.

Grinding machine –Theory of grinding – classification– cylindrical and surface grinding machine – Toolandcuttergrindingmachine –Grindingwheelspecification -typesof abrasives – bonds,TruingandDressingofwheels.Lapping,HoningandBroachingmachines – comparisonofgrinding,lapping and honing. Principles of design of Jigs and fixtures and uses, Classification of Jigs & Fixtures – Principles of location and clamping –types.

UNIT IV

Mechanical Energy Based Processes: Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultra Sonic Machining – Working Principle, Description of Equipment,Process Parameters, Metal Removal Rate, Applications, Advantages and Limitations.

Electrical Energy Based Processes: Electric Discharge Machining – Wire cut EDM - Working Principles, Process Parameters, Applications Advantages and Limitations.

UNIT V

Chemical and Electro Chemical Energy Based Processes: Chemical Machining and Electro Chemical Machining – Working Principle, Etchants, Maskants, Techniques of Applying - Process Parameters, Electro Chemical Grinding, Electro Chemical Honing,Applications, Advantages and Limitations.

Thermal Energy Based Processes: Laser Beam Machining and Drilling, Plasma Arc Machining, Electron Beam Machining – Working Principle, Process Parameters, Applications, Advantages and Limitations.

TextBooks:

1. ManufacturingTechnology-Kalpakzian-PearsonSeventhedition.(2018)
2. ProductionTechnologybyR.K. Jain andS.C. Gupta, KhannaPublishers, 17thedition.
3. Jain V.K., Advanced Machining Processes, 1st Edition, Allied Publishers Pvt. Ltd., New Delhi, 2007.

ReferenceBooks:

1. PandeyP.CandShanH.S.,ModernMachiningProcesses,1/e,McGrawHill,New Delhi, 2007.
2. BenedictG.F.,Non-traditionalManufacturingProcesses,1/e,CRCPress,1987.
3. ProductionTechnologybyH.M.T. (Hindustan Machine Tools),TMH,1st edition,2001
4. ManufacturingTechnologyVolIIbyP.N.Rao, Tata McGraw Hill, 4th edition,2013
5. MachineTechnologyMachinetoolsandoperationsbyHalmiAYousuf&Harson,CRC Press Taylor and Francies .
6. Workshop Technology – Vol II, B.S.Raghu Vamshi, Dhanpat Rai & Co, 10th edition, 2013

OnlineLearningResources:

- https://nptel.ac.in/courses/112/107/112107078/
- https://youtu.be/t3y_Ys3LgGM
- https://www.youtube.com/watch?v=E4VZ_rFqpG4&t=1s
- https://youtu.be/-tcaR7oSx_w
- https://youtu.be/Uybg6VDLoRQ
- https://youtu.be/Uybg6VDLoRQ
- https://youtu.be/aWQsEX1TrSI

B.TECH-ME-III-ISem

23A103502T	**THERMAL ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

	Courseobjectives: Theobjectivesofthecourseareto
1	ImparttheknowledgeonICEngine
2	Demonstratefuelsystems,Coolingmodesandtypesofignitionssystems.
3	Explainthefuelandcombustionsystemsvariablesanditseffects.
4	Studyof engine Performanceanditscharacteristics
5	InstructtheawarenessonAircompressorsandexercisetheproblemson compressors

CourseOutcomes: On successful completionofthecourse,thestudentwillbeableto,		
CO1	understandworkingofdifferentI.CEnginesandrecognizebasicelementsand subsystemsofanI.C. Engine	**L1,L2,L3**
CO2	InvestigateS.IEnginefuelairrequirements,evaluatefuelsupplysystemsin an S.I Engine, create necessary cooling modes and differentiate different ignitionsystems.	**L2, L3,L5, L6**
CO3	AnalyzetheFlameSpeedandEffectofEngineVariablesandevaluatetheabnormal combustion effects and its causes.	**L3, L5,L6**
CO4	Applying of different input parameters to analyze and create the best performanceinS.IandC.IEnginesandresolvetheinfluenceofnormaland abnormalcombustions.	**L3, L4,L5. L6**
CO5	Familiarizedtheworkingprincipleofvarioustypesofaircompressorsand solveproblemsrelatedtoreciprocatingaircompressor.	**L1, L2,L3**

UNIT-I

I.C. ENGINES : Definition of Engine and Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines SI & CI Engines, Valve and Port Timing Diagrams.

UNIT-II

Fuel System: S.I. Engine: Fuel Supply Systems, carburetor types Air Filters,Mechanical and Electrical Fuel Pump – Filters– Gasoline Injection Systems.

Cooling & Lubrication Systems: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo Siphon, Water And Forced Circulation System, Lubrication Systems-Flash, Pressurized and Mist Lubrication.

Ignition System: Function of an Ignition System, Battery coil Ignition System, Magneto Coil Ignition System, Electronic Ignition System using Contact Breaker, Electronic Ignition using Contact Triggers – Spark Advance and Retard Mechanism.

UNIT-III

FuelsandCombustion:

S I engine : Normal Combustion and Abnormal Combustion – Importance of Flame SpeedandEffectofEngineVariables–Types ofAbnormalCombustion,Pre-Ignitionand Knocking (Explanation) – Fuel Requirements and Fuel Rating, Anti Knock Additives, Combustion Chambers.

Engines: StagesOfCombustion –DelayPeriodAndItsImportance–EffectOfEngine

Variables–DieselKnock–CombustionChambers(DIAnd IDI),FuelRequirementsand Fuel Rating.

UNIT– IV

Testing and Performance : Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition, Brake Power – Determination of Frictional Losses And Indicated Power – Performance Test – Heat Balance Sheet and Chart.

UNIT-V

Air Compressors: Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Single Stage and Multi Stage Compressors, Effect of Inter cooling and Pressure Drop in Multi - Stage Compressors, Problems Related to Reciprocating Compressors, Working principles of Roots blower, Vane type Blower, Centrifugal Compressor - Axial Flow Compressors.

TEXTBOOKS:

1. I.C.Engines/V.Ganesan-TMHfourthedition(2017)
2. ThermalEngineering/Rajput/LakshmiPublications11th edition(2020)
3. InternalCombustionEngineFundamentalsJohnB.HeywoodTMH(2017)

REFERENCES:

1. ICEngines–Mathur&Sharma–DhanpathRai&Sons(2017)
2. EngineeringfundamentalsofICEngines–Pulkrabek,Pearson,PHI2nd edition(2015)
3. ThermalEngineering,Rudramoorthy–TMHFirstedition(2017)
4. Thermodynamics&HeatEngines,B.Yadav,CentralBookDepot.,Allahabad(2002)
5. ThermalEngineering/Rajput/LakshmiPublications11th edition(2020)

Online Learning Resources:

https://nptel.ac.in/courses/112103316

https://youtube.com/playlist?list=PLwdnzlV3ogoWV-_n1YItO933MxgPXfEiM&si=QcuZlil5MRldeTiDhttps://youtu.be/FDmYCI_xYlA?si=vS1kdhqc5WCRnl21https://youtube.com/playlist?list=PLfq4fiRrJSn5leKEZoUF-2vBkMG37iGs8&si=nZVdvgmACy-lVvSC

B.TECH-ME-III-ISem

23A103503	**METROLOGY&MEASUREMENTS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

	Courseobjectives: Theobjectivesofthecourseareto
1	Explainthesystemoflimits,fits&tolerancesanddesignofgauges.
2	Identifytheuseofflatnessandsurfacegauges
3	Knowthemeasurementofscrewthread,Gearprofiles.
4	DescribetheMeasurementofDisplacementandStrain.
5	IllustratethemeasuringprocessofPressure,ForceandTorque.

CourseOutcomes: Onsuccessfulcompletionofthecourse,thestudentwillbeableto,		
CO1	Demonstratetheconceptofdifferenttypesofdimensionaltolerancesand chosethedesirelimitsandfitcomponenttosolvetherequiredfit.	L2,L3,L6
CO2	Explainthebasicstandardsofmeasurementsandalsoapplythedesired flatnessandsurfacegaugestoanalyzethe dimensions.	L2,L3,L4
CO3	Evaluateengineeringpartswithvariousprecisioninstrumentsandchoosethe requiredsurfaceroughnessinstrumenttocomparetheparts.	L4,L5,L6
CO4	ListoutvariousmeasuringtechniquesforDisplacementandStrain.Definethe variousinstrumentsformeasuringthedisplacementandcalibratethestrain.	L2,L1,L5
CO5	EstimatetheInstrumentsaccuracyandPerformcalibrationofForce,Torque andpressuremeasuringinstruments	L6,L5,L1

UNITI

Conceptof measurement

Concept of Measurement: Concept of feedback Control systems -generalized measurement system, units and standards, measuring instruments, sensitivity, readability, range of accuracy, precision, static and dynamic response, repeatability, systematic and random errors, correction, calibration, terminology and limits fits and tolerances, hole basis and shaft basis system, interchangeability.

Limit Gauges And Gauge Design: Plug, Ring, Snap, Gap, Taper gauges. Taylor's principle. Design of Go and No Go gauges.

Linear and Angular Measurement: Linear measuring instruments: Vernier instruments, micrometers, slip gauges, tool makers microscope. Comparators: Mechanical, pneumatic and electrical. **Angular measurements:** Sine bar, bevel protractor and angle dekkor, rollers and spheres used to determine the tapers.

UNIT– II

FlatnessandSurfaceRoughnessmeasurement

Flatness Measurement: Measurement of flatness – straight edges – surface plates, optical flatand autocollimators, interferometers and their applications.

SurfaceRoughnessMeasurement: Terminologysystems,differencesbetweensurfaceroughness and surface waviness- Numerical assessment of surface finish - CLA, R.M.S Value-Ra, Rz values, Methods of measurement of surface finish-profilograph, talysurf, BIS symbols for indication of surface roughness.

UNIT– III

ScrewThreadandGearMeasurement

Screw thread measurements: Elements of threads, errors in screw threads, various methods for measuring external and internal screw threads, screw thread gauges.

Gear Measurement: Gear tooth terminology, measurement of gear elements-run out, lead, pitch backlash, profile, pressure angle, tooth thickness, diameter of gear, constant chord and base tangent method.

CoordinateMeasuringMachine(CMM)-Constructionandfeatures.

UNIT– IV

MeasurementofDisplacementandStrain

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo-electric, inductive, capacitance, resistance, ionization and photoelectric transducers, calibration procedures.

Measurements of Strain: Various types of electrical strain gauges, gauge factor,method of usage of resistance strain gauge for bending, compressive and tensile strains, usage for measuring torque,strain gauge rosettes.

UNIT–V

MeasurementofForce,TorqueandPressure

Measurement of Force: Direct method - analytical balance, platformbalance; elastic members – load cells, cantilever beams and proving rings.

MeasurementofTorque: Torsionbardynamometer,servocontrolleddynamometerand absorption dynamometer.

Measurement of Pressure: Standards and calibration, basic methods of pressure measurement,dead weight gauges and manometers, High and low pressure measurement, Elastic transducers.

Textbooks:

1. Beckwith,Marangoni,Linehard,MechanicalMeasurements,6/e,PHI,2013.
2. R.K.Jain,EngineeringMetrology,20/e,KhannaPublishers,2013.

ReferenceBooks:

1. Mahajan,EngineeringMetrology,2/e,DhanpatRai,2013.
2. S.Bhaskar,BasicPrinciples-MeasurmentsandControlSystems,Anuradha Publications, 2014.
3. AnandKBewoor&VinayAKulkarni,Metrology&Measurement,15/e,McGrawHill, 2015.
4. D.S.Kumar,MechanicalMeasurements&Control,MetropolitanPublishers,5/e,2015.

OnlineLearningResources:

- https://nitsri.ac.in/Department/Mechanical%20Engineering/MEC_405_Book_2,_for_Unit_2B.pdf
- https://www.digimat.in/nptel/courses/video/112104250/L47.html
- https:/
- www.digimat.in/nptel/courses/video/112106138/L01.html

https://www.digimat.in/nptel/courses/video/112106179/L01

- htmlhttps://www.youtube.com/watch?v=tczyyM4Dykc
- https://www.youtube.com/watch?v=_UsAiZmRC1M
- https://www.youtube.com/watch?v=oCkaxI19X8

23A104320	**INTRODUCTIONTOQUANTUMTECHNOLOGIES AND APPLICATIONS** (QualitativeTreatment)	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

CourseObjectives(COBJ):

- Introducefundamentalquantumconceptslikesuperpositionandentanglement.
- Understandtheoreticalstructureofqubitsandquantuminformation.
- Exploreconceptualchallengesinbuildingquantumcomputers.
- Explainprinciplesofquantumcommunicationandcomputing.
- Examinereal-worldapplicationsandthefutureofquantumtechnologies.

CourseOutcomes(CO):

- Explaincorequantumprinciplesinanon-mathematicalmanner.
- Compareclassicalandquantuminformationsystems.
- Identifytheoreticalissuesinbuildingquantumcomputers.
- Discussquantumcommunicationandcomputingconcepts.
- Recognizeapplications,industrytrends,andcareerpathsinquantumtechnology.

Unit1:IntroductiontoQuantumTheoryandTechnologies

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison,Quantum states and measurement: nature of observation,Overview of quantum systems: electrons, photons, atoms,The concept of quantization: discrete energy levels,Why quantum? Strategic, scientific, and technological significance,A snapshot of quantum technologies: Computing, Communication, and Sensing,National and global quantum missions: India‘s Quantum Mission, EU, USA, China

Unit2:TheoreticalStructureofQuantumInformationSystems

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract,The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences,Philosophical implications: randomness, determinism, and observer role

Unit3:BuildingaQuantumComputer–TheoreticalChallengesandRequirements

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Errormanagement, Scalability, Stability, Theoretical barriers:

Why maintaining entanglement is difficult,Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Visionvs reality: what‘s working and what remains elusive,The role of quantum software in managing theoretical complexities

Unit4:QuantumCommunicationandComputing–TheoreticalPerspective

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication,The Idea of the Quantum Internet – Secure Global Networking,IntroductiontoQuantumComputing,QuantumParallelism(ManyStates at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction,Real-World Importance and Future Potential

Unit5:Applications,UseCases,andtheQuantumFuture

Real-worldapplicationdomains:Healthcare(drugdiscovery),Materialscience,Logisticsandoptimization,

Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum,Ethical,societal,andpolicyconsiderations,Challengestoadoption:cost,skills,

standardization,Emerging careers in quantum: roles, skillsets, and preparation pathways,Educational and research landscape – India's opportunity in the global quantum race

Textbooks:

1. MichaelA.Nielsen,IsaacL.Chuang,*QuantumComputationandQuantumInformation*,Cambridge University Press, 10th Anniversary Edition, 2010.
2. EleanorRieffelandWolfgangPolak,*QuantumComputing:AGentleIntroduction*,MITPress,2011.
3. ChrisBernhardt,*QuantumComputingforEveryone*,MITPress,2019.

ReferenceBooks:

1. DavidMcMahon,*QuantumComputingExplained*,Wiley,2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. ScottAaronson,*QuantumComputingSinceDemocritus*,CambridgeUniversityPress,2013.
4. **Alastair I.M. Rae**, *Quantum Physics: A Beginner's Guide*, Oneworld Publications, Revised Edition, 2005.
5. **Eleanor G. Rieffel, Wolfgang H. Polak**, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
6. **Leonard Susskind, Art Friedman**, *Quantum Mechanics: The Theoretical Minimum*, Basic Books, 2014.
7. **Bruce Rosenblum, Fred Kuttner**, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. **GiulianoBenenti, GiulioCasati, GiulianoStrini**, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.
9. **K.B. Whaley et al.**, *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Governmentof India**, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

OnlineLearningResources:

- IBMQuantumExperienceandQiskitTutorials
- Coursera–QuantumMechanicsandQuantumComputationbyUCBerkeley
- edX–TheQuantumInternetandQuantumComputers
- YouTube–QuantumComputingfortheDeterminedbyMichaelNielsen
- QiskitTextbook–IBMQuantum

B.TECH-ME-III-ISem

23A103504b	AUTOMOBILE ENGINEERING (Professional Elective-I)	L	T	P	C
		3	0	0	3

	Courseobjectives: Theobjectivesofthecourseareto
1	ImparttheknowledgeonICEngine,AutomobilechasisandBody
2	Demonstratefuelsystemsandtypesofignitionssystems.
3	Explainthe Principles ofSteeringsystem and Suspension system.
4	Gainknowledgewheels, TyresandBrakingsystem.
5	MakethestudentswiththeawarenessonAutomobileelectricalsystem.

COURSEOUTCOMESOnsuccessfulcompletionofthiscoursethestudentwillbeableto		
CO1	*Findthedifferentpartsanddeveloptheautomobilesystemstoanalyzeengine components*	L1, L3,L4
CO2	*Identifytheworkingofvariouspartsinignitionsystemtoapplythe different vehicles and design the ignition and fuel injection systems.*	L3, L4,L6
CO3	*Demonstratehowthesteeringandthesuspensionsystemsworks,typesofsteeringandsus pension systems and its applications.*	L2,L3,L5
CO4	Recognize the different types of wheels and breaking systems. Choose the suitabletyres and brakes for different applications.	L2, L3,L4
CO5	Utilize different electrical systems in automobiles. Apply advanced electrical circuits.createadvancedGlobalPositioningSystem(GPS),Hybridvehicle,FuelCell.	L1, L3,L6

UNITI

Introductiontovehiclestructureandenginecomponents

Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Locationofengine-Cylinderarrangement-Constructiondetails-Cylinderblock-Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters. Crankcase ventilation.

UNITII

Ignitionandfuelsupplysystems

Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multipoint – Unit Injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI.

UNIT–III

Steeringandsuspensionsystem

Principle of steering - Steering Geometry and wheel alignment - Steering linkages –Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers.

UNIT–IV

Wheels,TyresandBrakingSystem

Wheels and Tyres - Construction - Type and specification - Tyre wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System(ABS).

UNIT–V

Automobileelectricalsystemsandadvancesinautomobileengineering

Battery-General electrical circuits- Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program(ESP), Traction Control System (TCS) - Global Positioning System (GPS), Hybrid vehicle, Fuel Cell.

Textbooks:

1. KirpalSingh,AutomobileEngineering,Vol.1&2,StandardPublications,13/e,2020.
2. William.H.Crouse,AutomotiveMechanics,10/e,McGraw-Hill,2006.
3. DavidA.Corolla,AutomotiveEngineering:Powertrain,ChassisSystemand Vehicle Body, Butterworth-Heinemann Publishing Ltd, 2009.

ReferenceBooks:

1. Bosch,AutomotiveHandBook,6/e,SAEPublications, 2007.
2. K.NewtonandW.Steeds,Themotorvehicle,13/e,Butterworth-Heinemann Publishing Ltd, 1989.
3. JosephHeitner,AutomotiveMechanicsPrinciplesandPractices,2/e,CBSpublishing2004.
4. RichardStone,JeffreyK.Ball,AutomotiveEngineeringFundamentals"SAE International, 2004.

OnlineLearningResources:

- https://nptel.ac.in/courses/107106088
- https://nptel.ac.in/courses/107106080
- https://hindustanuniv.ac.in/assets/pdf/ug/CBCS/cbcs-automobile-2018.pdf
- https://ed.iitm.ac.in/~shankarram/Course_Files/ED5160/ED5160.htm
- https://dbatu.ac.in/wp-content/uploads/2020/07/B-Tech-Automobile_Final-Yr_22.06.2020-pdf
- https://www.youtube.com/channel/UCGLlbmSTaLNUPhDwsMe-SgQ

B.TECH-ME-III-ISem

23A103502P	**THERMAL ENGINEERING LAB**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

	Courseobjectives: Theobjectivesofthecourseareto
1	Toimpartknowledgeonworkingprinciplesofvariousthermalequipmentslike compressors,ICEngines,Boilers etc.,
2	TostudytheworkingprincipleofICengines,performanceandcharacteristicsinterms ofheatbalancing,economicalspeedvariations,airfuelratioetc.,

List ofExperiments:

1. Valve/Port TimingDiagramsofanI.C.Engines
2. PerformanceTestona4-StrokeDieselEngines
3. PerformanceTeston2-StrokePetrolengine
4. EvaluationofEnginefrictionbyconductingMorseteston4-StrokeMulticylinder Engine
5. Retardationandmotoringteston 4-strokeengine
6. HeatBalanceofanI.C. Engine.
7. Air/FuelRatioandVolumetricEfficiencyofanI.C. Engines.
8. PerformanceTestonVariableCompressionRatioEngines,economicalspeedtest.
9. PerformanceTestonReciprocatingAir–Compressor Unit
10. Studyof Boilers
11. Dismantling/AssemblyofEnginestoidentifythepartsandtheirpositioninan engine.
12. ExhaustEmissiontestonICEngines.

CourseOutcomes: On successful completionofthecourse,thestudentwillbeableto,	
CO1	PerformanceTest on4-StrokeDieseland2-StrokePetrolengine.
CO2	AbletoevaluatetheEnginefrictionof4-StrokeMulticylinderEngineandAir/Fuelratioand Volumetric efficiency of I.C.Engines.
CO3	TocalculatetheheatbalanceoftheICEngines.
CO4	Tocalculatetheefficienciesandperformancecharacteristicsoftheengines.
CO5	Studytheboilers and identifypartsoftheengineparts.

OnlineLearningResources:

- https://www.youtube.com/watch?v=i4SF47hjnjQ&list=PL0AQx5JlTK3WUCXXkA9Hev3FFLz4sESSg
- https://www.youtube.com/watch?v=B-rFIdOi-No&list=PLkUEX3IbW7lfdC2ieft_9FH5zAAvUfZAn

B.TECH-ME-III-ISem

23A03505P	**DYNAMICS LAB**	**L**	**T**	**P**	**C**
		0	**1**	**2**	**1.5**

	Courseobjectives: Theobjectivesofthecourseareto
1.	Tosupplementtheprincipleslearntinkinematicsand Dynamics of Machinery.
2.	Tounderstandhowcertainmeasuringdevicesareusedfordynamic testing.

CourseOutcomes: On successful completionofthecourse,thestudentwillbeableto,	
1.	Abilitytodemonstratetheprinciples of kinematics and dynamicsofmachinery
2.	DeterminetheMassmomentofinertia,Rangesensitivity.
3.	DrawingofCamprofile,determinationoftorsional,undampedanddampednaturalfrequencies.
4.	Determiningofinfluenceofcoefficientandbalancingofrotating,reciprocatingmasses.
5.	Verifythelawsofspringsandforcedvibrationof cantilever beam.

LISTOFEXPERIMENTS

1. KinematicsofFourBar,SliderCrank,CrankRocker,Doublecrank,Doublerocker, Oscillating cylinder Mechanisms.
2. DeterminationofMassmomentofinertiaofFlywheel and Axlesystem.
3. Determinationofrangesensitivity,effortetc.,forWatts,Porter,Proell, andHartnellGovernors.
4. Cams–Camprofiledrawing,Motioncurvesandstudyofjumpphenomenon.
5. Determination of torsional natural frequency of single Rotor systems. Un damped andDamped Natural frequencies.
6. Determination of torsional natural frequency of Double Rotor systems. Un damped and Damped Natural frequencies.
7. Multidegreefreedomsuspensionsystem–Determinationofinfluencecoefficient.
8. DeterminationoftorsionalnaturalfrequencyofsingleandDoubleRotorsystems. - Un damped and Damped Natural frequencies.
9. Balancingofrotatingmasses.
10. Balancingofreciprocatingmasses.
11. DeterminationofnaturalFrequencyandverificationofLawsofsprings

12. ForcedVibrationofCantileverbeam–Modeshapesandnaturalfrequencies.

B.TECH-ME-III-ISem

23A103503P	**MACHINE TOOLS & METROLOGY LAB**	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

Courseobjectives: Theobjectivesofthecourseareto	
1	Tounderstandthepartsofvariousmachinetoolsandaboutdifferentshapesof products that can be produced on them.
2	Tomeasurebores,angles andtapers
3	Toperformalignmenttestsonvariousmachines

CourseOutcomes:Attheendofthecourse,studentwillbeableto	
CO1	Gainknowledgeaboutthepartsofvariousmachinetoolsandaboutdifferentshapes of products that can be produced on them.
CO2	Learnmeasurebores,anglesandtapers
CO3	Performalignmenttestsonvariousmachines

Note:Thestudentshavetoconductatleast6experimentsfromeachlab

MACHINE TOOLS LAB

1. .Introductionofgeneralpurposemachines-Lathe,Drillingmachine,Millingmachine,Shaper, Planing machine, Slotting machine, Cylindrical grinder, Surface grinder and Tool and cutter grinder.
2. OperationsonLathemachines- Stepturning,Knurling,Taperturning,ThreadcuttingandDrilling
3. OperationsonDrillingmachine-Drilling,reaming,tapping,Rectangulardrilling, circumferential drilling
4. OperationsonShapingmachine- (i)Round to square(ii) Round to Hexagonal
5. Operationson Slotter-(i)Keyway(T–slot)(ii)Keywaycutting
6. Operationsonmillingmachines- (i)Indexing(ii) Gear manufacturing

METROLOGYLAB

1. Calibrationofverniercalipers,micrometers,vernierheightgaugeanddialgauges.
2. Measurementofboresbyinternal micrometers anddialboreindicators.
3. Useofgeartoothverniercaliperfortooththicknessinspectionandflangemicrometerfor checking the chordal thickness of spur gear.

4. Machinetoolalignmenttestonthelathe.
5. Machinetoolalignmenttestondrillingmachine.
6. Machinetoolalignmenttestonmilling machine.
7. Angleandtapermeasurementswithbevelprotractor,Sinebar,rollersandballs.
8. Useofspiritlevel in findingthestraightnessofabedandflatnessof a surface.
9. Threadinspectionwithtwowire/ threewiremethod&toolmakersmicroscope.
10. Surfaceroughnessmeasurementwithroughnessmeasuringinstrument.

OnlineLearningResources:

1. https://www.youtube.com/watch?v=sG6GCfX7L3c&pp=ygUeTWFjaGluZSBUb29scyAgbGFiIGV4cGVyaW1lbnRz
2. https://www.youtube.com/watch?v=mafthRhz1iM&pp=ygUeTWFjaGluZSBUb29scyAgbGFiIGV4cGVyaW1lbnRz
3. https://www.youtube.com/watch?v=5--saq-oYBE&list=PLrcSDk_gQ7jiQCfWEzw93ZMaxHkg2v-CC
4. https://www.youtube.com/watch?v=m60m2TcbTgc&pp=ygUZbWV0cm9sb2d5IGxhYiBleHBlcmltZW50cw%3D%3D

B.TECH-ME-III-ISem

		L	T	P	C
23A104306P	**TINKERING LAB**	**2**	**0**	**0**	**1**

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

	Courseobjectives:Theobjectivesofthecourseareto
1	**EncourageInnovationandCreativity**
2	**ProvideHands-onLearningandImpartSkillDevelopment**
3	**FosterCollaborationandTeamwork**
4	**Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship**
5	**ImpartProblem-Solvingmind-set**

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students mayalso develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List ofexperiments:

1) Make your own parallel and series circuits using breadboard for any application of yourchoice.
2) Designand3DprintaWalkingRobot
3) Design and3DPrintaRocket.
4) Temperature &HumidityMonitoringSystem (DHT11 + LCD)
5) WaterLevelDetectionandAlertSystem
6) AutomaticPlantWatering System
7) Bluetooth-BasedDoorLockSystem
8) SmartDustbinUsingUltrasonic Sensor
9) FireDetectionandAlarmSystem
10) RFID-BasedAttendance System
11) Voice-ControlledDevicesviaGoogle Assistant
12) Heart RateMonitoringUsingPulseSensor
13) SoilMoisture-BasedIrrigation
14) SmartHelmetforAccidentDetection
15) MilkAdulterationDetectionSystem
16) WaterPurificationviaActivatedCarbon
17) SolarDehydratorforFoodDrying
18) Temperature-ControlledChemicalReactor
19) EthanolMini-PlantUsing Biomass
20) SmartFluid Flow Control(Solenoid +pH Sensor)
21) PortableWaterQualityTester
22) AICropDiseaseDetection
23) AI-basedSmartIrrigation
24) ECGSignalAcquisitionandPlotting
25) AI-PoweredTrafficFlowPrediction

26) SmartGridSimulationwith Load Monitoring
27) SmartCampusIndoor Navigator
28) WeatherStationPrototype
29) FirefightingRobotwithSensorGuidance
30) FacialRecognitionDustbin
31) Barcode-BasedLabInventorySystem
32) GrowthChamberforPlants
33) BiomedicalWasteAlertSystem
34) SoilClassificationwithAI
35) SmartRailwayGate
36) SmartBinLocatorviaGPSandLoadSensors
37) Algae-BasedWater Purifier
38) ContactlessAttendanceviaFace Recognition

- **Note:**Thestudentscanalsodesignandimplementtheirownideas,apartfromthelistof experiments mentioned above.
- **Note:**A minimum of8to 10experiments must becompletedbythestudents.

B.TECH-ME-III-ISem

23A103508	COMMUNITY SERVICE PROJECT Experiential learning through community engagement	L	T	P	C
		0	0	0	2

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the collegestudentsforthe village/ local development.Thecollege finds an opportunityto develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.The specific objectives are;

- Tosensitizethestudentstothelivingconditionsofthepeoplewhoarearoundthem,
- Tohelpstudentstorealizethestarkrealitiesofthesociety.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of boxsolutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

ImplementationofCommunityService Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Eachclass/sectionshouldbeassignedwithamentor.
- Specific Departments could concentrate on their major areas of concern.For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.

- Thelogbook has to becountersignedbythe concerned mentor/facultyincharge.

- Evaluationtobedonebasedontheactiveparticipationofthestudentandgradecouldbe awarded by the mentor/faculty member.
- Thefinalevaluationtobereflectedinthegradememoofthestudent.
- TheCommunityServiceProjectshouldbedifferentfromtheregularprogrammesof NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minorprojectreportshouldbesubmittedbyeachstudent.AninternalVivashallalsobe conducted by a committee constituted by the principal of the college.
- AwardofmarksshallbemadeasperttheguidelinesofInternship/apprentice/onthejob training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or villageormunicipal ward, as faraspossible,inthenearvicinityoftheirplaceofstay, so as to enable them to commute from their residence and return back by evening or so.
- TheCommunityService Project is atwofold one–
- First,thestudent/scouldconductasurveyofthehabitation,ifnecessary,intermsoftheirown domain or subject area. Or it can even be a general survey, incorporating all the different areas.A common survey format could be designed.This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
- Secondly, the student/s could take up a social activity, concerning their domain or subject area.The different areas, could be like.
  - Agriculture
  - Health
  - MarketingandCooperation
  - Animal Husbandry
  - Horticulture
  - Fisheries
  - Sericulture
  - RevenueandSurvey
  - NaturalDisasterManagement
  - Irrigation
  - Law& Order
  - ExciseandProhibition
  - MinesandGeology
  - Energy
  - Internet
  - FreeElectricity
  - DrinkingWater

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

LearningOutcomes

- Positiveimpactonstudents‘academic learning
- Improvesstudents‘abilitytoapplywhattheyhavelearnedin—therealworld‖
- Positive impactonacademicoutcomessuchasdemonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved abilitytounderstandcomplexityandambiguity

PersonalOutcomes

- Greatersenseofpersonalefficacy,personalidentity,spiritualgrowth,andmoraldevelopment
- Greater interpersonal development, particularlytheabilityto work well with others, and build leadership and communication skills

SocialOutcomes

- Reducedstereotypesandgreaterinter-culturalunderstanding
- Improvedsocialresponsibilityandcitizenshipskills
- Greaterinvolvementincommunityserviceaftergraduation

CareerDevelopment

- Connections with professionals and communitymembers for learning and career opportunities
- Greateracademiclearning,leadershipskills,andpersonalefficacycanleadtogreater opportunity

RelationshipwiththeInstitution

- Strongerrelationshipswithfaculty
- Greatersatisfactionwith college
- Improvedgraduationrates

BENEFITSOFCOMMUNITYSERVICEPROJECTTOFACULTYMEMBERS

- Satisfactionwiththequalityofstudentlearning
- Newavenuesforresearchandpublicationvianewrelationshipsbetweenfacultyand community
- Providingnetworkingopportunitieswithengagedfacultyin other disciplines orinstitutions
- Astrongercommitmenttoone‘sresearch

BENEFITSOFCOMMUNITYSERVICEPROJECTTOCOLLEGESANDUNIVERSITIES

- Improvedinstitutional commitment
- Improvedstudent retention
- Enhanced communityrelations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfactionwithstudentparticipation
- Valuablehumanresourcesneededtoachievecommunitygoals
- Newenergy,enthusiasmandperspectivesappliedtocommunitywork
- Enhancedcommunity-universityrelations.

SUGGESTIVELISTOFPROGRAMMESUNDERCOMMUNITYSERVICEPROJECT

Thefollowingthe recommended list ofprojectsforEngineeringstudents.Thelistsarenot exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects.The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

ForEngineeringStudents

41. Waterfacilitiesanddrinkingwateravailability
42. Healthand hygiene
43. Stresslevelsandcopingmechanisms
44. Healthinterventionprogrammes
45. Horticulture
46. Herbalplants
47. Botanicalsurvey
48. Zoologicalsurvey
49. Marine products
50. Aqua culture
51. Inlandfisheries
52. Animalsandspecies
53. Nutrition
54. Traditionalhealthcaremethods
55. Food habits
56. Air pollution
57. Waterpollution
58. Plantation
59. Soil protection
60. Renewableenergy
61. Plant diseases
62. Yogaawarenessandpractice
63. Healthcareawarenessprogrammesandtheir impact
64. Useof chemicals onfruitsandvegetables
65. Organicfarming
66. Crop rotation
67. Flouryculture
68. Accesstosafedrinkingwater

69. Geographicalsurvey
70. Geologicalsurvey
71. Sericulture
72. Studyofspecies
73. Food adulteration
74. IncidenceofDiabetesandotherchronicdiseases
75. Humangenetics
76. Blood groupsandbloodlevels
77. InternetUsageinVillages
78. AndroidPhoneusagebydifferentpeople
79. Utilisationoffreeelectricityto farmers and related issues
80. Genderrationinschoolinglvel- observation.

Complimentingthecommunityserviceprojectthestudentsmaybeinvolvedtotakeupsome awareness campaigns on social issues/special groups. The suggested list of programmesare;

ProgrammesforSchool Children

8. ReadingSkillProgramme(ReadingCompetition)
9. Preparation ofStudyMaterialsforthe next class.
10. Personality/ LeadershipDevelopment
11. CareerGuidanceforXclassstudents
12. ScreeningDocumentaryandothereducationalfilms
13. AwarenessProgrammeonGoodTouchandBadTouch(Sexualabuse)
14. AwarenessProgrammeonSociallyrelevantthemes.

ProgrammesforWomenEmpowerment

6. GovernmentGuidelinesandPolicyGuidelines
7. Womens'Rights
8. DomesticViolence
9. PreventionandControlofCancer
10. PromotionofSocialEntrepreneurship

GeneralCamps

13. GeneralMedicalcamps
14. EyeCamps
15. Dental Camps
16. Importanceofprotecteddrinkingwater
17. ODFawarenesscamp
18. Swatch Bharath
19. AIDSawarenesscamp
20. Anti PlasticAwareness
21. Programmeson Environment
22. Healthand Hygiene
23. Handwashprogrammes
24. CommemorationandCelebrationofimportantdays

ProgrammesforYouthEmpowerment

6. Leadership
7. Anti-alcoholismandDrugaddiction

8. Anti-tobacco
9. AwarenessonCompetitiveExaminations
10. PersonalityDevelopment

CommonProgrammes

6. AwarenessonRTI
7. Healthinterventionprogrammes
8. Yoga
9. Treeplantation
10. ProgrammesinconsonancewiththeGovt. Departmentslike–
    i. Agriculture
    ii. Health
    iii. MarketingandCooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. RevenueandSurvey
    ix. NaturalDisasterManagement
    x. Irrigation
    xi. Law& Order
    xii. ExciseandProhibition
    xiii. MinesandGeology
    xiv. Energy

RoleofStudents:

- Studentsmaynothavetheexpertisetoconductalltheprogrammesontheirown. The students then can play a facilitator role.
- ForconductingspecialcampslikeHealthrelated,theywillbecoordinatingwiththe Governmental agencies.
- AsandwhenrequiredtheCollegefacultythemselvesactasResourcePersons.
- StudentscanworkincloseassociationwithNon-GovernmentalOrganizationslikeLions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- AndalsowiththeGovernmentalDepartments.Iftheprogrammeisrolledout,theDistrict Administration could be roped in for the successful deployment of the programme.
- Anin-housetrainingandinductionprogrammecouldbearrangedforthefacultyand participating students, to expose them to the methodology of Service Learning.

TimelinefortheCommunityServiceProjectActivity

Duration:8 weeks

5. **PreliminarySurvey(OneWeek)**
   - Apreliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty.(However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

6. **CommunityAwarenessCampaigns(OneWeek)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time.The list of activities suggested could be taken into consideration.

7. **CommunityImmersionProgramme(ThreeWeeks)**

   Along with the CommunityAwarenessProgrammes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them.This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

8. **CommunityExitReport(OneWeek)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the8weeks work tobedrafted and acopyshallbesubmittedtothelocaladministration.This report will be a basis for the next batch of students visiting that particular habitation.The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

     Throughout the Community Service Project, a daily log-book need to be maintained by the studentsbatch,whichshouldbecountersignedbythegovernmentalagencyrepresentativeandthe teacher-mentor, who is required to periodically visit the students and guide them.

B.TECH-ME-III-IISem

23A03601T	**HEAT TRANSFER**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Courseobjectives: Theobjectivesofthecourseareto	
1	Understandtheconceptofheattransfermechanisms,focusingonsteadyandunsteadystateheat conduction, include practical applications.
2	Definefundamentalprinciplesandtypesofconvectiveheattransfer,enablingtounderstandandapply empirical correlations for analyzing heat transfer in both internal and external flows.
3	Knowledgeonthemechanismsandregimesofboilingandcondensation,emphasizingtheheattransfer characteristics and practical implications of each.
4	Designandanalysisofvarioustypesofheatexchangers,includingperformanceevaluationusing LMTD and NTU methods.
5	Demonstratetheprinciplesofthermalradiationandmasstransfer,includingfundamentallaws, radiation exchange, and diffusion mechanisms in gases and liquids.

COURSEOUTCOMES Onsuccessfulcompletionofthiscoursethestudentwillbeableto		
1	Analyzeandsolveheatconductionproblemsinvarioussystems,includingsteadyand transient conditions, using appropriate mathematical models and charts.	*L3,L5,L6*
2	Evaluate convective heat transfer in various systems by applying boundary layer theory and empirical correlations for practical engineering problems.	*L2,L3,L5*
3	Analyze and distinguish between different boiling regimes and condensation modes, and solve related heat transfer problems in engineering applications.	*L2,L4,L5*
4	Design and evaluation different heat exchanger configurations, by analysing appropriate methods.	*L4,L5,L6*
5	Applyradiationlawsand mass transfer principles toanalyze and solve problems involvingradiativeheatexchangeanddiffusivetransportinengineeringsystems.	*L3,L4,L5*

UNITI:Introduction

Basic modes of heat transfer- rate equations- generalized heat conduction equation-various forms - steady state heat conduction solution for plane and composite slabs - cylinders - critical thickness of insulation- heat conduction through fins of uniform cross section- fin effectiveness and efficiency.

Unsteady State Heat Transfer Conduction- Transient heat conduction- lumped system analysis and use of Heisler charts.

UNITII:Convection

Convection: Basic concepts of convection–heat transfer coefficients - types of convection – forced convection and free convection.

Free Convection: development of hydrodynamic and thermal boundary layer along a vertical plate– useof empirical relations forconvectiveheattransferonplatesand cylinders in horizontal andvertical orientation

Forced convection: In external flow–concepts of hydrodynamic and thermal boundary layer- use of empirical correlations for flow over plates and cylinders. Fluid friction – heat transfer analogy, approximate solution tolaminarboundarylayer equation for external flow. Internal flow – Use of empirical relations for convective heat transfer in horizontal pipe flow-problems.

UNITIII

BoilingandCondensation

Differentregimesofboiling-nucleate,transitionandfilmboiling–condensation–filmwise and drop wise condensation-problems.

UNITIV

HeatExchangers

Types of heat exchangers- parallel flow- counter flow- cross flow heat exchangers- overall heat transfer coefficient- LMTD and NTU methods- fouling in heat exchangers-problems.

UNITV

Radiation: Radiation heat transfer – thermal radiation – laws of radiation - Black and Gray bodies – shape factor-radiation exchange between surfaces - Radiation shields - Greenhouse effect- simple problems.

Mass Transfer: Conservation laws and constitutive equations - Fick's law of diffusion, isothermal equi-mass - Equimolal diffusion- - diffusion of gases and liquids- mass transfer coefficient.

Textbooks:

1. P.K.Nag,HeatTransfer,3/e,TataMcGraw-Hill,2011.
2. J.P.Holman,HeatTransfer,9/e,TataMcGraw-Hill,2008.
3. R.C.Sachdeva,FundamentalsofEngineeringHeat&Masstransfer,NewAge International Publishers, 2017.

ReferenceBooks:

1. F.P.IncroperaandD.P.Dewitt,FundamentalsofHeatandMassTransfer,6/e, John Wiley, 2007.
2. Cengel.A.Yunus,HeatTransfer-APracticalApproach,4/e,TataMcGraw-Hill,2007.
3. S.P.Sukhatme,ATextbookofHeatTransfer,UniversitiesPress, 2005.

4. S.C.Arora&S.Domkundwar,ACourseinHeatandMassTransfer,DhanpatRai& CO.(P) LTD-Delhi , 2007.
5. C.P.KothandaramanandS.Subramanyan,HeatandMassTransferdatabook,New Age Publications, 2014.
6. Er.R.K.Rajput,ATextbookofHeat&MassTransfer,S.Chandpublishers,1/e,2018.

OnlineLearningResources:

- https://ocw.mit.edu/courses/mechanical-engineering/2-051-introduction-to-heat-transfer-fall- 2015/
- https://www.udemy.com/topic/heat-transfer/
- https://www.youtube.com/watch?v=TWTQx3W-2k8
- https://onlinecourses.nptel.ac.in/noc20_ch21/preview
- https://ekeeda.com/degree-courses/mechanical-engineering/heat-transfer
- https://www.coursera.org/lecture/thermodynamics-intro/02-04-heat-transfer-gyDfJ
- https://www.youtube.com/watch?v=cjJ2LV5lkB8

B.TECH-ME-IV-ISem

23A103602T	**CAD/CAM (ProfessionalCore)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Courseobjectives: Theobjectivesofthecourseareto	
1	UnderstandthebasicofCAD/CAM.Exploregraphicsstandardsandanalyze2Dand3Dgeometric transformations.
2	Knowledgeandskillstoapplyvariousgeometricmodelingtechniques,aswellassolid modeling approaches.
3	ExplaintheprinciplesofComputerAidedManufacturing(CAM),numericalcontrol(NC),andthe functionalities of CNC and DNC systems.
4	DesignanddevelopapartprogrammingusingG/McodesandAPTforvariousmachiningoperations.
5	Explainthebasicsofautomationsystems,robotics,grouptechnology,CIM,andemergingtrendslike VR, AR, and AI.

CourseOutcomes: On successful completionofthecourse,thestudentwillbeableto,		
1	ApplyandEvaluatetheCAD/CAMprinciplestodesignandmanufacturingprocesses. CreateandmanipulateCADmodelsusingappropriatesoftwaretools.	*L3,L4,L5*
2	AnalyzeanddifferentiatebetweenHermite,Bezier,andB-splinecurvesandconstructand manipulatesurfacemodels.Evaluatetheeffectivenessof Booleanoperationsandcreate complexgeometricmodels.	*L2,L3,L5, L6*
3	Identify and analyze key components of NC and CNC systems in manufacturing processes.Evaluatetheperformanceof DNCsystemsinamanufacturingenvironment.	*L1,L2,L3, L4,L5*
4	ExplainthestructureandfunctioningofNC/CNC/DNCmachinetoolsandadaptive control systems. Develop part programs using standard codes andAPT for basic machiningoperations.	*L2,L6*
5	Understandandevaluatetheroleofrobotics,grouptechnology,andCIMinmodern manufacturingsystems,andexplainemergingtechnologieslikeVR,AR,andAI.	*L2,L5*

UNIT–I

OverviewofCAD/CAM: Productcycle,CAD,CAMandCIM.CADTools,CAMTools,Utilization in an Industrial Environment, Evaluation criteria. CAD data structure, Data base management systems.

ComputerGraphics:Co-ordinatesystems,Graphicspackagefunctions,2Dand3Dtransformations, clipping, hidden line / surface removal color, shading.

UNIT–II

Geometric Modeling: Representation techniques, Parametric and non-parametric representation, various construction methods, wire frame modeling, synthetic curves and their representations, surface modeling, synthetics surfaces and their representations. Solid modeling, solid representation, fundamentals, introduction to boundary representations, constructive solid geometry representations

UNIT-III

Numerical Control: NC, NC Modes, NC Elements, NC Machine tools and their structure,Machining center, types and features. Controls in NC, CNC systems, DNC systems.Adaptivecontrol machining systems, types of adaptive control.

CNC Part Programming: Fundamentals, NC word, NC Nodes, canned cycles, cutter radius compensation, length compensation, computed assisted part programming using APT: Geometry statements, motion statements, post process statements, auxiliary statements, macro statement program for simple components.

UNIT-IV

GroupTechnology&FMS: PartFamily,ClassificationandCoding,advantages&limitations, Group technology machine cells, benefits. FMS: Introduction, components of FMS, material handling systems, Computer control systems, advantages.
ComputerAidedQualityControl:TerminologyinQualitycontrol,Inspectionandtesting,Contact inspection methods - optical and non-optical, integration of CAQC with CAD and CIM.

UNIT-V

ComputerAidedProcessesPlanning: RetrievaltypeandGenerativetype,benefitsMachinability data systems, Computer generated time standards.

Computerintegratedproductionplanning:Capacityplanning,shopfloorcontrol,MRP-I,MRP-II, CIMS benefits. Trends in manufacturing systems: Concepts of Reconfigurable manufacturing, Sustainable manufacturing and lean manufacturing.

Textbooks:

1. MikellP.Groover,EmoryW.Zimmers,CAD/CAM,5/e,PearsonPrenticeHallofIndia,Delhi,2008.
2. Ibrahim Zeid, R.Siva Subramanian, CAD/CAM: Theory and Practice, 2/e, Tata McGraw-Hill, Delhi, 2009.

ReferenceBooks:

1. P.N.Rao,CAD/CAM:Principlesandapplications,3/e,TataMcGraw-Hill,Delhi,2017.
2. P.Radhakrishnan,S.Subramanyan&V.Raju,CAD/CAM/CIM,3/e,NewAgeInternational Publishers, 2008.
3. ComputerAidedManufacturing,3/e,TienChienChang,Pearson,2008.

OnlineLearningResources:

- https://onlinecourses.nptel.ac.in/noc20_me44/preview
- https://www.youtube.com/watch?v=EgKc9L7cbKc
- https://www.youtube.com/watch?v=KXFpTb9cBpY
- https://web.iitd.ac.in/~hegde/cad/lecture/L01_Introduction.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1530947994.pdf
- https://www.iare.ac.in/sites/default/files/lecture_notes/CAD_CAM_LECTURE_NOTES.pdf

B.TECH-ME-III-IISem

23A103603	DESIGNOFMACHINEMEMBERS	L	T	P	C
		3	0	0	3

Courseobjectives: Theobjectivesofthecourseareto	
1	Understandingofthemechanicalengineeringdesignprocessforstaticanddynamicloadsunder various loading conditions.
2	Explorethedesignprinciplesandanalysisofboltedandweldedjointsandbuttweldsundervarious loading conditions.
3	Studythedesignprinciplesofpowertransmissionshaftsandcouplings,focusingontheanalysisof shafts subjected loads, as well as the design of various types of couplings.
4	Explainthedesignprinciplesoffrictionclutches,brakes,andsprings,designofdifferentbrakes, clutches, helical and leaf springs under various loading conditions.
5	Demonstratethedesignprinciplesofslidingandrollingcontactbearings,gears,spurgears,beam strength, and load considerations.

COURSEOUTCOMESOnsuccessfulcompletionofthiscoursethestudentwillbeableto		
1	Apply design principles for components subjected to static and dynamic loads, analyzeand design for fatigue failure using relevant criteria	*L3,L4,L6*
2	Design and analyze bolted and welded joints, considering factors such as different types of loads, including eccentric loading scenarios.	L2,L4,L6
3	Designpowertransmissionshaftsandcouplingsforfluctuatingloads,andselecting appropriate couplings such as flange, bushed pin, and universal couplings.	L4,L5,L6
4	Design friction clutches, brakes, and springs, applying the various theories and analyzethe working for mechanical applications.	L2,L4,L6
5	Design andanalyze the slidingandrollingcontact bearings, spur gears,consideringbeam strength, dynamic, and wear load factors.	L3,L4,L6

UNITI

Introduction,DesignforStaticandDynamicloads

MechanicalEngineeringDesign: Designprocess,designconsiderations,codesand standards of designation of materials, selection of materials.

DesignforStaticLoads: Modesoffailure,designofcomponentssubjectedtoaxial, bending, torsional and impact loads. Theories of failure for static loads.

DesignforDynamicLoads: Endurancelimit,fatiguestrengthunderaxial,bendingand

torsion,stressconcentration,notchsensitivity. Typesoffluctuatingloads, fatiguedesign for infinite life. Soderberg, Goodman and modified Goodman criterion for fatigue failure. Fatigue design under combined stresses.

UNITII

DesignofBoltedandWeldedJoints

Design of Bolted Joints: Threaded fasteners, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, gasketed joints and eccentrically loaded bolted joints.

Welded Joints: Strength of lap and butt welds, Joints subjected to bending and torsion. Eccentrically loaded welded joints.

UNITIII

PowertransmissionshaftsandCouplings

PowerTransmissionShafts: Designofshaftssubjectedtobending,torsionandaxial loading. Shafts subjected to fluctuating loads using shock factors.

Couplings: Designofflangeandbushedpincouplings,universalcoupling.

UNITIV

DesignofClutches,BrakesandSprings

FrictionClutches: Torquetransmittingcapacityofdiscandcentrifugalclutches. Uniform wear theory and uniform pressure theory.

Brakes: Different types of brakes. Concept of self-energizing and self-locking of brake. Band and block brakes, disc brakes.

Springs: Designofhelicalcompression,tension,torsionandleafsprings.

UNITV

DesignofBearingsandGears

Design of Sliding Contact Bearings: Lubrication modes, bearing modulus, McKee's equations, design of journal bearing. Bearing Failures.

Design of Rolling Contact Bearings: Static and dynamic load capacity, Stribeck's Equation, equivalent bearing load, load-life relationships, load factor, selection of bearings from manufacturer's catalogue.

DesignofGears: Spurgears,beamstrength,Lewisequation,designfordynamicandwear loads.

Textbooks:

1. R.L.Norton,MachineDesignanIntegratedapproach,2/e,PearsonEducation,2004.
2. V.B.Bhandari,DesignofMachineElements, 3/e,TataMcGrawHill,2010.

ReferenceBooks:

1. R.K.Jain,MachineDesign,KhannaPublications, 1978.
2. J.E.Shigley,MechanicalEngineeringDesign,2/e,TataMcGrawHill,1986.
3. M.F.SpottsandT.E.Shoup,DesignofMachineElements,3/e,PrenticeHall (Pearson Education), 2013.
4. K.Mahadevan&K.BalaveeraReddy,Designdatahandbook,CBSPublications,4/e,2018.
5. Dr. N. C. Pandya &Dr. C. S. Shah, Machine design,17/e, CharotarPublishingHouse Pvt. Ltd, 2009.

OnlineLearningResources:

- https://www.yumpu.com/en/document/view/18818306/lesson-3-course-name-design-of- machine-elements-1-nptel
- https://www.digimat.in/nptel/courses/video/112105124/L01.html
- https://dokumen.tips/documents/nptel-design-of-machine-elements-1.html
- http://www.nitttrc.edu.in/nptel/courses/video/112105124/L25.html

B.TECH-ME-III-IISem

23A103604d	**OPERATIONSRESEARCH (ProfessionalElective-II)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Courseobjectives: Theobjectivesofthecourseareto	
1	Understanding of OR, focusing on model classification, formulation, and solution techniques for LP problems.
2	Knowledgeandtechniquesforformulatingandsolvingtransportationandassignmentproblems,and the Traveling Salesman Problem.
3	Fundamentalsofgametheoryandjobsequencing,includingoptimalstrategies,andscheduling techniques.
4	Demonstrateofqueuingtheory,queuingmodelsbasedonPoissonarrivalsandexponentialservice times, and the analysis of single and multichannel systems with various queue lengths.
5	Familiarizereplacementandmaintenancestrategies,fundamentalsofdynamicprogrammingandits applications in optimization problems.

CourseOutcomes(LearningOutcomes): Onsuccessfulcompletionofthiscourse,thestudentwill be able to		
1	Buildandcomparedifferentmathematicalmodelsoftherealtimesituationsby using different Research models. Solve the LP problems and find Multiple Optimal Solutions.	L3, L2,L5
2	ImplementTransportationandAssignmentproblemstosolvetherealtime industry needs.	L1,L3,L5
3	ChoosethebeststrategyofGametheoryandcapableofidentifyingthesuitable techniques .Solve the Job Sequencing Problem.	L2,L3,L5
4	Apply different Queuing models to optimize the queuing length. Define the queuingandinventoryterminologytosolvethedifferentinventoryandqueuing problems.	L1, L3,L6
5	Applyconceptsofreplacementandmaintenanceanalysisandsolveoptimization problems using dynamic programming techniques.	L3,L4,L5

UNIT I

IntroductiontoOR

Introduction to Operations Research (OR):OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models

LinearProgramming(LP): ProblemFormulation,GraphicalMethod,SimplexMethod,Big-MMethod, Two–

PhaseSimplexMethod,SpecialCasesofLP-Degeneracy,InfeasibilityandMultipleOptimalSolutions;

Concepts ofdual theorem

UNIT–II

TransportationandAssignmentProblems

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution –North West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Method – Modified Distribution (MODI) Method; Special Cases – Unbalanced Transportation Problem, Degenerate Problem. Assignment Problem – Formulation, Hungarian Method for Solving Assignment Problems, TravelingSalesman problem.

UNIT–III

Gametheory&JobSequencing

Game theory: Optimal solution of two person zero sum games, the max min and min max principle. Games without saddle points, mixed strategies. Reduction by principles of dominance, arithmetic, algebraic method and graphical method.

Job Sequencing: Introduction to Job shop Scheduling and flow shop scheduling, Solution of Job Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, graphical method.

UNIT–IV

QueuingTheory&Inventory Control

Queuing Theory: Introduction – Terminology, Arrival Pattern, Service Channel, Population, Departure Pattern, Queue Discipline, Birth & Death Process, Single Channel Models with Poisson Arrivals, Exponential Service Times with infinite and finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with infinite queue length.

Inventory Control: Introduction, Deterministic models – EOQ model with and without shortages, Production model, Buffer stock and discount inventory models with single price breaks. Selective inventory control.

UNIT–V

ReplacementandMaintenanceAnalysis&DP

Replacement and Maintenance Analysis: Introduction – Types of Maintenance, Make or buy decision.TypesofReplacementProblems,DeterminationofEconomicLifeof anAsset,andSimpleProbabilisticModel for Items which completely fail-Individual Replacement Model, Group Replacement Model. **Dynamic Programming (DP):** Introduction –Bellman‘s Principle of Optimality – Applications of Dynamic Programming – Shortest Path Problem – Capital Budgeting Problem – Solution of Linear Programming Problem by DP.

Textbooks:

1. SharmaS.D.,OperationsResearch:Theory,MethodsandApplications,15/e,KedarNathRamNath, 2010
2. TahaH.A.,OperationsResearch,9/e,PrenticeHallofIndia,NewDelhi,2010.

Reference Books:

1. HillerF.S.,andLibermanG.J.,IntroductiontoOperationsResearch,7/e,TataMcGrawHill,2010.
2. SharmaJ.K.,OperationsResearch:TheoryandApplications,4/e,LaxmiPublications,2009.
3. PremkumarGuptaandHira,OperationsResearch,3/e,SChandCompanyLtd.,NewDelhi,2003.
4. PannerselvamR.,OperationsResearch,2/e,PenticeHallofIndia,NewDelhi,2006.
5. Sundaresan.V,andGanapathySubramanian.K.S,ResourceManagementTechniques:OperationsResearch, A.R Publications, 2015.

Online Learning Resources:

- http://www2.informs.org/Resources/
- http://www.mit.edu/~orc/
- http://www.ieor.columbia.edu/
- http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm
- http://www.wolfram.com/solutions/OperationsResearch/

23A103605b	INDUSTRIAL SAFETY (ProfessionalElective-III)	L	T	P	C
		3	0	0	3

Courseobjectives: Theobjectivesofthecourseareto	
1	Understandtheconceptsofindustrialsafetyandmanagement.
2	Demonstratetheaccidentpreventionsandprotective equipment.
3	Understandandapplytheknowledgeofsafetyacts
4	knowledgeaboutfirepreventionandprotectionsystems
5	Understandandapplyfiresafetyprinciplesinbuildings

COURSEOUTCOMESOnsuccessfulcompletionofthiscoursethestudentwillbeableto		
1	Students learn theconcepts of industrial safetyandmanagement.	*L2*
2	Learnaboutthesmartmachinesandsmartsensors	L1,L2
3	ApplyIoTtoIndustry4.0andtheyareabletomakeasystemtailor-madeas per requirement of the industry	L4,L5
4	Studentslearnaboutfirepreventionandprotectionsystems.	L2,L3
5	Students learn and applythefiresafetyprinciplesinbuildings	L2,L4

UNIT-I

INTRODUCTION TO THE DEVELOPMENT OF INDUSTRIAL SAFETY AND MANAGEMENT: History and development of Industrial safety: Implementation of factories act, Safety and productivity, Safety organizations. Safety committees and structure, Role of management and role of Govt.in industrial safety.

UNIT-II

ACCIDENT PREVENTIONS AND PROTECTIVE EQUIPMENT:Personal protective equipment, Surveytheplantforlocations,Partofbodytobeprotected,Educationandtraininginsafety,Preventioncauses and cost of accident, Housekeeping, First aid, Accident reporting, Investigations. Industrial psychology in accident prevention, Safety trials, Safety related to operations.

UNIT-III

SAFETY ACTS: Features of Factory Act, Introduction of Explosive Act, Boiler Act, ESI Act, Workman‘s

compensationAct,Industrialhygiene,Occupationalsafety,Diseasesprevention,Ergonomics,Occupational diseases, stress, fatigue, health, safety and the physical environment, Engineering methods of controlling chemical hazards, safety and the physical environment, Control of industrial noise and protection against it, Code and regulations for worker safety and health, codes for safety of systems.

UNIT-IV

FIRE PREVENTION AND PROTECTION: Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E-Fire extinguishing agents- Water, Foam, Dry chemical powder, Carbon-dioxide Halon alternatives Halocarbon compounds-Inert gases, dry powders – types of fire extinguishers – fire stoppers –hydrant pipes – hoses – monitors – fire watchers – layout of stand pipes – fire station-fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills –first aid for burns.

UNIT-V

BUILDING FIRE SAFETY: Objectives of fire safe building design, Fire load, fire resistant material and fire testing – structural fire protection – structural integrity – concept of egress design -exit– width calculations – fire certificates – fire safety requirements for high rise buildings.

TEXTBOOKS:

1. OccupationalSafetyManagementandEngineeringWillieHammer–PrenticeHall(2000)
2. PurandareD.D&AbhayD.Purandare,—HandbookonIndustrialFireSafety‖P&A publications, NewDelhi, 2006.

REFERENCEBOOKS:

1. Installation,ServicingandMaintenanceBhattacharya,S.N.-S.Chandand Co.
2. JainVK —FireSafetyinBuilding‖NewAgeInternational 1996.
3. Reliability,MaintenanceandSafetyEngineeringbyDr.A.K.Guptha
4. ATextbookofReliabilityandMaintenanceEngineeringbyAlakeshManna
5. McElroy,FrankE.,—Accident Prevention Manual for Industrial Operations‖, NSC, Chicago, 1988.
6. Green,A.E.,—HighRiskSafetyTechnology‖,JohnWileyandSons,1984.

Online Learning Resources:

https://nptel.ac.in/courses/110105094https://youtube.com/playlist?list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua&si=FcbDQzZK6i_3TASDhttps://youtube.com/playlist?list=PLbRMhDVUMngdXebaRB59KdKwstzuAovua&si=6RaMiYhEkp5-EfAHhttps://youtube.com/playlist?list=PLln3BHg93SQ8RYKhe9czOHq1hVjpEWMts&si=5y0WMqX3wrvvispq

B.TECH-ME-III-IISem

L	T	P	C
3	0	0	3

RENEWABLE ENERGY SOURCES (23A102312)
(Open Elective-II)

Course Outcomes (CO): At the end of the course the student will be

able to: CO1:Understandprinciple operation of various renewable

Energy sources.L1

CO 2: Identify site selection of various renewable energy sources.L2
CO 3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques,Geothermal, Biomasss, Tidal Wave and Fuel cell energies L3
CO 4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.L5 CO 5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power. L4

UNIT-ISolarEnergy:

Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT-IIPVEnergySystems:

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules fromsolar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

UNIT-IIIWindEnergy:

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

UNITI-VGeothermalEnergy:

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dryrock, magma. Advantages, disadvantages and application of geothermal energy, prospectsof geothermal energy in India.

UNIT–VMiscellaneousEnergyTechnologies:

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations.

Wave Energy-Principle of working, energy and power fromwaves, wave energy conversion devices, advantages and limitations.
Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration
Fuelcell:Principleofworkingofvarioustypesoffuelcellsandtheirworking,performanceandlimitations.

Textbooks:

1. G.D.Rai,—Non-ConventionalEnergySources‖,4thEdition,KhannaPublishers,2000.
2. Chetan Singh Solanki —Solar Photovoltaics fundamentals, technologies and applications‖ 2nd Edition PHI Learning Private Limited. 2012.

ReferenceBooks:

1. StephenPeake,—RenewableEnergyPowerforaSustainableFuture‖,OxfordInternationalEdition,2018.
2. S.P.Sukhatme,—SolarEnergy‖,3rdEdition,TataMcGrawHillEducationPvt.Ltd,2008.
3. BHKhan,—Non-ConventionalEnergyResources‖,2ndEdition,TataMcGrawHillEducationPvtLtd,2011.
4. S.HasanSaeedandD.K.Sharma,—Non-ConventionalEnergyResources‖,3rdEdition,S.K.Kataria&Sons, 2012.
5. G.N.TiwariandM.K.Ghosal,—RenewableEnergyResource:BasicPrinciplesandApplications‖, Narosa Publishing House, 2004.

OnlineLearningResources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

B.TECH-ME-III-IISem

23A103601P	HEAT TRANSFER LAB	L	T	P	C
		0	0	3	1.5

CourseObjectives: Studentsundergoingthiscoursewould	
1	Understanddifferentmodesofheattransfer
2	Gainknowledgeaboutnaturalandforceconvectionphenomenon
3	Estimateexperimentaluncertaintyinmeasurements

CourseOutcomes: Uponthesuccessfulcompletionofcourse,studentswillbeableto	
1	Explaindifferentmodesofheattransfer
2	Identifyparametersformeasurementforcalculatingheat transfer
3	Determineeffectivenessofheatexchanger
4	Designnewequipmentrelatedtoheattransfer
5	Applyprinciplesofheattransferinwideapplicationininindustries.

ListofExperiments:

1. Determinetheoverallheattransfercoefficientacrossthewidthofcompositewall
2. Determinethethermalconductivityofametalrod
3. Determinethethermalconductivityofinsulatingpowdermaterialthroughconcentricsphereapparatus
4. Determinethethermalconductivityofinsulatingmaterialthroughlaggedpipeapparatus
5. Determinetheefficiencyofapinfininnaturalandforced convection.
6. Determinetheheattransfercoefficientforaverticalcylinderinnatural convection
7. Determinetheheattransfercoefficientinforcedconvectionofairinahorizontaltube.
8. Determinetheheattransfercoefficientsonfilmanddropwisecondensationapparatus.
9. Determinetheeffectivenessofaparallelandcounterflowheatexchanger.
10. Studythepoolboilingphenomenonanddifferentregimesofpoolboiling.
11. Experimentonpool boiling
12. Determinetheemissivityofthetestplate surface.
13. ExperimentonStefan-Boltzmannapparatus

14. Determinetheheattransferratecoefficientinfluidizedbedapparatus.

VirtualLab:-

1. Determinationofthermalconductivityofametal rod

   https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab/determination-of-thermal-conductivity-of-a-metal-rod
2. NaturalConvectionheattransfer

   https://sites.google.com/view/vlab-bnmitmech/home/heat-transfer-lab/natural-convection
3. Heat Transfer by Radiation

   https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=802&cnt=1
4. HeattransferbyConductionhttps://vlab.amrita.edu/index.php?sub=1&brch=194&sim=801&cnt=1
5. The Study of phase change

   https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=709&cnt=1
6. BlackBodyRadiation:DeterminationofStefan'sConstanthttps://vlab.amrita.edu/index.php?sub=1&brch=194&sim=548&cnt=1
7. Newton's Law of Cooling

   https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=354&cnt=1
8. Lee'sDiscApparatushttps://vlab.amrita.edu/index.php?sub=1&brch=194&sim=353&cnt=1
9. ThermoCouple-SeebeckEffect
10. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=351&cnt=1

B.Tech(ME)–III-II Sem

23A103602P	**CAD/CAM Lab (ProfessionalCore)**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

Courseobjectives: Theobjectivesofthecourseareto	
1	Developstudents'skillsindraftingandunderstandingorthographic,isometricviews,andCADfile formats like DXE and IGES.
2	EnablethecreationofD3partmodelsusingbasicandadvancedfeaturesinCADtools.
3	Hands-onexperienceinassemblymodelingusingbothfeature-basedandBoolean-basedmethods.
4	FamiliarizewithCAMsoftwareforgeneratingNCcodeforvariousmachiningprocesses.
5	Expertiseindustrialmanufacturingviatheuseofpost-processorsandNCmachinesforreal-time machining.

CourseOutcomes: On successful completionofthecourse,thestudentwillbeableto,		
1	Createaccurate2Dtechnicaldrawingsusingorthographicandisometricprojections,and interpretfileformatslikeDXEandIGES.	*L1,L2,L3*
2	Develop3Dpartmodelsusingfeaturessuchasprotrude,revolve,shell,andsweep,and demonstrateandevaluateparent-childrelationships.	*L2,L3,L5*
3	Constructandanalyzeassembliesusingfeature-basedandBooleanoperationsforsimple mechanicalsystemsandcreatecomplexmechanicalassemblies.	*L3,L4,L6*
4	GenerateNCcodeforcomplexsurfacesusingCAMtoolsandstudythefunctionof variouspost-processors.	*L1,L3,L6*
5	TransferNCcodetoCNCmachines.Performandevaluatebasicmachiningtaskssuchas turning and milling and generate new technics by using modern tools.	*L4,L5,L6*

List ofExperiments:

1. **Drafting:** Development of part drawings for various components in the form oforthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXE AND IGES FILES.
2. **PartModelling:**Generationofvarious3DModelsthroughProtrusion,revolve,shellsweep. Creation of various features. Study of parent child relation.
3. **Assemblymodelling:**FeaturebasedandBooleanbasedmodellingsurfaces,Assembly Modelling of simple components and Design of simple components.
4. CAM**:**

a) Studyofvarious post processors used in NC Machines.
b) DevelopmentofNCcodeforfreeformandsculpturedsurfacesusingCAMpackages.
c) Machining ofsimplecomponentsonNClatheandMillbytransferringNCCode/froma CAM packages.
ThroughAnyFourSoftwarePackagesfromthefollowing:UseofAutoCAD,MicroStation, CATIA, Pro-E, I-DEAS, , CAEFEM, Gibbs CAM, Master CAM etc,.

5. EvaluationofStress/Strainforaplatewithahole.

B.TECH-ME-III-IISem

23A103608	3D PRINTING LAB	L	T	P	C
		0	1	2	3

CourseObjectives: Studentsundergoingthiscoursewould	
1	Understanddifferentmethodsof3DPrinting.
2	GainknowledgeaboutsimulationofFDMprocess
3	Estimatetimeandmaterialrequiredformanufacturinga3Dcomponent

CourseOutcomes: Uponthesuccessfulcompletionofcourse,studentswillbeableto	
1	Explaindifferenttypesof3dPrintingtechniques
2	Identifyparametersforpowderbindingandjettingprocess
3	DetermineeffectiveuseofABSmaterialfor3DPrinting
4	Applyprinciplesofmathematicstoevaluatethevolumeofmaterialrequire.

Module1:

IntroductiontoPrototyping,Workingof3DPrinter,Typesof3DprintingMachines: Exp

1: Modelling of Engineering component and conversion of STL format.

Exp 2: Slicing of STL file and study of effect of process parameter like layer thickness, orientation, and infill on build time using software.

Exercise1:Component-1

Exercise2:Component-2

Module2:

Exp1:3DPrintingofmodelledcomponentbyvaryinglayerthickness. Exp 2 :

3D Printing of modelled component by varying orientation.

Exp3:3DPrintingofmodelledcomponentbyvaryinginfill.

Module3:

StudyoneffectofdifferentmaterialslikeABS,PLA,Resinetc,anddimensionalaccuracy.

Module4:

Identifyingthedefectsin3DPrinted components.

Module5

Exp1:Modellingofcomponentusing3DScannerofreallife objectofunknowndimensioninreverseengineering**.**

Exp2:3DPrintingofabovemodelledcomponent.

References:

1. IanGibson,DavidW.Rosen,BrentStucker,AdditiveManufacturingTechnologies:RapidPrototyping to Direct Digital Manufacturing, 1/e, Springer, 2010.
2. ChuaC.K.,LeongK.F.andLimC.S.,RapidPrototyping:PrinciplesandApplications,2/e,World Scientific Publishers, 2003.

OnlineLearningResources/VirtualLabs:

- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdfh ttps://www.youtube.com/watch?v=NkC8TNts4B4

B.TECH-ME-III-IISem

23A99601	TECHNICAL REPORT WRITING & IPR	L	T	P	C
		2	0	0	0

CourseObjectives:

1. Toenablethestudentstopracticethebasicskillsofresearchpaper writing
2. TomakethestudentsunderstandtheimportanceofIPandtoeducatethemonthebasicconceptsof Intellectual Property Rights.
3. Topracticethebasicskillsofperformingqualityliteraturereview
4. Tohelptheminknowingthesignificanceofreallifepracticeandprocedureof Patents.
5. ToenablethemlearntheprocedureofobtainingPatents,Copyrights,&TradeMarks

rseOutcomes:Onsuccessfulcompletionofthiscourse,thestudentswillbeableto:

COURSEOUTCOMES: Attheendofthecourse,studentswillbeable to		**BloomsLevel**
CO1	Identifykeysecondaryliteraturerelatedtotheirproposedtechnical paper writing	L1,L2
CO2	Explainvariousprinciplesandstylesintechnicalwriting	L1, L2
CO3	Usetheacquiredknowledgeinwritingaresearch/technicalpaper	L3
CO4	AnalyserightsandresponsibilitiesofholderofPatent,Copyright, Trademark, International Trademark etc.	L4
CO5	EvaluatedifferentformsofIPRavailableatnational&internationallevel	L5
CO6	DevelopskillofmakingsearchofvariousformsofIPRbyusing moderntoolsandtechniques.	L3,L6

UNIT–I:

PrinciplesofTechnicalWriting:stylesintechnicalwriting;clarity,precision,coherenceandlogicalsequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .

UNIT–II:

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis

UNIT–III:

Process of research: publication mechanism: types of journals- indexing-seminars-

conferences-proofreading–plagiarismstyle;seminar&conferencepaperwriting;

Methodology-discussion-results- citation rules

UNIT–IV:

oduction to Intellectual property:Introduction, types of intellectual property,International organizations, agenties, importance of intellectual property rights

deMarks:Purposeandfunctionof trademarks,acquisitionoftrademarkrights,protectablematter,selectuating trade mark, trade mark registration processes.

UNIT–V:

ofcopyrights:Fundamentalsofcopyrightlaw,originalityofmaterial,rightsofreproduction,rightsto ormtheworkpublicly,copyrightownershipissues,copyrightregistration,noticeofcopyright,international y right law

of patents: Foundation of patent law, patent searching process, ownership rights and transfer.Patent law, llectual property audits.

TEXT BOOKS:

1. Deborah.E.Bouchoux,*IntellectualPropertyRights*,CengageLearningIndia, 2013
2. MeenakshiRaman,SangeetaSharma.*TechnicalCommunication:Principlesandpractices.*Oxford.

ReferenceBooks:

1. R.Myneni,*LawofIntellectualProperty*,9thEd,AsialawHouse,2019.
2. PrabuddhaGanguli,*IntellectualPropertyRights*TataMcgrawHill,2001
3. P.Naryan,*IntellectualPropertyLaw*,3rdEd,EasternLawHouse,2007.
4. Adrian Wallwork.*EnglishforWritingResearchPapers*SecondEdition.SpringerChamHeidelberg New York ,2016
5. DanJones,SamDragga,*TechnicalWritingStyl*

Online Resources

1. **https://theconceptwriters.com.pk/principles-of-technical-writing/**
2. **https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html**
3. **https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html**
4. **https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/**
5. **https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf**
6. **https://lawbhoomi.com/intellectual-property-rights-notes/**
7. **https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf**

B.Tech ME-IV-I

S.No	Course code	Title	L	T	P	Credits
1	23A103701	AI & ML for Mechanical Engineering	3	0	0	3
2	23A100702c	**Management Course-II** Management Science	2	0	0	2
3	23A103702d	**Professional Elective-IV** Mechatronics &MEMS	3	0	0	3
4	23A103702d	**Professional Elective-V** Automation &Robotics	3	0	0	3
5	23A152703	**Open Elective-III** Employability Skills	3	0	0	3
6	23A100055	**Open Elective-IV** Sensors & Actuators for Engineering Applications	3	0	0	3
7	23A103706	**Skill Enhancement Course** Introduction to Drone Technology	0	1	2	2
8	23A100059	**Audit Course** Gender Sensitization	2	0	0	-
9	23A03707	**Internship** Evaluation of Industry Internship	-	-	-	2
Total			**18**	**1**	**04**	**21**

IV B.Tech II Semester (ME)

S.No.	Course code	Title	Category	L	T	P	Credits
1	23A103801	Internship		-	-	-	4
2	23A103802	Project		-	-	-	8
Total							**12**

B.TECH-ME-IV-ISem

23A103701	**AI & ML FOR MECHANICAL ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Courseobjectives: Theobjectivesofthecourseareto	
1	Knowledge of Artificial Intelligence, focusing on intelligent agents, problem-solving techniques,and state-space search approaches.
2	Understandandapplyvariousproblem-solvingandsearchtechniques,includinguniformand heuristic search strategies in artificial intelligence.
3	ExploreandapplylocalsearchtechniquesforsolvingConstraintSatisfactionProblems(CSPs)and adversarial search strategies to make optimal decisions.
4	ApplyvariousstatisticalreasoningtechniquesforknowledgerepresentationandreasoninginAI,as well as logic programming and reasoning methods.
5	FamiliarinfundamentalconceptsofMachineLearningtechniques,aswellasclassification, regression, clustering problems, and an introduction to neural networks and deep learning.

COURSEOUTCOMES Onsuccessfulcompletionofthiscoursethestudentwillbeable to		
1	Designintelligentagents,defineproblemsusingstate-spacemodels,andapplyAI techniques.	*L1,L3,L6*
2	Implementandcomparedifferentsearchalgorithms(bothuniformandheuristic),apply andanalyzeappropriatestrategiesforsolvingAIproblems.	L3,L4,L5
3	SolveCSPsusinglocalsearchmethodsandimplementadversarialsearchalgorithmsto makeoptimaldecisionsincompetitivegamescenarios.	L2,L5,L6
4	Utilizestatisticalandlogicalreasoningmethods,torepresentknowledgeandperform forwardandbackwardreasoninginAIapplications.	L1,L2,L3
5	Understandingandapplyvariousmachinelearningtechniques,alongwithanintroduction toneuralnetworksanddeep learning.	L1,L2,L3

UNITI

IntroductiontoArtificialIntelligenceandProblem-SolvingAgent: ProblemsofAI,AItechnique,Tic–Tac – Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents.Definingtheproblemasstatespace search, production system, problem characteristics, and issues in the design of search programs.

UNITII

Search Techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best -first search, A* search, AO* search, memory bounded heuristicsearch: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.

UNITIII

Constraint Satisfaction Problems and Game Theory: Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimaxsearchprocedure,alpha-betapruning,additional refinements, iterative deepening.

UNITIV

Knowledge & Reasoning: Statistical Reasoning: Probability and Bays‘ Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge,Logicprogramming,Forwardandbackward reasoning.

UNITV

Introduction to Machine Learning: Exploring sub-discipline ofAI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.

TextBooks

1. S. Russell and P. Norvig, —Artificial Intelligence:AModernApproach‖, Prentice Hall,Third Edition, 2015.
2. Nils J.Nilsson,—ArtificialIntelligence:ANewSynthesis‖,1stEdition,Morgan-Kaufmann,1998.

ReferenceBooks

1. ElaineRich,KevinKnight,&ShivashankarBNair,—ArtificialIntelligence‖,McGrawHill,3rd ed.,2017.
2. Patterson,—IntroductiontoArtificialIntelligence&ExpertSystems‖,Pearson,1sted.2015.
3. SarojKaushik,—Logic&PrologProgramming‖,NewAgeInternational,Istedition,2002.
4. JosephC.Giarratano,GaryD.Riley,—ExpertSystems:PrinciplesandProgramming‖,4thEdition, 2007.

Online Learning Resources:

https://nptel.ac.in/courses/113104517https://nptel.ac.in/courses/127104664https://nptel.ac.in/courses/110104164https://nptel.ac.in/courses/106106226

23A100702cc	MANAGEMENT SCIENCE	L	T	P	C
		2	0	0	2

COURSEOBJECTIVES: Theobjectivesofthiscourseare

1 Toprovidefundamentalknowledgeon Management,Administration,Organization& its concepts.

2 Tomakethestudentsunderstandtheroleofmanagementin Production

3 ToimparttheconceptofHRMinordertohaveanideaonRecruitment,Selection, Training & Development, job evaluation and Merit rating concepts

4 Tocreateawarenessonidentify Strategic Managementareas&thePERT/CPMfor better Project Management

5 Tomakethestudentsawareofthecontemporaryissuesinmodernmanagement

UNIT-IINTRODUCTIONTOMANAGEMENT

Management-Conceptandmeaning -Nature-Functions-ManagementasaScienceandArtandboth.Schools of Management Thought - Taylor‘s Scientific Theory-Henry Fayol‘s principles - Elton Mayo‘s Human relations-**OrganizationalDesigns**-Line organization-Line &Staff Organization-Functional Organization
- Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

LEARNINGOUTCOMES: AttheendoftheUnit,thestudentswillbeableto

- Understandtheconceptofmanagementand organization
- Applytheconcepts&principlesofmanagementinreallifeindustry.
- Analyzetheorganizationchart&structureofan enterprise.

UNIT-IIOPERATIONSMANAGEMENT

PrinciplesandTypesofPlantLayout-MethodsofProduction(Job,batchandMassProduction),WorkStudy - Statistical Quality Control- **Material Management** - Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - **Marketing Management** - Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNINGOUTCOMES: AttheendoftheUnit,thestudentswillbeableto

- UnderstandthecoreconceptsofOperationsManagement
- ApplytheknowledgeofQualityControl,Work-studyprinciplesinreallife industry.
- EvaluateMaterialsdepartments&DetermineEOQ
- AnalyzeMarketingMixStrategiesforanenterprise.
- Createanddesignadvertisingandsalespromotion

UNIT-IIIHUMANRESOURCESMANAGEMENT(HRM)

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection -Process - Employee Training and Development - methods - PerformanceAppraisal Concept - Methods of Performance

Appraisal – Placement - Employee Induction - Wage and SalaryAdministration
LEARNINGOUTCOMES: AttheendiftheUnit,thestudentswillbeableto

- UnderstandtheconceptsofHRM,Recruitment,Selection,Training&Development
- Analyzetheneedof training
- Evaluateperformanceappraisal
- Designthebasicstructureofsalariesandwages

UNIT-IVSTRATEGIC&PROJECTMANAGEMENT

Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management** - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost-Analysis - Project Crashing (Simple problems).

LEARNINGOUTCOMES: AttheendoftheUnit,thestudentswillbeableto

- UnderstandMission,Objectives,Goals&strategiesforanenterprise
- ApplySWOTAnalysistostrengthenthe project
- AnalyzeStrategyformulationandimplementation
- EvaluatePERTandCPMTechniques

UNIT-VCONTEMPORARYISSUESINMANAGEMENT

Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management – employee engagement and retention -Business Process Re-engineeringandBenchMarking -Knowledge Management – change management –sustainability and corporate social responsibility.

LEARNINGOUTCOMESAttheendiftheUnit,thestudentswillbeableto

- Understandmodernmanagement techniques
- ApplyKnowledgeinUnderstandinginTQM,SCM
- AnalyzeCRM,BPR
- Evaluatechangemanagement&sustainability

TextBooks:

1. FrederickS.Hillier,MarkS.Hillier.*Introductionto Management Science*,October 26, 2023

2. A.RAryasri,*ManagementScience*,TMH,2019

References:

1. Stoner,Freeman,Gilbert.*Management*,PearsonEducation,NewDelhi,2019.
2. Koontz&Weihrich,*EssentialsofManagement*,6/e,TMH,2005.
3. ThomasN.Duening&JohnM.Ivancevich,*ManagementPrinciplesandGuidelines*,Biztantra.
4. KanishkaBedi,ProductionandOperationsManagement,OxfordUniversityPress,2004.
5. SamuelC.Certo,*ModernManagement*,9/e,PHI, 2005

COURSEOUTCOMES: Attheendofthecourse,studentswillbeable to		**BTL**
CO1	Remembertheconcepts&principlesofmanagementanddesignsoforganizationin a practical world	**L1**
CO2	UnderstandtheknowledgeofWork-studyprinciples&QualityControltechniques inindustry	**L2**
CO3	ApplytheprocessofRecruitment&Selectionin organization.	**L3**
CO4	AnalyzetheconceptsofHRM&differenttrainingmethods.	**L4**
CO5	EvaluatePERT/CPMTechniquesforprojectsofanenterpriseandestimatetime& cost of project & to analyze the business through SWOT.	**L5**
CO6	Createawarenessoncontemporaryissuesinmodernmanagement&technology.	**L3**

BTL=BloomsTaxonomyLevel

ONLINERESOUECES:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization-231308043/231308043
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/
5. https://onlinecourses.nptel.ac.in/noc24_mg112/

B.Tech(ME)–IV-ISem

23A103702d	MECHATRONICS & MEMS (Professional Elective-IV)	L	T	P	C
		3	0	0	3

Courseobjectives: Theobjectivesofthecourseareto	
1	**Tointroduce**theconceptofmechatronicsanditssignificanceinmodernindustrialapplications.
2	**Toexplain**theworkingprinciples,characteristics,andselectionofvarioustypesofsensors.
3	**Todescribe**differentactuatorsystemsandtheirintegrationinautomationcircuits.
4	**Todevelop**understandingofmicroprocessors,microcontrollers,andPLCsincludingprogramming andcontrollogic.
5	**Toexplore**MEMStechnologies,fabricationtechniques,andtheirapplicationsinminiaturized systems.

CourseOutcomes: Onsuccessfulcompletionofthecourse,thestudentwillbeableto,		
1	Defineandexplainthefundamentalconceptsandapplicationsofmechatronicsin industrialsystems.	L1,L2,L3
2	Identifyandanalyzevarioustypesofsensorsandtheirperformancecharacteristicsfor specificapplications.	L2,L4,L5
3	Designandevaluateactuatorsystemsincludinghydraulicandpneumaticcircuitsfor automationtasks.	L3,L5,L6
4	UnderstandanddevelopPLCladderlogicprogramsforindustrialautomationusing sequencing,timers,counters,andanalogI/O.	L2,L3,L6
5	DescribeMEMSfabricationmethods,applyandanalyzetheeffectofscalinginmicro electromechanicalsystems.	L2,L3,L4

UNITI

Introduction

Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications – Computer numerical control (CNC) machines, Tool monitoring systems, Flexible manufacturing system (FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

UNITII

Sensors

Static and dynamic characteristics of sensors, Displacement, Position and Proximity sensors, Force and torque sensors, Pressure sensors, Flow sensors, Temperature sensors,Acceleration sensors, Level sensors, Light sensors, Smart material sensors,Micro and Nano sensors, Selectioncriteriafor sensors.

UNITIII

Actuators

Mechanical, Electrical, Hydraulic and Pneumatic Actuation systems, Characteristics and their limitations, Design of Hydraulic and Pneumatic circuits, Piezoelectric actuators, Shape memory alloys, Selection criteria for actuators.

UNITIV

Microprocessors,MicrocontrollersandProgrammableLogicControllers

Architecture of Microprocessor, Microcontroller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

UNITV

MicroElectroMechanicalSystems(MEMS)

History,Effectofscaling,FabricationTechniques:Oxidation,PhysicalVapordisposition,Chemical Vapor Deposition, Lithography, Etching,Wafer bonding, LIGA, DRIE,Applications: Lab on chip.

Textbooks:

1. Bolton,MechatronicsElectronicsControlSystemsinMechanicalandElectricalEngineering,3/e, Pearson Education Press, 2005.
2. DevadasShettyandRichardAKolk,MechatronicSystemDesign,2/e,Cengagelearning,2010.
3. N.Mahalik,MEMS,McGrawHillEducations,2017.

ReferenceBooks:

1. ClarenceW.deSilva,MechatronicsanIntegratedApproach,CRCPress,2004.
2. JamesJAllen,MicroElectroMechanicalSystemsDesign,CRCPressTaylor&Francisgroup,2005.
3. GaneshSHedge,Mechatronics,Jones&BartlettLearning,2010.
4. MohammedGad,MEMS;DesignandFabrication,CRCPress,2010.

OnlineLearningResources:

- https://onlinecourses.nptel.ac.in/noc22_me54/preview
- https://nptel.ac.in/courses/112108092
- https://nptel.ac.in/courses/112101304
- https://onlinecourses.nptel.ac.in/noc20_ee56/preview
- https://www.cet.edu.in/noticefiles/259_Lecturer%20Note%20on%20Mechatronics-ilovepdf-compressed.pdf,https://lecturenotes.in/subject/1176/mechatronics-and-mems

B.Tech(ME)–IV-ISem

23A103702d	**AUTOMATION & ROBOTICS (Professional Elective-V).**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Courseobjectives: Theobjectivesofthecourseareto	
1	**Tointroduce**thefundamentalsofindustrialautomation,itstypes,components,andstrategiesacross manufacturingsystems.
2	**Toexplain**theworkingofautomatedflowlinesandthemethodsusedinassemblylinebalancingand flexibleautomation.
3	**Toimpart**knowledgeaboutindustrialrobots,theirconfigurations,anatomy,andapplicationsin manufacturingprocesses.
4	**Todevelop**anunderstandingofmanipulatorkinematics,homogeneoustransformations,actuators,and sensorsusedinrobotics.
5	**Toanalyze**manipulatordynamicsandapplytrajectoryplanningtechniquesforroboticmotion and obstacleavoidance.

CourseOutcomes: Onsuccessfulcompletionofthecourse,thestudentwillbeableto,		
1	Explaintheneed,types,andelementsofautomationsystemsandanalyzedifferent levels ofautomationstrategiesinindustry.	L1,L2,L4
2	Demonstratetheoperationofautomatedflowlinesandapplymethodsforassemblyline balancingand optimization.	L2,L3,L4
3	Identifyroboticcomponentsanddescribetheirconfiguration,degreesoffreedom,and industrialapplicationsinvariousprocesses.	L1,L2,L3
4	ApplytransformationtechniquesandD-Hnotationtosolveproblemsinrobotkinematics andevaluateactuatorandsensorselection.	L2,L3,L5
5	AnalyzerobotdynamicsusingJacobiansandEulerformulationsanddevelopsuitable trajectoriesforobstacle-freemotion.	L3,L5,L6

UNIT-I

IntroductiontoAutomation:

Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processinginmanufacturing,Automationstrategiesandlevelsofautomation,Hardwarecomponents for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT–II

Automatedflowlines:

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly processandsystemsassemblyline,linebalancingmethods, ways of improvinglinebalance,flexible assembly lines.

UNIT-III

IntroductiontoIndustrialRobotics:

Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

UNIT-IV

ManipulatorKinematics:

ManipulatorKinematics,Homogenoustransformationsasapplicabletorotationandtransition -D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT-V

RobotProgramming:

RobotProgramming,Methodsofprogramming-requirementsandfeaturesofprogramming languages, software packages. Problems with programming languages.

Robot Application in Manufacturing: Material Transfer -Material handling, loadingand unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

TextBooks:

1. Automation,ProductionsystemsandCIM,M.P.Groover/4thEdition,Pearsoneducation(2016)
2. IndustrialRobotics-M.P.Groover,TMH(1996)

References:

1. Robotics,FuKS,McGrawHill,4thedition, 2010.
2. AnIntroductiontoRobotTechnology,P.CoiffetandM.Chaironze,Kogam Page Ltd. 1983 London.
3. RoboticEngineering,RichardD.Klafter,PrenticeHall
4. Robotics,FundamentalConceptsandanalysis–AshitaveGhosal,OxfordPress,1/e,2006
5. RoboticsandControl,MittalRK&NagrathIJ,TMH.

OnlineLearningResources:

Web References:

- http://www.cadcamfunda.com/cam_computer_aided_manufacturing
- http://wings.buffalo.edu/eng/mae/courses/460-564/Course-Notes/cnc-classnotes.pdf
- http://nptel.iitm.ac.in/courses.php?branch=Mechanical
- http://academicearth.org/courses/introduction-to-roboticsVideoreferences:-
  http://nptel.iitm.ac.in/video.php?courseId=1052

23A103706	INTRADUCTION TO DRONE TECHNOLOGIES	L	T	P	C
		0	1	2	2

COURSEOBJECTIVES:

1. Tolearnandunderstandthefundamentsofdesign,fabricationandprogrammingofdrone
2. ToteachtechnicalcharacteristicsoftheDronepartsanditsfunctions
3. Toimparttheknowledgeofanflyingandoperation of drone
4. Toknowaboutthevarious applications of drone
5. Tounderstandthesafetyrisksandguidelinesofflysafely

COURSEOUTCOMES

Uponsuccessfulcompletionofthecourse,studentsshouldbeableto:
CO1:Knowaboutavarioustypeofdronetechnology,dronefabricationandprogramming. CO2: Execute the suitable operating procedures for functioning a drone
CO3: Select appropriate sensors and actuators for Drones
CO4:Developadronemechanismforspecificapplications CO5:
Createthe programs for various drones

UNITI

INTRODUCTIONTO DRONE TECHNOLOGY

Drone Concept - VocabularyTerminology- History of drone - Types of current generation of drones based on their method of propulsion- Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurshipand employability

UNIT II

DRONEDESIGN, FABRICATIONAND PROGRAMMING

Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts -Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program -Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection

UNIT III

DRONEFLYINGANDOPERATION

Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations –management tool –Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications

UNIT IV

DRONECOMMERCIALAPPLICATIONS

Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing

UNIT V

FUTUREDRONESAND SAFETY

The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms

TEXT BOOKS

1. Daniel Tal and John Altschuld, —Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation andImplementation‖, 2021 John Wiley & Sons, Inc.
2. TerryKilbyandBelindaKilby,—Make:GettingStartedwithDrones—,MakerMedia,Inc,

REFERENCES

1. John Baichtal, —Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs‖, Que Publishing, 2016
2. Zavrsnik, —Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance‖, Springer, 2018.

Learningresources

https://nptel.ac.in/courses/101108661https://www.youtube.com
/watch?v=iJnuTtUFiWM

B.Tech(ME)–IV-ISem

23A100059	**GENDER SENSITIZATION (AUDIT COURSE). (Common to All Branches of Engineering)**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**

Course Objectives:

- Toenablestudentstounderstandthegenderrelatedissues,vulnerabilityofwomenandmen
- Tofamiliarizethemaboutconstitutionalsafeguardforgenderequality
- Toexposethestudentstodebatesonthepoliticsandeconomicsofwork
- Tohelpstudentsreflectcriticallyongenderviolence
- Tomakethemunderstandthatgenderidentitiesandgenderrelationsarepartofculture as they shape the way daily life is lived in the family as well as wider community and the workplace.

CourseOutcomes(CO):

COs	Statements	Blooms level
CO1	Understandthebasicconceptsofgenderanditsrelatedterminology	L1,L2,
CO2	Identifythebiological,sociological,psychologicalandlegalaspectsof gender.	L1,L2
CO3	Usetheknowledgeinunderstandinghowgenderdiscriminationworksinour societyand how to counter it.	L3
CO4	Analyzethegendereddivisionoflabouranditsrelationtopoliticsand economics.	L4
CO5	Appraisehow gender-rolebeliefsandsharingbehaviourareassociatedwith morewell-beinginallcultureandgendergroups	L5
CO6	Developstudents‘sensibilitywithregardtoissuesofgenderin contemporary India	L3

Unit-1UNDERSTANDINGGENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit-2GENDERROLESANDRELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and its Consequences- Declining Sex Ratio- Demographic Consequences-Gender Spectrum -

Unit-3GENDERANDLABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- —My Mother doesn‘t Work.‖—SharetheLoad.‖-Work: ItsPoliticsandEconomics -FactandFiction-Unrecognized and Unaccounted work -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit-4GENDER-BASEDVIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-5GENDERANDCULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Just Relationships

PrescribedBooks

1. A.Suneetha,UmaBhrugubanda,etal.*TowardsaWorldofEquals:ABilingual Textbook on Gender*‖,TeluguAkademi, Telangana, 2015.
2. Butler, Judith.*Gender Trouble: Feminism and the Subversion of Identity*. UK Paperback Edn. March 1990

ReferenceBooks

1. Wtatt,RobinandMassood,Nazia,*BrokenMirrors:ThedowryProblemsinIndia*,London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment*, London: Lynne Rienner Publishers, 2002
3. Brush,LisaD.,*GenderandGovernance*,NewDelhi,RawatPublication,2007
4. Singh,Direeti,*WomenandPoliticsWorldWide*,NewDelhi,AxisPublications,2010
5. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges*(English, Hardcover), Raj Publications, 2019
6. A.Revathy&Murali,Nandini,*A Life inTransActivism*(LakshmiNarayan Tripathi). The University of Chicago Press, 2016

Online Resources:

1. UnderstandingGender chrome-extension: //kdpelmjpfafjppnhbloffcjpeomlnpah/https://www.arvindguptatoys.com/arvindgupta/kamla-gender1.pdf

https://onlinecourses.swayam2.ac.in/nou24_hs53/preview

2. GenderRolesandRelations

https://www.plannedparenthood.org/learn/gender-identity/sex-gender-identity/what-are-gender-roles-and-stereotypes

https://www.verywellmind.com/understanding-gender-roles-and-their-effect-on-our-relationships-7499408

https://onlinecourses.swayam2.ac.in/cec23_hs29/preview

3. GenderandLabour

https://www.economicsobservatory.com/what-explains-the-gender-division-of-labour-and-how-can-it-be-redressed

https://onlinecourses.nptel.ac.in/noc23_mg67/preview

4. **GENDER-BASEDVIOLENCE**
https://eige.europa.eu/gender-based-violence/what-is-gender-based-violence?language_content_entity=en

https://www.worldbank.org/en/topic/socialsustainability/brief/violence-against-women-and-girls

https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

5. **GENDERAND CULTURE**
https://gender.study/psychology-of-gender/culture-impact-gender-roles-

identities/https://sociology.iresearchnet.com/sociology-of-culture/gender-and-

culture/https://archive.nptel.ac.in/courses/109/106/109106136/

Abdulali Sohaila. —I Fought For My Life…and Won.‖Available online (at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

CourseCode	EMPLOYABILITYSKILLS	L	T	P	C
23A52703	OPEN ELECTIVE-III	3	0	0	3

CourseObjectives:

- Toencourageallrounddevelopmentofthestudentsbyfocusingonproductive skills
- TomakethestudentsawareofGoalsettingandwritingskills
- Toenablethemtoknowtheimportanceofpresentationskillsinachievingdesiredgoals.
- Tohelpthemdeveloporganizationalskillsthroughgroupactivities To

function effectively with heterogeneous teams

CourseOutcomes(CO):	Blooms Level
CO1:Understandtheimportanceofgoalsandtrytoachievethem	L1, L2
CO2: Explain the significance of self-management	L1,L2
CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes	L3
CO4: Analyse various forms of Presentation skills	L4
CO5:Judgethegroupbehaviourappropriately	L5
CO6:Developskillsrequiredforemployability.	L3, L6

UNIT-I	GoalSettingandSelf-Management	LectureHrs

Definition,importance,typesofGoalSetting–SMARTGoalSetting–Advantages-Motivation–Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOCAnalysis

UNIT-II	WritingSkills	LectureHrs

Definition,significance,typesofwritingskills–ResumewritingVsCVWriting-E-Mailwriting, Cover Letters- E-Mail Etiquette -SoP (Statement of Purpose)

UNIT-III	TechnicalPresentationSkills	LectureHrs

Nature,meaning&significanceofPresentationSkills–Planning,Preparation,Presentation,Stage Dynamics – Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

UNIT-IV	GroupPresentationSkills	LectureHrs

BodyLanguage–GroupBehaviour-TeamDynamics–LeadershipSkills–PersonalityManifestation-Group Discussion-Debate –Corporate Etiquette

UNIT-V	JobCracking Skills	LectureHrs

Nature,characteristics,importance&typesofInterviews–JobInterviews–Skillsforsuccess– Job searchingskills-STARmethod-FAQs-AnsweringStrategies–MockInterviews

Textbooks:

1. SabinaPillai,AgnaFernandez.*SoftSkills&EmployabilitySkills*,2014.CambridgePublisher.

2. *AlkaWadkar*.LifeSkillsforSuccess,*SagePublications,2016.*

ReferenceBooks:

1. **GangadharJoshi.*CampustoCorporatePaperback*,SagePublications.2015**
2. SherfieldMontogomeryMoody,*CornerstoneDevelopingSoftSkills*,PearsonPublications.4Ed.2008
3. ShikhaKapoor.*PersonalityDevelopmentandSoftSkills-Preparing forTomorrow*.1 Edition,Wiley,2017.
4. M.SenGupta,*SkillsforEmployability*,InnovativePublication,2019.
5. SteveDuckandDavidTMcMahan,*TheBasicsfCommunicationSkillsARelationalPerspective*,Sagepress,2012.

OnlineLearningResources:

1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. https://www.youtube.com/c/skillopedia/videos
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. https://archive.nptel.ac.in/courses/109/107/109107172/#
9. https://archive.nptel.ac.in/courses/109/104/109104107/

IVB.TechISem

		L	T	P	C
23A100055	**SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (Open Elective-IV)** (Common to all branches)	**3**	**0**	**0**	**3**

COURSEOBJECTIVES	
1	Toprovideexposuretovariouskindsofsensorsandactuatorsandtheirengineering applications.
2	Toimpartknowledgeonthebasiclawsandphenomenonbehindtheworkingofsensorsand actuators
3	Toexplaintheoperatingprinciplesofvarioussensorsandactuators
4	Toeducatethefabricationofsensors
5	Toexplaintherequiredsensorandactuatorforinterdisciplinaryapplication

UNITI Introduction to Sensors and Actuators **9H**

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNITII Temperature and Mechanical Sensors **9H**

TemperatureSensors:Typesoftemperaturesensorsandtheirbasicprincipleofworking:Thermo-resistivesensors:Thermistors,Thermo-electricsensors:Thermocouples,PNjunctiontemperature sensors

MechanicalSensors:TypesofMechanicalsensorsandtheirbasicprincipleofworking:Forcesensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNITIIIOpticalandAcousticSensors **9H**

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators,Microphones

UNITIV Magnetic and Electromagnetic Sensors **9H**

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magnetostrictive sensors and actuators.

UNITVChemicalandRadiation Sensors **9H**

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

RadiationSensors:PrincipleandworkingofIonizationdetectors,Scintillationdetectors,Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. SensorsandActuators–ClarenceW.deSilva,CRCPress,2ndEdition,2015
2. SensorsandActuators,D.A.HallandC.E.Millar,CRCPress,1999

ReferenceBooks:

1. SensorsandTransducers-D.Patranabhis,PrenticeHallofIndia(Pvt)Ltd.2003
2. Measurement,Instrumentation,andSensorsHandbook-JohnG.Webster,CRCpress1999
3. Sensors–AComprehensiveSensors-HenryBolte,John Wiley.
4. Handbookofmodernsensors,Springer,StefanJohannRupitsch.